Remedial Investigation Report - Appendix B

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February 21, 2020

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Volume III

APPENDIX B

Groundwater and Surface Water Data Summary Report

March 16, 2018

GROUNDWATER AND SURFACE WATER DATA SUMMARY REPORT

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Prepared for

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LIST OF ACRONYMS

Acronym	Definition
AOC	Administrative Settlement Agreement and Order on Consent
BLS	Below Land Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFAC	Columbia Falls Aluminum Company, LLC
CFS	Cubic Feet per Second
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DEQ	Department of Environmental Quality
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
EE	Ecology and Environment, Inc.
ESV	Ecological Screening Value
FS	Feasibility Study
FT	Feet
FT-AMSL	Feet Above Mean Sea Level
FT-BLS	Feet Below Land Surface
GWC-IAC	Groundwater Concentration to Indoor Air Concentration
GWE	Groundwater Elevation
GW	Groundwater
HQ	Hazard Quotient
IDW	Investigation Derived Waste
LOD	Level of Detection
MBMG	Montana Bureau of Mines and Geology
MCL	Maximum Contaminant Levels
MPDES	Montana Pollutant Discharge Elimination System
MDEQ	Montana Department of Environmental Quality
MDL	Method Detection Limits
MS	Matrix Spike
MSD	Matrix Spike Duplicate

Acronym	Definition
MW	Monitoring Well
NAD	North American Datum
NAVD	North American Vertical Datum
NM	Not Measured
ORP	Oxidation Reduction Potential
PAH	Polyaromatic Hydrocarbon Compounds
PCB	Polychlorinated Biphenyls
PHREEQC	pH Redox Equilibrium (in C language)
PW	Production Well
QA	Quality Assurance
QC	Quality Control
RI	Remedial Investigation
RPD	Relative Percent Difference
RSL	Regional Screening Level
S	Second
SAP	Sampling and Analysis Plan
SLERA	Screening Level Ecological Risk Assessment
SOP	Standard Operating Procedure
SOW	Scope of Work
SPL	Spent Potliner
SU	Standard Unit
SVOC	Semivolatile Organic Compounds
SW	Surface Water
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VISL	Vapor Intrusion Screening Levels
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

Roux Associates, Inc. (Roux Associates), on behalf of Columbia Falls Aluminum Company, LLC (CFAC), has prepared this Groundwater and Surface Water Data Summary Report (GW/SW Data Summary Report) as part of the ongoing Remedial Investigation/Feasibility Study (RI/FS) of the CFAC facility located in Flathead County, Montana (hereinafter, "the Site"). The RI/FS is being conducted pursuant to the Administrative Settlement Agreement and Order on Consent (AOC) dated November 30, 2015, between CFAC and the United States Environmental Protection Agency (USEPA) (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Docket No. 08-2016-0002).

The purpose of this GW/SW Data Summary Report is to summarize the results of the groundwater and surface water investigations that were completed between September 2016 and July 2017 as part of the Phase I Site Characterization Scope of Work. The Phase I Site Characterization Scope of Work is documented in the RI/FS Work Plan (Roux Associates, 2015a), the Phase I Site Characterization Sampling and Analysis Plan (Phase I SAP [Roux Associates 2015b]), and the Phase I Site Characterization Sampling and Analysis Plan Addendum (Phase I SAP Addendum, [Roux Associates, 2016a]). The results of the Phase I Site Characterization field activities, including a summary of the first round of the groundwater and surface water investigations, was provided in the Phase I Site Characterization Data Summary Report (Phase I Data Summary Report [Roux Associates, 2017a]).

The work described in this GW/SW Data Summary Report was completed in general accordance with the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (USEPA, 1988) as well as other appropriate USEPA and Montana Department of Environmental Quality (MDEQ) guidance; and the substantive RI/FS requirements of the National Contingency Plan (40 CFR 300) (USEPA, 1994).

1.1 Site Background

The Site is located at 2000 Aluminum Drive near Columbia Falls, Flathead County, Montana. The Site is approximately 2 miles northeast from the center of Columbia Falls and the Site is accessed by Aluminum Drive via North Fork Road (County Road 486). The boundaries of the Site were defined in the RI/FS Work Plan (Roux Associates, 2015a) and are depicted in Figure 1.

The Site consists of approximately 1,340 acres bounded by Cedar Creek Reservoir to the north, Teakettle Mountain to the east, Flathead River to the south, and Cedar Creek to the west.

The Site was operated as a primary aluminum reduction facility (commonly referred to as an aluminum smelter) from 1955 until 2009. The facility began with two potlines in 1955 and an annual capacity of 67,500 tons per year (using 120 pots per potline). A third potline was added in 1965, and the fourth and fifth potline were added 1968, increasing total aluminum production capacity at the Site to 180,000 tons per year. The plant expanded to 10 pot rooms in the 1960s. Aluminum production at the Site was suspended in 2009 due to a downturn in aluminum market conditions, and CFAC announced the permanent closure of the facility in March 2015. A detailed description of the operational history at the Site was provided in Section 2.7.2 of the RI/FS Work Plan (Roux Associates, 2015a).

Buildings and industrial facilities remaining at the Site at the start of the Phase I Site Characterization included offices, warehouses, laboratories, mechanical shops, paste plant, coal tar pitch tanks, pump houses, casting garage, and the potline facility. The Site also includes seven closed landfills, one open landfill that hasn't been used since 2009, material loading and unloading areas, two closed leachate ponds, and several wastewater percolation ponds. A detailed description of each Site feature was provided in Section 3.2 of the RI/FS Work Plan (Roux Associates, 2015a). A map showing the locations of Site features is provided for reference as Figure 2 of this GW/SW Data Summary Report.

1.2 Phase I Site Characterization Objectives

The Phase I Site Characterization program was designed to identify and/or confirm source areas and associated contaminants of potential concern (COPCs) outlined in the RI/FS Work Plan (Roux Associates, 2015a), as well as provide a broad characterization of the hydrogeologic conditions and the nature and extent of contamination across the Site and around Site features. As stated in the RI/FS Work Plan (Roux Associates, 2015a), the following objectives were established for Phase I Site Characterization Program:

- Evaluate the conditions at all identified RI areas and Site features to determine which RI areas and Site features require further investigation and/or quantitative evaluation in the Baseline Risk Assessment;

- Refine the list of COPCs that require further investigation at various RI areas and Site features so lists of laboratory analyses can be reduced during subsequent phases of investigation;
- Refine the understanding of groundwater flow and groundwater quality beneath the Site, particularly in the vicinity of potential receptors;
- Develop a more detailed understanding of bedrock topography and the depths, thicknesses, and extents of the various hydrogeologic units, both of which may influence groundwater flow and the distribution of COPCs in the subsurface;
- Begin to evaluate seasonal influences on groundwater/surface water interactions and contaminant concentrations in groundwater and surface water;
- Develop data to support the preparation of the Baseline Risk Assessment Work Plan; and
- Develop data to support identification and screening of remedial technologies as part of the FS.

This GW/SW Data Summary Report summarizes the results of groundwater and surface water investigations that have been completed to achieve the Phase I Site Characterization objectives listed above.

2.0 SITE GEOLOGY AND HYDROGEOLOGY

This Section provides a summary of the Site geology observed during the Phase I Site Characterization and discusses the influence that Site geology has on hydrogeologic conditions in the subsurface beneath the Site. This Site geology section provides a framework for understanding the groundwater flow and groundwater/surface water quality data and discussion presented throughout this GW/SW Data Summary Report.

2.1 Site Stratigraphy

A summary of regional and Site geology was provided in Section 2.4 of the RI/FS Work Plan (Roux Associates, 2015a) based on previous investigations at the Site and published literature for the Kalispell Valley region. Lithology collected from soil borings completed during the Phase I Site Characterization were utilized to evaluate the stratigraphy beneath the Site. As presented in the Phase I Data Summary Report (Roux Associates, 2017a), there are three major stratigraphic units underlying the Site. The three stratigraphic units consist primarily, from land surface down, of:

- Glacial Outwash and Alluvium: A layer of glaciofluvial and alluvial coarse-grained soils, varying in vertical extent and grain size depending on vicinity to Site features (i.e., Teakettle Mountain, Flathead River, etc.);
- Glacial Till: A layer of dense, poorly sorted glacial till with interbedded deposits of glaciolacustrine clays and silts; and
- Bedrock.

Generalized hydrogeologic cross sections are provided in the Phase I Data Summary Report (Roux Associates, 2017a). Descriptions of the three stratigraphic units observed during the Phase I Site Characterization are provided in the following sections.

2.1.1 Glacial Outwash and Alluvium

The glacial outwash and alluvium layer typically contains coarse grained soils (varying amounts of sand, gravel, and cobbles) with varying degrees of sorting and with lesser amounts of fines. The glacial outwash layer is encountered at the surface across most of the Site, with recent alluvial deposits present primarily near the southern border of the Site in the vicinity of the Flathead River.

The findings described in the Phase I Data Summary Report (Roux Associates, 2017a) indicate that the glacial outwash vertical thickness appears to be relatively consistent in areas north and west of the Main Plant Area, with average thicknesses ranging from 50 to 80 feet thick. The glacial outwash north of the Main Plant Area reaches maximum vertical thickness in the areas beneath the Former Drum Storage Area, West Landfill, Wet Scrubber Sludge Pond, and Center Landfill; where thickness was typically observed to range from 125 to 150 feet. The thickness tends to decrease close to Teakettle Mountain where bedrock elevations are shallower. Near the Flathead River, the vertical extent of the alluvial deposits is approximately 100 feet thick beneath the western and south-central portion of the Site. The thickness of the alluvial deposits near the river is greatest to the area south east of the Main Plant Area, near former production wells (PW) PW-4 and PW-5 (CFMW-052 and CFMW-051, respectively), where thicknesses of greater than 150 feet were observed.

2.1.2 Glacial Till

Glacial till was observed in the subsurface across most of the Site, typically beneath the coarse-grained outwash deposits. The glacial till layer is a dense, poorly-sorted deposit, consisting of varying amounts of sand, gravel, cobbles, silt, and clay. The till was typically noted to be drier and denser than the overlying coarse-grained deposits.

The maximum vertical extent of the glacial till is unknown in the areas to the north, west, and south of the Site, as the next lithologic layer was not encountered during drilling. This indicates that the till is typically at least 200 feet thick or greater in these areas. The glacial till unit was observed to have pockets of wet, coarse grained soils interbedded in the till layer and also interbedded layers of primarily silt or primarily clay. The interbedded layers are generally not continuous and can be found scattered throughout the till layer. These interbedded layers form complex, heterogeneous conditions that likely result in interbedded zones of high and low hydraulic conductivities, which influence the overall deep groundwater flow system beneath the Site.

2.1.3 Bedrock

Based on regional geologic literature, beneath the unconsolidated glacial deposits are pre-Cambrian aged bedrock. The literature indicates that the depth to bedrock increases in a

southwestern direction across the Site, as you move away from Teakettle Mountain. This was confirmed during the Phase I Site Characterization. Bedrock was encountered in soil boring CFMW-023a, which is located in the eastern portion of the Site near Teakettle Mountain, at approximate depths of 150 feet below land surface (ft-bls). Weathered bedrock was also encountered in soil boring CFMW-008a (also located near Teakettle Mountain) at approximately 130 ft-bls, and a more competent bedrock within the same boring at approximately 245 ft-bls. Bedrock was not encountered in any of the other deep soil borings completed at the Site, indicating that depth to bedrock is greater than 300 ft-bls across most of the Site.

2.2 Hydrogeology from Phase I Site Characterization Activities

The stratigraphic units underlying the Site form a complex hydrogeologic framework that influences groundwater elevations, groundwater flow, and potential COPC migration beneath the Site. The coarse grained glacial outwash and alluvium deposits that are found above the glacial till are collectively referred to as the "upper hydrogeologic unit" at the Site. During drilling, the glacial deposits comprising the upper hydrogeologic unit were typically observed to be loose and wet when water was encountered at the water table. Based upon relatively consistent elevations at which groundwater was encountered within the upper hydrogeologic unit, and the occurrence of groundwater at all drilling locations, it appears that the unit is horizontally continuous across the investigated area. The continuity of the upper hydrogeologic unit is also confirmed by hydraulic flow directions and gradients measured during monitoring well gauging (see section 4.1) and by the geochemistry and apparent transport of COPCs observed during groundwater sampling (see section 4.3.2).

While the upper hydrogeologic unit appears to be continuous across the Site, the groundwater within the upper hydrogeologic unit appears to exist under perched water-table conditions. Perched zones have been documented to occur at various locations throughout the Kalispell Valley and have historically been referred to in regional literature as the Pleistocene perched aquifers (Konizeski et al., 1968). The perched conditions are supported by the lithology, and also the rapid and pronounced response to precipitation/seasonal changes that are observed around the landfill and Main Plant Areas, as described in Sections 4.1 and 4.2. The saturated thickness of the upper hydrogeologic unit varies across the Site depending upon the depth to underlying glacial till (see below) and proximity to Teakettle Mountain. Saturated thickness was observed to be less

near Teakettle Mountain, when compared to areas beneath the landfills and west of the landfills. This was confirmed during monitoring well gauging (See section 4.1 below), when it was observed that some of the wells near Teakettle Mountain became dry in late summer/early fall due to seasonal fluctuation in groundwater levels.

During drilling, the glacial tills found below the upper hydrogeologic unit were typically characterized as containing a higher percentage of fines, and as denser and drier, than the overlying outwash and alluvium deposits. The till deposits were often characterized as stiff and, moist or dry; in contrast to the overlying outwash and alluvium that was typically characterized as loose and wet. These observations indicate that the till deposits likely have a lower hydraulic conductivity than the overlying outwash and alluvium deposits. This is supported by observations during monitoring well development, where the new, deep wells screened within the tills typically yielded much less water than wells screened in the outwash deposits. This is also supported by slug testing data which was collected from monitoring wells screened in the glacial till. As described in Section 4.5, slug testing data indicates that the minimum, maximum, and geometric mean hydraulic conductivities measured in the glacial till were lower than the upper hydrogeologic unit.

Based upon the conceptual Site model, bedrock is considered to define the bottom of the hydrogeologic system beneath the Site.

2.3 Site Monitoring Wells

As part of the Phase I Site Characterization field activities, 44 new monitoring wells were installed at the Site, including 28 monitoring wells installed slightly beneath the water table within the upper hydrogeologic unit and 16 monitoring wells installed deeper within the glacial tills. The new monitoring well locations were installed to supplement the existing monitoring well network at the Site to support further evaluation of groundwater quality in potential source areas and in areas that have not previously been monitored, while also helping to refine the understanding of Site groundwater flow. Plate 1 shows the locations of all monitoring wells at the Site. Table 1 summarizes the construction details for the monitoring wells at the Site.

Upper hydrogeologic unit monitoring wells were typically installed with the top of the screened interval located approximately 5 to 10 feet below the observed water table at the time of drilling to account for seasonal fluctuations in groundwater elevations. Deep monitoring wells were installed to evaluate the vertical extent of COPCs in groundwater and to evaluate groundwater flow within deeper hydrogeologic units. The screened intervals of the deep wells were determined by Roux Associates personnel based on field observations made during drilling, and were typically set below the first low-permeability unit observed during drilling. In locations where a low permeability unit was not encountered, a spacing of 25 feet or greater was placed between the monitoring wells installed beneath the water table and the deeper wells. In locations where bedrock was encountered close to the water table, the deeper well was placed immediately above the bedrock.

Construction details for all new monitoring wells are provided in well logs in the Phase I Data Summary Report (Roux Associates, 2017a). Following surface completion, all newly installed monitoring wells, as well as existing monitoring wells, were surveyed by Sands Surveying Inc. (Sands Surveying) of Kalispell, Montana for horizontal (North American Datum [NAD] 83) and vertical (North American Vertical Datum [NAVD] 88) coordinates within the Montana State Plane Coordinate System (FIPS2500). Survey data is included on Table 1.

2.4 Site Surface Water Features

The Site is located within the Flathead River watershed. The Site is bordered by surface water features on each side, including the Flathead River to the south, Cedar Creek to the west, and Cedar Creek Reservoir Overflow Ditch to the east. Figure 2 depicts the locations of these surface water features. The below sections provide a summary of the surface water features at the Site.

2.4.1 Flathead River

The North Fork of the Flathead River originates in British Columbia and the Middle Fork of the Flathead River originates in the Bob Marshall Wilderness located south of Glacier National Park. The North Fork and the Middle Fork border Glacier National Park on the western and southern boundaries, respectively, and flow south of Glacier National Park where they meet the South Fork of the Flathead River at the entrance of Badrock Canyon, and the river is then called the Flathead River. The Flathead River flows west through Badrock Canyon towards Columbia Falls, where it

eventually flows past the Site. After passing the Site, the River flows south towards Flathead Lake (Ecology and Environmental, Inc [EE], 1988).

As of January 2017, the United States Geological Survey (USGS) currently maintains three active gauging stations on the Flathead River in the general vicinity of the Site. The closest station is located approximately three miles southwest of the Site near Columbia Falls (USGS Station #12363000). Two stations are located approximately 10 miles north/northeast of the Site: the station on the North Fork of the Flathead River and the Middle Fork station immediately west of Glacier National Park (USGS Station #s 12355500 and 12358500, respectively). Discharge data downloaded from the USGS gauging station closest to the Site is provided in Appendix A and is discussed in Section 5.1.

In terms of interaction with the groundwater system, published literature indicates the Spring high flows in the Flathead River result in the Flathead River recharging groundwater and acting as a losing stream (Konizeski et al., 1968). As described in the Phase I Data Summary Report (Roux Associates, 2017a), the water level data collected in August 2016 and November 2016 (a low flow period) indicate that adjacent to the Site, the Flathead River is receiving groundwater from the upper hydrogeologic unit beneath the Site.

2.4.2 Cedar Creek

Cedar Creek originates north of the Site in the Whitefish mountains and flows approximately three miles southwest towards the City of Columbia Falls. Based upon the flat topography of the portion of the Site located within one-half mile of Cedar Creek, there is little potential for surface water runoff into Cedar Creek from the Main Plant Area or surrounding former operational areas within the Site. In addition, the elevation of Cedar Creek is higher than groundwater elevations within the Site, indicating that Cedar Creek is a perched or losing stream rather than a gaining stream (i.e., Site groundwater does not discharge into Cedar Creek).

2.4.3 Cedar Creek Reservoir Overflow Ditch

The Cedar Creek Reservoir Overflow Ditch runs from the Cedar Creek Reservoir north of the Site, to the Flathead River. The Cedar Creek Reservoir Overflow Ditch runs alongside the Sanitary

Landfill, Center Landfill, the southern Asbestos Landfill, and the East Landfill and Leachate Collection Ponds before discharging into the Flathead River.

The Cedar Creek Reservoir Overflow Ditch flows intermittently in the spring and is used to regulate flow for Cedar Creek and levels within the reservoir. Based upon proximity and land surface topography, some surface water runoff from the eastern side of the Site, originating from the vicinity of the East and Sanitary Landfills, may flow to the Cedar Creek Reservoir Overflow Ditch. Similar to Cedar Creek, the elevation of Cedar Creek Reservoir Overflow Ditch is higher than surrounding groundwater elevations within the Site, indicating that the Cedar Creek Reservoir Overflow Ditch may be a losing stream.

2.4.4 South Percolation Ponds

The South Percolation Ponds are a series of three ponds located on the south end of the Site, adjacent to the Flathead River. The ponds are 2.4, 1.2 and 6.6 acres in size (from west to east) forming a total of 10.2 acres, and are connected in series. Water is discharged into the South Percolation Ponds system from a concrete pipe located on the west end of the pond system. From the pipe, water flows into the ponds through an unlined ditch. Historically, the South Percolation Ponds received water from various operations within the Main Plant area. Currently, only stormwater is discharged into the South Percolation Ponds.

2.4.5 North Percolation Ponds

The North Percolation Ponds consists of two interconnected percolation ponds (the North-East Percolation Pond and the North-West Percolation Pond). The North-East Percolation Pond is approximately 2.0 acres in size and was constructed in 1955. The North-East Percolation Pond is currently operational and a discharge point for stormwater drainage. This percolation pond received discharges from various operations within the Main Plant area until manufacturing ceased in 2009. Based on the aerial photography review, the exact size and shape of the North-East Percolation Pond changed slightly over time.

The North-West Percolation Pond is approximately 8 acres in size. The North-West Percolation Pond receives water from the North-East Percolation Pond. The two ponds were connected by an approximately 1,440-foot-long unlined ditch.

2.4.6 Northern Surface Water Feature

The Northern Surface Water Feature is a seasonal ponding area located between Cedar Creek and the Cedar Creek Reservoir Overflow Ditch, just south of the Industrial Landfill. Site reconnaissance indicated the area is seasonally fed in the spring and early summer by at least two groundwater seep areas located north of the main ponding area in the southern portion of the feature. Further reconnaissance later in September 2016 show the feature to be void of surface water. It is believed that during the spring, the snowmelt and increased seasonal precipitation creates a localized elevated or perched water table which feed the seeps. The substrate of the feature is predominantly grass covered with areas of channelization which help direct the groundwater from the seep area to the feature.

3.0 SCOPE OF WORK

The Scope of Work summarized in this GW/SW Data Summary Report is a subset of the of work described in the RI/FS Work Plan (Roux Associates, 2015a) and the Phase I SAP (Roux Associates, 2015b). Modifications to the Scope of Work were documented in field modifications throughout the Phase I Site Characterization field activities. The Scope of Work included the following tasks:

- Four rounds of Site-wide monitoring well gauging to evaluate Site-wide groundwater elevations and flow directions;
- Installation of pressure transducers to monitor long-term groundwater elevations at selected monitoring well locations;
- Four rounds of groundwater sampling to evaluate seasonal changes in groundwater quality;
- Four rounds of surface water sampling and streamflow measurements to evaluate seasonal changes in surface water quality and surface water flow; and
- Pneumatic and mechanical slug testing to evaluate hydraulic conductivity.

The following sections describe the work that was completed for each task.

3.1 Groundwater Gauging

Site-wide groundwater levels were measured by Roux Associates on August 30, 2016, November 29, 2016, March 14/15, 2017, and June 16, 2017. Groundwater level measurements were collected to provide a snapshot of the Site-wide groundwater elevations immediately prior to the start of each groundwater and surface water sampling round. Groundwater levels were collected with an electronic water-level meter capable of measuring fluid elevation within an accuracy of 0.01 feet (ft). Plate 1 shows the locations of Site monitoring wells and Table 2 provides a summary of the measurements collected on each date. Wells designated as "NM" on Table 2 were not measured due to being inaccessible.

3.2 Long Term Elevation Monitoring with Pressure Transducers

Six (6) In-Situ Level Troll 700 pressure transducers were deployed in existing monitoring wells at the Site in April 2016, prior to installation of any new monitoring wells. The transducers were installed to continuously collect groundwater elevation data in various areas of the Site and around different Site features, with the objective of developing an understanding of groundwater elevation

fluctuations in response to precipitation events and longer term seasonal trends at the Site. The monitoring wells equipped with pressure transducers in April 2016 included CFMW-001, 007, 020, and 049 (screened in the upper hydrogeologic unit), and CFMW-044b and 056 (screened below the upper hydrogeologic unit). The pressure transducer in CFMW-007 was removed in June 2016 and installed in monitoring well CFMW-003, which is also screened in the upper hydrogeologic unit.

In March 2017, the six pressure transducers were relocated to monitoring wells CFMW-016, 016a, 019, 019a, 053, and 053a. These well locations were selected to evaluate groundwater elevation fluctuations in nested monitoring wells (i.e., well locations with monitoring wells screened in the upper hydrogeologic unit and below the upper hydrogeologic unit) around the West and Center Landfills, and near the Flathead River downgradient of the landfill area.

Pressure transducer data were downloaded multiple times throughout the field activities, typically coinciding with monitoring well gauging activities. Hydrographs for each location displaying groundwater elevation over time and precipitation from Glacier National Park Airport (Kalispell, MT) are provided in Appendix B. In addition to the data collected with the six deployed pressure transducers, Roux Associates also reviewed data collected by the Montana State Bureau of Mines from a pressure transducer that was deployed in existing monitoring well CFMW-007/TW-3 (identified ID 87873 in the Montana Bureau of Mines and Geology [MBMG] website well database [MBMG, 2017]).

3.3 Groundwater Sampling

Roux Associates and Hydrometrics (Roux Associates' subcontractor) performed groundwater sampling during four separate sampling events between September 2016 and June 2017. Each round of sampling was approximately two weeks in duration. Groundwater samples were collected using the methods described in the USEPA guidance document titled "Ground Water Sampling Procedure, Low Stress (Low Flow) Purging and Sampling" (USEPA, 2010) and in accordance with the applicable Roux Associates' Standard Operating Procedures (SOPs) provided in the Phase I SAP (Roux Associates, 2015b).

During groundwater sampling, a water quality meter was used to monitor water quality indicator parameters such as pH, conductivity, dissolved oxygen (DO), oxidation reduction potential (ORP), temperature, and turbidity. The field parameters and information about each sample were recorded on monitoring well sampling field data sheets which are included as Appendix C. The following sections further describe each groundwater sampling round.

3.3.1 Round 1 Groundwater Sampling – September 2016

The first round of groundwater sampling was conducted from September 9, 2016 through September 21, 2016 (Round 1) with samples being collected from a total of 60 monitoring wells. Groundwater samples were not collected from four monitoring wells (CFMW-016, CMFW-017, CFMW-018, and CFMW-025) that were dry during the sampling event. Samples collected during the Round 1 September 2016 groundwater sampling event are summarized in Table 3.

3.3.2 Round 2 Groundwater Sampling – December 2016

The second round of groundwater sampling was conducted from December 5, 2016 through December 19, 2016 (Round 2) with samples being collected from a total of 58 monitoring wells. A total of six monitoring wells (CFMW-002, CFMW-016, CFMW-017, CFMW-018, CFMW-025, and CFMW-042) were unable to be sampled due to either dry conditions or insufficient water within the well to collect a sample during the sampling event. Samples collected during the Round 2 December 2016 groundwater sampling event are summarized in Table 3.

3.3.3 Round 3 Groundwater Sampling – March 2017

The third round of groundwater sampling was conducted from March 20, 2017 through March 30, 2017 (Round 3) with samples being collected from 61 monitoring wells. Groundwater samples were not collected from two monitoring wells (CFMW-042 and CFMW-053) due to dry well conditions or insufficient water within the well during the sampling event. Additionally, a sample was not collected from monitoring well CFMW-025 because it was inaccessible due to being damaged by a snow plow. Samples collected during the Round 3 March 2017 groundwater sampling event are summarized in Table 3.

3.3.4 Round 4 Groundwater Sampling – June 2017

The fourth round of groundwater sampling was conducted from June 19, 2017 through June 29, 2017 (Round 4) with samples being collected from 63 monitoring well locations. A sample was not collected from monitoring well CFMW-025 which did not contain sufficient water for sampling during the sampling event. Additionally, two monitoring wells (CFMW-025 and CFMW-053) that were damaged from the snow plow during the winter were repaired prior to the sampling. Both wells were resurveyed by Sands Surveying on June 13, 2017. Samples collected during the Round 4 June 2017 groundwater sampling event are summarized in Table 3.

3.3.5 Groundwater Sampling Analytical Methods

All groundwater samples from all four sampling events were analyzed for the following analytical methods as noted in the RI/FS Work Plan (Roux Associates, 2015a) and Phase I SAP (Roux Associates, 2015b):

- Dissolved Target Analyte List (TAL) metals via USEPA Methods 6020A / 7470A;
- Total cyanide via USEPA Method 335.4;
- General chemistry including fluoride via USEPA Method 300, alkalinity via Method SM2320B, and hardness via Method 2340B;
- Nutrients including chloride and sulfate via USEPA Method 300.0, nitrate and nitrite (as nitrogen) via USEPA Method 353.2, ammonia nitrogen via USEPA Method 350.1/350.3, and orthophosphate as phosphorus via USEPA Method 365.1; and
- Total dissolved solids (TDS) and total suspended solids (TSS) via Methods SM 2540C/D.

The groundwater samples collected adjacent to potential source areas, as noted in the RI/FS Work Plan (Roux Associates, 2015a) and Phase I SAP (Roux Associates, 2015b), also included the following additional analytes:

- Target Compound List (TCL) volatile organic compounds (VOCs) via USEPA Method 8260B; and
- TCL semivolatile organic compounds (SVOCs) via USEPA Method 8270D.

Based on review of the groundwater quality data from Rounds 1 and 2 of sampling (September 2016 and December 2016), and prior to Round 3 (March 2017), Field Modification #9 was submitted to USEPA (described in Section 3.8) requesting the addition of free cyanide analysis via

USEPA method 9016 for the third round of sampling at all locations where total cyanide was detected in either Round 1 or Round 2. As such, a total of 44 out of the 64 existing monitoring wells located at the Site were analyzed for free cyanide during the third groundwater sampling event.

At a project meeting held on April 19, 2017, USEPA, MDEQ, CFAC, Roux Associates, and CDM Smith (USEPA third-party oversight) discussed the sampling results from Rounds 1 through 3 and agreed to add additional analyses to the Round 4 sampling. During Round 4 in June 2017, the 63 monitoring wells sampled were analyzed for the following additional analyses:

- Total TAL metals via USEPA Methods 6020A / 7470A;
- Dissolved total cyanide via USEPA Method 335.4; and
- Dissolved fluoride via USEPA Method 300.0.

Additionally, at all locations where total cyanide was detected in Rounds 1, 2, or 3, groundwater samples were analyzed for both free cyanide and dissolved free cyanide via USEPA Method 9016 during Round 4. This included 51 monitoring wells, which was an increase from the 44 monitoring wells that were analyzed for free cyanide in Round 3.

3.4 Surface Water Sampling

Roux Associates performed surface water sampling during four sampling events between September 2016 and June 2017. Each surface water sampling event was generally performed over a one-week period, and the four sampling events coincided with the groundwater sampling events. During each sampling event, Roux Associates collected surface water samples from Site surface water features that were observed to contain water during the respective sampling event. In addition to the four sampling events, select surface water locations were sampled in June 2016, prior to the first round of sampling, because it was determined during the initial Site reconnaissance that some surface water areas could dry out over the summer months.

Surface water samples were collected as grab samples from within the Site feature by Roux Associates personnel. Samples were collected at a depth of approximately 60 percent of the total water column depth. The maximum water depth at any surface water sample location was approximately two feet. However, during the initial Site reconnaissance, several surface water

sample locations along the Flathead River were deemed inaccessible by foot due to the presence of forested areas and limited bank/shoreline for traversing. In accordance with Field Modification #8 (described in Section 3.8), Roux Associates collected surface water samples from Flathead River with the use of a boat provided by Kennedy/Jenks Consulting (subcontractor to Roux Associates). A captain representative of Kennedy/Jenks Consulting steered the boat through the river, and surface water samples were collected from the boat by taking a grab sample directly from the waterbody using the sample collection container for each analysis.

As part of the sample collection activities within the surface water bodies, the surface water was field screened with a water quality meter to evaluate water quality parameters; including: temperature, conductivity, pH, turbidity, DO, and ORP. The water quality meter was placed directly in the surface water body and monitored until stable readings were observed. The readings were recorded on a field datasheet and the location within the surface water body was logged with GPS technology with sub-meter accuracy. Surface water sample field data sheets are included as Appendix C. Surface water sampling locations are shown on Plate 2 and are summarized on Table 4. Each surface water sampling event is further described in the next sections.

3.4.1 Pre-Round 1 Surface Water Sampling – June 2016

On June 6, 2016 and June 7, 2016, ten surface water samples were collected from selected surface water bodies that were anticipated to dry out over the summer months as part of the pre-Round 1 surface water investigation. These locations included three locations in the South Percolation Ponds, five locations in the Cedar Creek Reservoir Overflow Ditch, and two locations in the Northern Surface Water Feature. The North-West and North-East Percolation ponds were also inspected during this time period for potential sampling but no surface water was present and therefore, no surface water samples were collected from these locations. Samples collected during the pre-Round 1 June 2016 surface water sampling event are summarized in Table 4.

3.4.2 Round 1 Surface Water Sampling – September 2016

The first surface water sampling event occurred from August 29, 2016 to September 16, 2016 and included sampling of the 12 remaining surface water locations not sampled during the June 2016 pre-Round 1 investigation. During Round 1, samples were collected from within the Flathead

River, the Backwater Seep Sampling Area, and Cedar Creek. Similar to the June 2016 sampling event, surface water samples were not collected within the North-West and North-East Percolation ponds due to an absence of surface water. Samples collected during the Round 1 surface water sampling event are summarized in Table 4.

3.4.3 Round 2 Surface Water Sampling – December 2016

The second surface water sampling event occurred from November 30, 2016 to December 2, 2016, and also included an additional day of sampling on December 20, 2016. During Round 2, 17 surface water locations were sampled, including one location in Cedar Creek (CFSWP-025) that was added to the Scope of Work as an opportunity sample (collected on December 20, 2016), based on evaluation of the Round 1 data. During the Round 2 sampling event, seven proposed surface water sampling locations were not sampled due to being dry. These seven locations were within the Northern Surface Water Feature, North-West and North-East Percolation Ponds, and the Cedar Creek Reservoir Overflow Ditch. Samples collected during the Round 2 surface water sampling event are summarized in Table 4.

3.4.4 Round 3 Surface Water Sampling – March 2017

The third round of surface water sampling occurred from March 13, 2017 through April 4, 2017. Thirteen surface water samples were collected from March 13, 2017 to March 16, 2017. During this period, the remainder of the surface water features were covered with snow due to accumulation over the winter months and were either inaccessible or no running/ponded water was observed within these sampling locations. Eleven surface water locations were sampled on April 3, 2017 and April 4, 2017, after snow melted and the locations were accessible for sampling. One surface water point (CFSWP-024) located within the North-East Percolation Pond was not sampled during the third round of sampling due to dry conditions. Samples collected during the Round 3 surface water sampling event are summarized in Table 4.

3.4.5 Round 4 Surface Water Sampling – June 2017

The fourth sampling event occurred from June 12, 2017 to June 15, 2017. Round 4 of sampling included the collection of 23 surface water samples. Two sampling locations were found to contain no water during Round 4, CFSWP-022 and CFSWP-023. These sampling points are located within the Northern Surface Water Feature and the North-West Percolation Pond,

respectively. Samples collected during the Round 4 surface water sampling event are summarized in Table 4.

3.4.6 Surface Water Sampling Analytical Methods

All surface water samples from the four sampling events were analyzed for the following analytical methods as noted in the RI/FS Work Plan (Roux Associates, 2015a) and Phase I SAP (Roux Associates, 2015b):

- Total recoverable TAL metals via USEPA Methods 6020A / 7470A;
- Total cyanide via USEPA Method 335.4;
- General chemistry including fluoride via USEPA method 300, alkalinity via Method SM2023B, and hardness via USEPA Method 200.7;
- Nutrients including chloride and sulfate via USEPA method 300.0, nitrate and nitrite (as nitrogen) via USEPA Method 353.2, ammonia nitrogen via USEPA Method 350.1 / 350.3, and orthophosphate as phosphorous via USEPA Method 365.1; and
- TDS and TSS via Methods SM 2540C/D.

The initial surface water samples collected during pre-Round 1 within the South Percolation Ponds were also analyzed for the following additional analytes:

- TCL VOCs via USEPA Method 8260;
- TCL SVOCs via USEPA Method 8270;
- TCL polychlorinated biphenyls (PCBs) via USEPA Method SW8082; and
- TCL pesticides via USEPA Method 8081.

Similar to groundwater, Roux Associates evaluated the surface water quality data from the first and second rounds of sampling (September 2016 and December 2016). Based on review of the data, and prior to Round 3, Field Modification #9 was submitted to USEPA (described in Section 3.8) requesting the addition of free cyanide analysis via USEPA Method 9016 for the third round of sampling at all locations where total cyanide was detected in either Round 1 or Round 2. A total of seven out of 25 possible locations were analyzed for free cyanide during the third sampling event. These locations included three samples in the Backwater Seep Sampling Area,

two samples in Cedar Creek, and one sample each in the Flathead River and the South Percolation Ponds.

At the project meeting held on April 19, 2017, USEPA, MDEQ, CFAC, Roux Associates, and CDM Smith also discussed the surface water sampling results from Rounds 1 through 3 and agreed to add additional analyses to the Round 4 sampling event. During Round 4 in June 2017, the surface water samples were also analyzed for the following additional analyses:

- Dissolved TAL metals via USEPA Methods 6020A / 7470A;
- Dissolved total cyanide via USEPA Method 335.4;
- Dissolved fluoride via USEPA Method 300.0;
- Sulfide via USEPA Method SM 4500_S2_F; and
- Dissolved Organic Carbon (DOC) via USEPA Method 9060A.

Additionally, at all seven locations where total cyanide was detected in Rounds 1, 2, or 3, surface water samples were analyzed for both free cyanide and dissolved free cyanide via USEPA Method 9016.

3.5 Surface Water Elevation Monitoring

Surface water elevations at USGS station #12363000 (located in the Flathead River immediately down river of the Site as described in Section 5.1) were reviewed throughout the Phase I Site Characterization field activities to understand seasonal changes in the Flathead River conditions and to evaluate river conditions prior to sampling events. Data from the USGS station was downloaded and graphed in Appendix A.

A temporary staff gauge was also installed within the Flathead River to enable measurement of river level conditions immediately adjacent to the Site. The temporary staff gauge was surveyed by Sands Surveying and staff gauge readings were recorded in conjunction with each groundwater level gauging event. Following the reading from the staff gauge during the third round of sampling, Roux workers observed that the staff gauge was damaged and bent due to strong water flow and ice debris within Flathead River. A new staff gauge was installed on June 13, 2017, prior to the Round 4 Site-wide gauging event conducted on June 16, 2017. The newly installed

staff gauge was surveyed by Sands Surveying on the same day of installation. Surface water elevations from the staff gauge are included Table 2 and discussed in Section 5.1.

3.6 Surface Water Discharge Monitoring

As part of the surface water sampling events, the discharge of Cedar Creek and the Cedar Creek Drainage Overflow were measured utilizing a mechanical current-meter. The stream channel cross section was divided into equal vertical subsections. In each subsection, the area was calculated by measuring the width and depth of the subsection, and the water velocity was determined using a current flow meter. The discharge in each subsection was computed by multiplying the subsection area by the measured velocity and the total discharge was determined by summing the discharge of each subsection. Stream discharge calculations for each sampling event are provided in Appendix D.

3.7 Slug Testing

Roux Associates conducted slug testing on the new 2-inch diameter monitoring wells installed as part of the Phase I Site Characterization. The slug tests were performed following the fourth groundwater and surface water sampling event, from July 10, 2017 to July 27, 2017. The slug testing program was conducted to determine hydraulic conductivity in the subsurface across the Site and to evaluate the *in situ* permeability contrast between various hydrogeologic units beneath the Site.

Slug tests were performed on 43 of the 44 newly installed Phase I Site Characterization monitoring wells. One monitoring well (CFMW-018) did not have adequate water to conduct a slug test, and therefore, was not tested. Slug tests were performed via one of two methods: pneumatic or mechanical slug testing. The pneumatic slug test method was the preferred testing method due to the level of accuracy able to be achieved in high conductivity settings. Pneumatic slug testing methods were used at locations where the entire length of screen of the monitoring well was submerged beneath the level of standing water in the well. If the water level was below the top of the screen, mechanical slug testing was performed.

Four tests were generally completed at each location: two 1-foot displacement tests; and two 2-foot displacement tests. Two tests were conducted at each displacement level to assess the

reproducibility of the data for consecutive tests. As outlined in the Field Modification #11 (described is Section 3.8), if water levels did not return to static or near static conditions within one hour of the first test, a test at the second displacement depth (i.e., two-foot displacement) was not completed. Slug testing field data sheets are provided in Appendix C. Slug testing data and analysis is discussed in Section 4.5. The remainder of this Section describes the different slug testing methods.

3.7.1 Pneumatic Slug Testing

Pneumatic slug tests were performed on 35 of the 43 wells. All pneumatic tests were conducted in accordance with the procedures outlined in the SOP titled "Standard Operating Procedure 4.8 for Conducting a Pneumatic Slug Test." Pneumatic slug tests were conducted using compressed air as the displacing (slug) volume. The water column within the well casing was depressed by increasing the air pressure in the casing above the water column. When the water level was depressed to a predetermined level and the air pressure stabilized within the test interval, the air pressure within the well casing was rapidly released. The instantaneous release of air pressure from the well casing initiated a pneumatic slug withdrawal test, which was recorded using a pressure transducer data logger.

3.7.2 Mechanical Slug Testing

Mechanical slug tests were performed on seven wells. Additionally, one well (CFMW-002) had the 1-foot test completed pneumatically and the 2-foot test completed mechanically due to the water level in the well dropping below the screen between the two tests. All mechanical tests were conducted in accordance with the procedures outlined in the SOP titled "Standard Operating Procedure 4.9 for Conducting a Mechanical Slug Test." Mechanical slug tests were conducted within using a solid cylinder (slug). Due to the fact that mechanical slug tests were being performed on wells screened near the water table, the testing was limited to "slug-out" tests. As part of the "slug-out test", the water column within the well casing was decreased by rapidly removing the solid slug from the water column. All changes in water levels were recorded using a pressure transducer data logger.

3.8 Field Modifications

A total of three field modifications related to evaluation of groundwater and/or surface water were implemented in consultation with the USEPA throughout the course of the Phase I Site Characterization, including:

- Modification #8 (August 30, 2016) – Several surface water and sediment sample locations along the Flathead River were determined to be inaccessible by foot due to the presence of forested areas and limited bank/shoreline for traversing; therefore, these sample locations were accessed with the use of a boat for all four rounds of sampling.

- Modification #9 (March 2, 2017) – Free cyanide analysis was added to the sampling Scope of Work for all monitoring well and surface water locations where there were detections of cyanide above the method detection limit in Rounds 1 and 2.

- Modification #11 (June 12, 2017) – Pneumatic and mechanical slug testing of newly installed monitoring wells were added to the Scope of Work.

Modifications were memorialized in Record of Modification forms submitted to the USEPA for approval prior to implementing the change. Executed Record of Modification forms are included as Appendix E. In addition to the three modifications described above, additional sampling analyses were added to the fourth round of surface water and groundwater sampling following the USEPA meeting in April 2017 as described in Sections 3.3.5 and 3.4.6.

3.9 Investigation Derived Waste Management

Water investigation derived waste (IDW) that was generated during monitoring well development and the four rounds of groundwater sampling was managed onsite in accordance with the IDW Management Plan dated May 9, 2016. IDW water was stored in two 8,000-gallon frac tanks onsite and later characterized for transport and disposal offsite. IDW water manifests are provided in Appendix F.

Water IDW samples were collected in accordance with the IDW Management Plan to characterize the water for transport and disposal offsite. Roux Associates collected three waste characterization water samples from frac tank #1 (CFWC-001-WG, CFWC-002-WG, CFWC-003-WG) from August 2016 through November 2016 following the completion of Round 1 of groundwater and surface water sampling. The sampling results are provided in Appendix F, F1 through F8. Roux Associates provided the sampling results to USEPA and the Oregon Department of Environmental Quality (for notification purposes in the state where the waste will be shipped) on March 24, 2017. USEPA provided their concurrence with the sample results and plan for water disposal via e-mail

on April 4, 2017. The results showed the IDW water (approximately 7,000 gallons of water) was non-hazardous. The results also indicated detections of total cyanide and fluoride in all three samples at concentrations that exceed the USEPA Tapwater RSLs, but are below the USEPA MCLs.

Disposal of water IDW associated with the above referenced samples was completed in May 2017. The first load of water (approximately 5,000 gallons) was transported via tanker truck to Chemical Waste Management, 17629 Cedar Springs Lane, Oregon 97812 on May 11, 2017, followed by the second load of water (approximately 2,000 gallons) on May 16, 2017. Transport of the water was managed by Cascade Drilling.

Roux Associates collected one waste characterization water sample from frac tank #2 (CFWC-004-WG) on June 30, 2017 following the completion of the fourth groundwater sampling event. The sampling results are provided in Appendix F, Tables F1 through F8. Roux Associates provided the sampling results to USEPA and the Oregon Department of Environmental Quality on July 27, 2017. The results showed the IDW water was non-hazardous. The results also indicated detections of total cyanide and fluoride in all three samples at concentrations that exceed the USEPA Tapwater RSLs, but are below the USEPA MCLs. USEPA provided their concurrence with the sample results and plan for water disposal via e-mail on August 2, 2017.

Disposal of water IDW associated with the above referenced sample was completed in August 2017. The water (approximately 3,200 gallons) was extracted from the onsite tank on August 17, 2017, transported via tanker truck, and received by Chemical Waste Management, 17629 Cedar Springs Lane, Oregon 97812 on August 18, 2017 in accordance with the IDW Management Plan. Transport of the water was managed by Cascade Drilling.

The two onsite frac tanks were cleaned by Cascade Drilling on September 7, 2018. The tank contents (2,000 gallons of residual drilling materials and rinsate) were extracted and transported offsite via tanker truck on September 8, 2017 to Chemical Waste Management, 17629 Cedar Springs Lane, Oregon 97812, in accordance with the IDW Management Plan (Roux Associates, 2016b). The two tanks were transported offsite by Cascade Drilling in October 2017.

4.0 GROUNDWATER INVESTIGATION RESULTS

This Section describes the results of the groundwater investigation activities, including groundwater gauging, groundwater sampling, and slug testing.

4.1 Groundwater Elevations/Potentiometric Surfaces and Flow Patterns

Depth to groundwater and potentiometric surface elevations from the four gauging events are provided in Table 2. The elevation data indicates that groundwater elevations (GWE) fluctuate seasonally at varying magnitudes depending on the area of the Site. Near Teakettle Mountain and the landfill area, average water levels fluctuated by approximately 16 feet between March 2017 (low water levels) and June 2017 (high water levels). During the same time period, monitoring wells in the center of the Site and the southern area of the Site fluctuated by 12.5 feet and 17.5 feet, respectively. The table below summarizes average groundwater elevations in three general areas of the Site during each gauging round. The data in the table below further illustrate the points above regarding temporal fluctuations.

Location	Wells Utilized	Average Groundwater Elevation Feet above Mean Sea Level *[ft-amsl])* Round 1 Aug 30, 2016	Average Groundwater Elevation *(ft-amsl)* Round 2 Nov 29, 2016	Average Groundwater Elevation *(ft-amsl)* Round 3 Mar 14/15, 2017	Average Groundwater Elevation *(ft-amsl)* Round 4 June 16, 2017
Teakettle Mountain / Landfill Area	CFMW-002 CFMW-010 CFMW-012 CFMW-014 CFMW-015 CFMW-016 CFMW-019 CFMW-020 CFMW-021	3065.76	3065.87	3063.78	3079.88
Center of the Site (Between Main Plant and Landfills)	CFMW-026 CFMW-027 CFMW-028 CFMW-029 CFMW-031 CFMW-032 CFMW-033 CFMW-034 CFMW-035 CFMW-043 CFMW-044	3063.30	3060.64	3058.27	3071.05

Location	Wells Utilized	Average Groundwater Elevation Feet above Mean Sea Level *[ft-amsl])* Round 1 Aug 30, 2016	Average Groundwater Elevation *(ft-amsl)* Round 2 Nov 29, 2016	Average Groundwater Elevation *(ft-amsl)* Round 3 Mar 14/15, 2017	Average Groundwater Elevation *(ft-amsl)* Round 4 June 16, 2017
Southern Area (Between Main Plant and Flathead River)	CFMW-037 CFMW-038 CFMW-040 CFMW-042 CFMW-045 CFMW-047 CFMW-049 CFMW-050 CFMW-053 CFMW-054	3032.49	3026.59	3023.87	3041.49

The groundwater elevations from monitoring wells screened in the upper hydrogeologic unit were utilized to create groundwater contour maps and to evaluate groundwater flow. The groundwater contour maps are provided in Plates 3 through 6. Overall, groundwater flow across the Site in the upper hydrogeologic unit was generally to the south / southwest direction towards the Flathead River during all four rounds of gauging. The groundwater flow maps also indicate that the hydraulic gradients are consistent across all four rounds and can generally be divided into three distinct areas. Near Teakettle Mountain and in the landfill area of the Site, the groundwater hydraulic gradient is steep and generally mirrors the steeper topography in that portion of the Site. Groundwater elevations in the center of the Site (near the North Percolation Ponds, former Operational Area, and northern half of the Main Plant Area) are consistent over long distances, indicating a relatively flat groundwater hydraulic gradient across the center of the Site (i.e., generally an order of magnitude less than near the landfill area). The gradient then increases in the southern area of the Site between the Main Plant Area and the Flathead River (which is also consistent with the steep drop in topography between the railroad and the river). The table below summarizes the average hydraulic gradients in the three general areas of the Site during each gauging round:

Location	Hydraulic Gradient *(ft/ft)* Round 1 Aug 30, 2016	Hydraulic Gradient *(ft/ft)* Round 2 Nov 29, 2016	Hydraulic Gradient *(ft/ft)* Round 3 Mar 14/15, 2017	Hydraulic Gradient *(ft/ft)* Round 4 June 16, 2017
Teakettle Mountain/ Landfill Area	0.0280	0.0433	0.0536	.0719

Location	Hydraulic Gradient *(ft/ft)* Round 1 Aug 30, 2016	Hydraulic Gradient *(ft/ft)* Round 2 Nov 29, 2016	Hydraulic Gradient *(ft/ft)* Round 3 Mar 14/15, 2017	Hydraulic Gradient *(ft/ft)* Round 4 June 16, 2017
Center of the Site (Between Main Plant and Landfills)	0.0013	0.0028	0.0030	0.0034
Southern Area (Between Main Plant and Flathead River)	0.0131	0.0078	0.0053	0.0199

The groundwater elevations measured during all four sampling events within the deep wells that are screened in the glacial till unit (i.e., below the upper hydrogeologic unit) are also provided on Plates 3 through 6 for comparison with elevations measured in wells screened in the upper hydrogeologic unit. In addition, the table below shows the elevations measured in monitoring well clusters, where there is a well screened within the upper hydrogeologic unit and an adjacent deep well screened below the upper hydrogeologic unit. The table below also includes the elevations measured in monitoring well clusters CFMW-016/CFMW-016a, CFMW-028/CFMW-028a, CFMW-045/CFMW-045a, and CFMW-049/CFMW-049a, which are monitoring well cluster locations where both monitoring wells are screened in the upper hydrogeologic unit.

Monitoring Well Location ID	Geologic Unit	Aug 30, 2016 GWE *(ft-amsl)* Round 1	Nov 29, 2016 GWE *(ft-amsl)* Round 2	March 14/15, 2017 GWE *(ft-amsl)* Round 3	June 16, 2017 GWE *(ft-amsl)* Round 4
Monitoring Well Clusters with an Upper Hydrogeologic Unit and Below Upper Hydrogeologic Unit Well					
CFMW-003	Upper	3121.48	3122.83	3123.35	3126.1
CFMW-003a	Below Upper	2994.17	2996.23	2997.36	3001.89
CFMW-011	Upper	3064.99	3063.39	3060.18	3075
CFMW-011a	Below Upper	3003.10	3003.78	3004.95	3011.6
CFMW-012	Upper	3066.78	3065.42	3062.17	3076.98
CFMW-012a	Below Upper	2997.42	2999.05	3000.11	3006.02
CFMW-019	Upper	3064.43	3062.7	3059.87	3073.25
CFMW-019a	Below Upper	2997.48	2999.07	3000.11	3006.71
CFMW-025	Upper	DRY	3077.09	3079.10	3076.889
CFMW-025b	Upper	3068.84	3069.73	3069.50	3073.76
CFMW-025a	Below Upper	3055.65	3047.51	3048.53	3064.608
CFMW-032	Upper	3064.59	3062.48	3059.61	3073.508

Monitoring Well Location ID	Geologic Unit	Aug 30, 2016 GWE *(ft-amsl)* Round 1	Nov 29, 2016 GWE *(ft-amsl)* Round 2	March 14/15, 2017 GWE *(ft-amsl)* Round 3	June 16, 2017 GWE *(ft-amsl)* Round 4
CFMW-032a	Below Upper	3003.59	3004.67	3005.01	3012.515
CFMW-044	Upper	3060.02	3056.41	DRY	3066.393
CFMW-044a	Upper	3056.40	3052.88	3049.87	3062.866
CFMW-044b	Below Upper	3044.03	3051.38	3039.81	3051.199
CFMW-053	Upper	3052.45	3038.58	3035.14	3063.427
CFMW-053a	Below Upper	3023.76	3021.97	3020.41	3028.561
CFMW-056b	Upper	3067.50	3065.93	3065.96	3073.819
CFMW-056a	Below Upper	3021.119	3022.38	3023.73	3032.369
CFMW-056	Below Upper	3014.79	3015.92	3017.50	3026.289
Monitoring Well Clusters with both wells screened in the Upper Hydrogeologic Unit					
CFMW-016	Upper	3068.89	3073.30	3072.66	3094.73
CFMW-016a	Upper	3066.78	3073.32	3072.67	3094.62
CFMW-028	Upper	3064.24	3062.31	3059.52	3072.38
CFMW-028a	Upper	3064.35	3062.40	3059.68	3072.56
CFMW-045	Upper	3029.97	3025.20	3022.23	3039.20
CFMW-045a	Upper	3024.38	3022.88	3020.73	3031.33
CFMW-049	Upper	3017.79	3019.44	3018.19	3029.71
CFMW-049a	Upper	3017.69	3019.51	3018.34	3030.05

As shown above, in all cases the elevations measured in deep wells screened below the upper hydrogeologic unit are lower than the elevations in adjacent wells screened within the upper hydrogeologic unit. The differences in elevations between the upper hydrogeologic unit wells and the glacial till wells is typically greater than 25 feet, and in some cases, exceed 50 feet. This large difference is indicative of limited (if any) hydraulic connectivity between the two water bearing zones.

The groundwater elevations measured in monitoring well clusters where both monitoring wells are screened in the upper hydrogeologic unit typically differ by less than 0.2 ft; and often by less than 0.1 ft.

Vertical gradients for each nested well pair for each gauging event and the geometric mean for all events are provided in the table below:

Monitoring Well	Geologic	Aug 30, 2016 Vertical Gradient	Nov 29, 2016 Vertical Gradient	March 14/15, 2017 Vertical Gradient	June 16, 2017 Vertical Gradient	Geometric Mean Vertical Gradient
Location ID	**Unit**	***ft/ft***	***ft/ft***	***ft/ft***	***ft/ft***	***ft/ft***
		Round 1	**Round 2**	**Round 3**	**Round 4**	**All Rounds**
CFMW-003	Upper	0.884	0.879	0.875	0.863	0.875
CFMW-003a	Below Upper					
CFMW-011	Upper	0.534	0.514	0.476	0.547	0.517
CFMW-011a	Below Upper					
CFMW-012	Upper	0.534	0.511	0.477	0.546	0.516
CFMW-012a	Below Upper					
CFMW-019	Upper	0.507	0.482	0.453	0.504	0.486
CFMW-019a	Below Upper					
CFMW-025b	Upper	0.330	0.555	0.524	0.229	0.385
CFMW-025a	Below Upper					
CFMW-032	Upper	0.407	0.385	0.364	0.407	0.390
CFMW-032a	Below Upper					
CFMW-044a	Upper	0.124	0.015	0.101	0.117	0.068
CFMW-044b	Below Upper					
CFMW-053	Upper	0.279	0.161	0.143	0.339	0.216
CFMW-053a	Below Upper					
CFMW-056b	Upper	0.546	0.512	0.497	0.488	0.510
CFMW-056a	Below Upper					
CFMW-016	Upper	0.059	-0.001	0.000	0.003	0.015
CFMW-016a	Upper					
CFMW-028	Upper	-0.002	-0.002	-0.003	-0.003	-0.002
CFMW-028a	Upper					
CFMW-045	Upper	0.087	0.036	0.023	0.123	0.055
CFMW-045a	Upper					
CFMW-049	Upper	0.003	-0.002	-0.004	-0.009	-0.003
CFMW-049a	Upper					

The magnitude of the vertical gradients between the upper hydrogeologic unit and the glacial till vary depending on the location of the well within the Site. The vertical gradients between the two units also show variation temporally, where the lowest gradients were observed during lower water levels (i.e., November 2016 and March 2017).

The vertical gradients calculated for clusters within the upper hydrogeologic unit confirm that there is a limited vertical gradient, and that the direction of the gradient (upward or downward)

may vary temporally at individual well clusters. The only well with a consistently downward gradient was CFMW-045/045a.

4.2 Long Term Elevation Trends from Pressure Transducer Data

Groundwater elevations obtained from pressure transducers were plotted over time to produce hydrographs for the various well locations (Appendix B). Data from April 2016 to late November 2016, which was included in the Phase I Data Summary Report (Roux Associates, 2017a), indicates that the highest Site water levels during this period were observed in late May/early June 2016 and the lowest water levels were observed in late October/early November 2016. The magnitude of groundwater elevation fluctuations was dependent on the location within the Site and the well screen depth. The largest fluctuations were observed in monitoring wells screened in the upper hydrogeologic unit and located near the landfills and Teakettle Mountain, including CFMW-007 (>40 feet) and CFMW-020 (>30 feet). Review of the elevation data compared to precipitation records suggest that the water table elevations may fluctuate significantly over short periods of time (>20 feet over one month) as a result of precipitation events and from contributions of losing streams. Smaller fluctuations were observed in wells located in the northern areas of the Site, including CFMW-001 (approximately 2 feet), and also wells screened below the upper hydrogeologic unit, including CFMW-044b (approximately 8 feet). The fluctuations in these wells are gradual and do not correlate with the short-term precipitation events.

In March 2017, the transducers were moved to their new locations (i.e., nested wells at CFMW-016/16a, CFMW-019/19a, and CFMW-053/53a) as described in Section 3.2. Data from March 2017 through September 2017 were utilized to evaluate groundwater elevation fluctuations in locations around and downgradient of the landfills, and to evaluate differences in groundwater elevation fluctuations in the upper hydrogeologic unit and below the upper the hydrogeologic unit. Note that monitoring wells CFMW-016 and CFMW-016a are both screened in the upper hydrogeologic unit, and therefore were not used to compare differences between the two hydrogeologic units.

The data from monitoring wells CFMW-016 and 019 (both screened in the upper hydrogeologic unit near the Wet Scrubber Sludge Pond) indicate that the highest Site water levels were observed

in late March/early April 2017 and the groundwater elevation levels trended downward through September 2017. Groundwater elevation changes were greater than 20 feet in monitoring well CFMW-019 (located on the southern boundary of the Wet Scrubber Sludge Pond) and groundwater elevation changes were greater than 50 feet in CFMW-016 (located on the eastern boundary of the Wet Scrubber Sludge Pond). Elevation fluctuations of greater than 50 feet were also observed at CFMW-007 (located on the western boundary of the West Landfill) during the same time (data was obtained from the Montana State Bureau of Mines website [MBMG, 2017]). The fluctuations in these upper hydrogeologic unit monitoring wells corresponded with increased seasonal precipitation and snow melt.

Groundwater elevation data from wells screened below the upper hydrogeologic unit did not show large fluctuations like the wells screened in the upper hydrogeologic unit. Monitoring well CFMW-053a and CFMW-019a fluctuated by less than 10 feet between March and September 2017. These fluctuations were gradual and do not correlate with the short-term precipitation events like the wells in the upper hydrogeologic unit. The slower, gradual responses observed in well pairs CFMW-053/053a and CFMW-019/019a further suggests limited connectivity between the deeper unit and the upper hydrogeologic units proximal to these well pairs. In addition, cyanide, present at concentrations between 791 and 1,770 µg/L in upper unit well CFMW-019 and 238 and 386 µg/l in upper unit well CFMW-053, was non-detect in monitoring wells CFMW-019a and CFMW-053a (screened below the upper hydrogeologic unit) in all four Phase I sampling rounds. These results further support that there is limited connectivity, if any, between the deeper unit and the upper hydrogeologic units proximal to these well pairs.

Pressure transducers will continue to be utilized long term at the Site to evaluate seasonal groundwater elevations. Data will be downloaded during future monitoring well gauging events.

4.3 Groundwater Quality

The following sections provide a summary of groundwater quality based on field and laboratory analytical data that were generated during the four rounds of data collection. Tables containing all of the groundwater quality data generated during the work are provided in Appendix G, Tables 1 through 4. Additionally, laboratory data reports were provided to the USEPA as separate

submittals throughout the work. Electronic Data Deliverables (EDDs) with the groundwater data were also provided online for download by the USEPA from the CFAC RI/FS project database.

4.3.1 Field Parameters

Field parameters measured during well purging activities immediately prior to collection of groundwater samples are provided on field datasheets included in Appendix C and are summarized on Table 5. The field parameter data were reviewed to evaluate any potential anomalies in general groundwater chemistry that could potentially be influencing the groundwater sampling results. Field parameters were observed to fluctuate depending on the round of sampling. However, except for elevated pH, no anomalies were noted in the field parameters that are expected to influence groundwater sampling results. The pH measurement data is further discussed in Section 4.3.1.1 and 6.2.

4.3.1.1 Monitoring Well pH

As part of the field parameter data review during monitoring well development and sampling, anomalously high pH (i.e., above 10 Standard Units [SUs]) was identified in 11 monitoring wells (one well installed in the upper hydrogeologic unit and ten wells installed deeper). These monitoring wells also typically produced elevated conductivities and low ORP. Based on the distribution of wells across the Site and the groundwater chemistry observed in the sampling data (as discussed in Section 6.2) the elevated pH conditions were attributed to the cement grout used during well construction. The elevated pH conditions were discussed with the USEPA and MDEQ during project update conference calls and via email correspondence. The USEPA requested that the pH conditions continue to be assessed as part of the ongoing groundwater monitoring activities at the Site.

As part of the pH evaluation, Roux Associates mobilized personnel from Hydrometrics to the Site on October 11, 2016 with the objective of determining if further purging groundwater from the wells (i.e., flushing the well screen) could result in a reduction of pH. Hydrometrics personnel were onsite from October 11 through 14, 2016 and October 18 through 20, 2016 and purged all 11 wells that were identified as having pH over 10. During the purging, Hydrometrics monitored the pH conditions to observe whether pH was reduced in each well. The monitoring indicated that pH in six of the 11 wells were reduced to below 10 as a result of the purging activities.

Monitoring wells with pH remaining above 10 after the purging included CFMW-008a, 032a, 044a, 53a, and 57a.

After the purging efforts performed by Hydrometrics were completed, Cascade subsequently mobilized to the Site on December 12 through 15, 2016 to complete additional purging at the eleven monitoring wells. During the purging, Cascade monitored the pH conditions to observe whether pH was reduced in each well. The monitoring indicated that six of the 11 wells had pH over 10; monitoring wells CFMW-008a, 032a, 044a, 049a, 53a, and 57a.

The groundwater pH measured during all four groundwater sampling events are provided in the table below for those wells which were initially identified as exhibiting elevated pH. The following measurements were identified as the stabilized pH readings upon completion of purging at each well prior to sampling during each of the four rounds. These measurements were taken using a Horiba U-52 water quality meter.

Monitoring Well Location ID	Geologic Unit	Aug 30, 2016 pH Round 1	Nov 29, 2016 pH Round 2	Mar 14/15, 2017 pH Round 3	June 16, 2017 pH Round 4
CFMW-008a	Upper	9.10	8.58	8.94	12.59
CFMW-011a	Below Upper	10.18	7.67	7.97	7.46
CFMW-016a	Upper	11.39	8.84	7.34	11.53
CFMW-019a	Below Upper	10.24	8.38	8.62	7.96
CFMW-032a	Below Upper	14.00	12.74	13.11	12.63
CFMW-044a	Upper	12.25	9.10	9.18	8.50
CFMW-047	Upper	10.86	7.81	7.44	7.91
CFMW-049a	Upper	12.46	10.49	12.84	12.08
CFMW-053a	Below Upper	14.00	12.46	13.22	10.53
CFMW-057a	Below Upper	12.80	12.91	12.24	12.57
CFMW-059a	Below Upper	14.00	8.86	9.32	9.38

The pH in groundwater was further evaluated based on the geochemical data collected during sampling and is described in Section 6.2.

4.3.2 Overview of Groundwater Quality based on Laboratory Analytical Results

Laboratory analytical results for groundwater samples collected from Site monitoring wells were evaluated to determine the presence, or lack thereof, of COPCs in Site groundwater and to evaluate seasonal changes in concentrations. Tables 6 through 15 provide a statistical summary of the analytical results for groundwater data from monitoring wells screened in the upper hydrogeologic unit and below the upper hydrogeologic unit, respectively, during each round of sampling. These tables identify the frequency of detection; as well as the minimum, maximum and average detected concentrations, of each analyte in groundwater for the respective set of monitoring wells. Where concentrations were non-detect, the statistics were calculated using ½ the MDL. The MDLs achieved throughout the Phase I Site Characterization, relative to USEPA screening levels, were evaluated and further described in Section 7.2. In addition, the statistical summary tables provide the frequency that the measured concentration of each analyte in groundwater exceeded the following human health screening criteria as noted in the RI/FS Work Plan (Roux Associates, 2015a) and Phase I SAP (Roux Associates, 2015b):

- MDEQ Circular DEQ-7, Human Health Numeric Water Quality Standards (MDEQ, 2012);
- USEPA Drinking Water Maximum Contaminant Levels (MCLs) (USEPA, 2016a); and
- USEPA Tapwater Regional Screening Levels (RSLs) (USEPA, 2016b).

The groundwater at the Site is not used as drinking water, however, all comparisons of analytical results to screening criteria, including drinking water and tapwater criteria, are provided to enable better understanding of the relative concentrations of the various analytes. The screening criteria are developed by the USEPA using conservative assumptions and are not action levels to which COPCs must be remediated. For example, the USEPA Tapwater RSLs are so low, that for many analytes, any detection results in an exceedance. The presence of analytes in groundwater at concentrations exceeding USEPA Tapwater RSLs does not indicate that a risk exists or that remedial action is required, but rather, that further evaluation of that particular analyte and exposure scenario is warranted during the risk assessment phase of the RI/FS, where the risk to human health and ecosystems, as applicable, will be assessed. Remedial actions will be based on such assessed risks and not screening criteria.

In addition to comparisons to the human health screening criteria, the statistical summary tables provide the frequency that the measured concentration of each analyte in groundwater exceeded the concentration measured in monitoring well CFMW-001, which was identified in the RI/FS Work Plan (Roux Associates, 2015a) as a background monitoring well based upon its location in the northern area of the Site, upgradient of potential source areas.

The following sections provide an evaluation of groundwater results from all four sampling rounds.

4.3.2.1 Cyanide in Groundwater

The statistical summary of cyanide in groundwater in Rounds 1 through 4 are shown in Tables 6 through 15. Thematic dot maps showing the concentrations of cyanide in groundwater in Rounds 1 through 4 are provided in Appendix H, Plates 1 through 4. Iso-concentrations maps of cyanide concentrations in groundwater in Rounds 1 through 4 are shown on Plate 7. Maps presenting a comparison of total concentrations of cyanide and free cyanide in Rounds 3 and 4 are provided on Plates 8 and 9, respectively. Table 16 presents a comparison of concentrations of total and dissolved cyanide and free cyanide collected during Round 4. These data indicate the following:

- Total cyanide was detected in approximately 84% of the groundwater samples collected from monitoring wells screened in the upper hydrogeologic unit and 13% of the groundwater samples collected from wells screened below the upper hydrogeologic unit throughout all four rounds of sampling. Total cyanide was detected in 91%, 80%, 85%, and 78% of the groundwater samples collected from wells screened in the upper hydrogeologic unit during Rounds 1 through 4, respectively. Total cyanide was detected in 15%, 15%, 15%, and 8% of the groundwater samples collected from wells screened below the upper hydrogeologic unit during Rounds 1 through 4, respectively.

- In each location where cyanide was detected, it exceeded the USEPA Tapwater RSL of 0.15 µg/L. Total cyanide was detected at concentrations greater than the DEQ-7 Human Health Standard / USEPA MCL of 200 µg/L in groundwater from monitoring wells screened in the upper hydrogeologic unit in 21 samples during Round 1 (35% of samples), 18 samples during Round 2 (31% of samples), 21 samples during Round 3 (34% of samples), and 18 samples during Round 4 (29% of samples).

- Total cyanide did not exceed the DEQ-7 Human Health Standard / USEPA MCL of 200 µg/L in any groundwater samples from monitoring wells screened below the upper hydrogeologic unit in all four rounds of sampling. The maximum concentration of total cyanide detected in groundwater below the upper hydrogeologic unit was 10.5 µg/L during Round 4.

- The highest concentrations of total cyanide were located downgradient of the West Landfill and Wet Scrubber sludge pond during all four rounds of sampling. The highest detection of total cyanide was observed in monitoring well CFMW-015 (located on the western boundary of the Wet Scrubber Sludge Pond and downgradient of the West Landfill) in June 2017 (Round 4) at a concentration of 8,120 µg/L. Groundwater from monitoring well CFMW-017, screened beneath the Central Landfill, was not sampled during Rounds 1 and 2 due to insufficient volume of water in the well. The groundwater from monitoring well CFMW-017 was sampled during Round 3 and 4, and during Round 3 the detected total cyanide concentration of 1,880 µg/L exceeded the DEQ-7 Human Health Standard / USEPA MCL.

- A consistent pattern was observed during all four rounds of sampling; cyanide migrates in south / southwesterly direction from the aforementioned landfills toward the Flathead River. Total cyanide concentrations in groundwater within the upper hydrogeologic unit decrease with increasing distance away from the landfills.

- Variable concentrations of total cyanide were observed downgradient of the West Landfill / Wet Scrubber Sludge Pond, in the area located around the North-East Percolation Pond and to the west of the Main Plant buildings. Immediately south and southwest of the NE Percolation Pond, an area of lower cyanide concentrations is typically observed. The size of the lower concentration area varies from round to round, but appears largest (as delineated by the closed 300 µg/l contour) in the June 2017 sampling event. The contour maps for all four rounds indicate no increase in concentrations in monitoring wells located downgradient of the Main Plant.

- Total cyanide was not observed to migrating toward Aluminum City, and total cyanide was non-detect in monitoring wells next to Aluminum City in all four rounds of sampling.

- Free cyanide was detected in 56% and 68% of the upper hydrogeologic unit samples analyzed for free cyanide during Rounds 3 and 4, respectively. In each location where free cyanide was detected, it exceeded the USEPA Tapwater RSL of 0.15 µg/L. Free cyanide was only detected at concentrations greater than the DEQ-7 Human Health Standard / USEPA MCL of 200 µg/L at one location during Round 3 (CFMW-002) at a concentration of 306 µg/L. Free cyanide did not exceed the DEQ-7 Human Health Standard / USEPA MCL of 200 µg/L at any locations during Round 4. Detections of free cyanide were generally concentrated near the West Landfill, Wet Scrubber Sludge Pond, Former Drum Storage Area, and Main Plant Area. Detected concentrations of free cyanide were less than detected concentrations of total cyanide at all locations. Free-cyanide was not detected in any groundwater samples from monitoring wells screened below the upper hydrogeologic unit.

- Concentrations of total and dissolved cyanide and free cyanide were similar, with the total concentrations in most instances being slightly higher than dissolved.

- Total cyanide was detected in background monitoring well CFMW-001 at a concentration of 2.4 µg/L in Round 1, and was non-detect in Rounds 2 through 4.

4.3.2.2 Fluoride in Groundwater

The statistical summary of fluoride in groundwater in Rounds 1 through 4 are shown in Tables 6 through 15. Thematic dot maps showing the concentrations of fluoride in groundwater in Rounds 1 through 4 are provided in Appendix H, Plates 5 through 6. Iso-concentrations maps of fluoride concentrations in groundwater in Rounds 1 through 4 are shown on Plate 10. Table 16 presents a comparison of concentrations of total and dissolved fluoride collected during Round 4. These data indicate the following:

- Fluoride was detected in more than 97% of the samples during each groundwater sampling round. Fluoride was detected at concentrations exceeding the USEPA Tapwater RSL of 80 µg/L in 97% of groundwater samples from monitoring wells screened in the upper hydrogeologic unit and 90% of groundwater samples from monitoring wells screened below the upper hydrogeologic unit.

- Fluoride was detected at concentrations greater than the DEQ-7 Human Health Standard / USEPA MCL of 4,000 µg/L from monitoring wells screened in the upper hydrogeologic unit in 15 % (seven) of samples during Round 1, 9% (four) of samples during Round 2, 17% (eight) of samples during Round 3, and 16% (eight) of samples during Round 4. Fluoride did not exceed the DEQ-7 Human Health Standard / USEPA MCL in any groundwater samples from monitoring wells screened below the upper hydrogeologic unit in all four rounds of sampling. Fluoride concentrations in monitoring wells screened below the upper hydrogeologic unit were typically an order of magnitude less than concentrations of fluoride in upper hydrogeologic unit monitoring wells. Review of Table 16 shows that total and dissolved concentrations of fluoride were similar.

- Similar to cyanide, the highest concentrations of fluoride were primarily located downgradient of the West Landfill and Wet Scrubber sludge pond during all four rounds of sampling. The highest detection of fluoride was observed in monitoring well CFMW-015 (located on the western boundary of the Wet Scrubber Sludge Pond and downgradient of the West Landfill) in June 2017 (Round 4) at a concentration of 55,300 µg/L (dissolved concentration).

- Fluoride was detected in background monitoring well CFMW-001 at concentrations of 91.7 µg/L, 132 µg/L, 184 µg/L, and 120 µg/L; in Rounds 1 through 4, respectively. These concentrations are similar to concentrations measured in public and community water supply wells as noted in the bullet above.

4.3.2.3 Metals in Groundwater

The statistical summary of metals in groundwater in Rounds 1 through 4 are shown in Tables 6 through 15. Thematic dot maps showing the concentrations of select metals in groundwater in Rounds 1 through 4 are provided in Appendix H, Plates 7 through 44. Table 16 presents a comparison of concentrations of total and dissolved metals exceeding the DEQ-7 Human Health

Standard / USEPA MCL screening levels collected during Round 4. These data indicate the following:

- Many metals occur naturally in the groundwater at the Site, and thus metals are expected to be detected frequently in groundwater samples. The most commonly detected metals in groundwater in all four sampling rounds were barium, calcium, magnesium, potassium, and sodium. These metals were detected in 100% of groundwater samples collected during all four rounds of groundwater sampling.

- Aluminum, antimony, arsenic, barium, chromium, cobalt, iron, manganese, selenium, vanadium, and zinc were detected at concentrations greater than USEPA Tapwater RSLs.

- Arsenic, antimony, barium, and zinc were the only metals detected in groundwater samples at concentrations exceeding their respective DEQ-7 Human Health Standard and/or USEPA MCL. The exceedances were limited to one sampling location for each metal in each sampling round; with the exception of arsenic which exceeded the USEPA MCL at a maximum of four locations during Round 4.

- Although concentrations of detected metals are generally below the DEQ-7 Human Health Standards / USEPA MCLs, the concentrations of select metals including aluminum, arsenic, cobalt, iron, and lead are highest in the same monitoring wells as the elevated fluoride and cyanide located immediately downgradient of the West Landfill and Wet Scrubber Sludge Pond.

- Several of the deep wells have notably higher calcium concentrations (e.g., maximum of 922,000 µg/L [dissolved concentration] at CFMW-053a during Round 1), as compared to concentrations of calcium within the wells screened in the upper hydrogeologic unit (average concentration of 59,476 µg/L). These elevated calcium concentrations in the deep wells appear to be attributable to the cement grout used during the well construction as noted in Section 6.2.

- During Round 4, metals and cyanide analyses included total and dissolved (i.e., filtered). Table 16 provides a comparison of total and dissolved results for metals that exceeded their respective DEQ-7 Human Health Standard and/or USEPA MCL during the fourth-round of groundwater sampling. These data show that total and dissolved concentrations were similar, with the total concentrations in most instances being slightly higher than dissolved. In 15 of 20 samples where total zinc was detected, dissolved zinc was below detection limits.

- Metal analytes that exceeded their respective DEQ-7 Human Health Standard and/or USEPA MCL during the groundwater sampling, including arsenic, barium, and zinc, were also compared to concentrations measured in background monitoring well CFMW-001. The results of this comparison are provided in Tables 7 through 10, and 12 through 15.

4.3.2.4 VOCs and SVOCs in Groundwater

The statistical summary of VOCs and SVOCs in groundwater in Rounds 1 through 4 are shown in Tables 6 through 15. These data indicate the following:

- VOCs and SVOCs were detected in less than 10% and 4% respectively, of all groundwater samples collected from monitoring wells screened in the upper hydrogeologic unit throughout the sampling. VOC and SVOC detections did not exceed DEQ-7 Human Health Standards / USEPA MCLs in any groundwater samples.

- Polycyclic Aromatic Hydrocarbons (PAHs), a subset of the SVOCs found most frequently in soil during the Phase I Site Characterization, were not detected in any groundwater samples collected during the four rounds of sampling.

- The RI/FS Work Plan (Roux Associates, 2015a) also specified the Vapor Intrusion Screening Level (VISL) calculator as a criterion to be considered at the Site. The maximum concentrations of each VOC detected in groundwater within the upper hydrogeologic unit were entered into the USEPA VISL Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (USEPA, 2016c), as presented in Appendix I. The results from Round 1 provided in the Phase I Data Summary Report (Roux Associates, 2017a) indicate that all estimated vapor intrusion carcinogenic risks were less than 1.0×10^{-6}, and that only trichloroethene (TCE), based upon a detected value of 0.76 µg/L at one location, was above the hazard quotient (HQ) of 0.1. It is noted that the groundwater average temperature used in this evaluation was 25°C. A review of the field datasheets for all four rounds of sampling (Appendix C) indicates that the average groundwater temperature is less than 11°C. Based on a Site-specific groundwater temperature, the results indicate that all estimated vapor intrusion carcinogenic risks were less than 1.0×10^{-6} in all four rounds; and all estimated HQs were less than 0.1

4.3.2.5 General Chemistry in Groundwater

General chemistry analyses including alkalinity, ammonia, chloride, hardness (as calcium carbonate), nitrate + nitrite (as nitrogen), orthophosphate (as phosphorus), and sulfate were performed on groundwater samples to obtain data that could be utilized in chemical fate and transport evaluations and modeling, if needed, in the future as part of the RI/FS. General chemistry results were also compared to the standards and RSLs where available. The statistical summary of general chemistry results for groundwater in Rounds 1 through 4 are shown in Tables 6 through 15. Thematic dot maps showing the concentrations of general chemistry results in groundwater in Rounds 1 through 4 are provided in Appendix H, Plates 45 through 58. These data indicate the following:

- Nitrate + nitrite (as nitrogen) is the only general chemistry parameter with a DEQ-7 Human Health Standard / USEPA MCL (i.e., 10,000 µg/L). Nitrate + nitrite (as nitrogen) was detected at frequencies ranging from 66% to 83% (between the upper hydrogeologic

unit and below upper hydrogeologic unit) during the four sampling rounds. A maximum number of exceedances of the USEPA MCL occurred during Round 3, when seven samples exceeded the criteria. The exceedances of nitrate + nitrite (as nitrogen) USEPA MCL during all four rounds of sampling were primarily in monitoring wells located immediately downgradient of the West Landfill / Wet Scrubber Sludge Pond, in the same area as the elevated cyanide and fluoride concentrations.

- Review of the thematic maps in Appendix H also indicates that sulfate and ammonia concentrations are typically highest downgradient of the landfills.

4.4 Seasonal Variability of Concentrations in Groundwater Samples

Concentrations of total cyanide and fluoride from the four groundwater sampling rounds were tabulated for comparison with groundwater elevations to evaluate if COPC concentrations varied seasonally. For each monitoring well, the minimum and maximum detected concentrations of total cyanide and fluoride were identified with their associated sampling round. Additionally, the minimum and maximum groundwater elevations for each monitoring well were identified. The comparison table is provided as Table 17.

As described in Section 4.1 and shown in Table 17, the maximum groundwater elevation in each well occurred during Round 4 (June 2017) with only one exception. Round 4 was also when the greatest number of wells (but less than 50 percent of the wells) exhibited the minimum concentrations of total cyanide and fluoride.

In general, cyanide and fluoride were detected in the same monitoring well locations during each round of sampling and the primary source areas of cyanide and fluoride (i.e., the West Landfill, Wet Scrubber Sludge Pond, and Center Landfill) do not appear to change temporally. Iso-concentrations maps provided in Plates 7 and 10 indicate that the overall shape of the spatial distribution of total cyanide and fluoride detections were similar across the four rounds and appears to mimic the groundwater flow directions from the primary source areas towards the Flathead River. The iso-concentration contours on Plates 7 and 10 also indicate that the concentrations within the contoured area may vary seasonally, primarily in the areas immediately north and west of the Main Plant building.

4.5 Slug Testing Results

Data collected during pneumatic and mechanical slug testing activities were recorded utilizing down-hole pressure transducers manufactured by In-Situ. For the pneumatic slug testing, change in head (i.e., change in groundwater elevation in the monitoring well) was recorded every 0.1 second (s). For the mechanical slug tests, change in head was recorded every 0.25 second. Slug testing data was plotted as normalized head in feet (measured displacement divided by the initial displacement) over time in seconds for each test performed and the data plots are provided as Appendix J. The data from each slug test were evaluated in accordance with the procedures outlined in the SOP titled "Standard Operating Procedure 4.10 for Analyzing Slug Test Data." An analytical solution was selected for each set of data and was utilized to determine hydraulic conductivity values for each slug test. The data solutions were computed using a combination of Aqtesolv Analysis Software (HydroSOLVE, 2007) and Geoprobe Slug Test Analysis Software (Geoprobe, 2005). The Geoprobe software has less manual curve matching functionality that Aqtesolv. Therefore, for monitoring wells exhibiting very slow recovering data, the curve matching functionality in Aqtesolv was utilized.

4.5.1 Slug Test Analysis Methods, Inputs, and Assumptions

Table 18 summarizes the methods, inputs and assumptions that were utilized to perform the slug test data analysis. The required input data for well construction details and aquifer characteristics were obtained from monitoring well construction logs, which are included in Appendix K. Based on the hydrogeologic conceptual model for the Site and the monitoring well logs, all 43 monitoring wells where slug testing was performed were classified as unconfined and partially penetrating wells. The aquifer thickness at each location was estimated by calculating the difference in the depth to till and depth to water for wells screened in the upper hydrogeologic unit; and calculating the difference in the estimated depth to bedrock and depth to water for wells screened below the upper hydrogeologic unit.

The primary method selected for analysis of the slug testing data was the Bouwer & Rice (1976) solution (Butler, 1997), which is applicable for homogeneous, isotropic, unconfined conditions, with partially penetrating wells and overdamped well response. The Bouwer-Rice equation used to calculate hydraulic conductivity is:

$$K = \frac{R_c^2 \ln\left(\frac{R_e}{R_s}\right)}{2L_e T_{0.37}}$$

Where:

K = hydraulic conductivity
R_c = radius of the well casing
R_e = effective radius of boring, empirical parameter
R_s = effective radius of the screen
L_e = effective length of the screen
$T_{0.37}$ = time it takes water level to rise or fall 37% of initial change

During analysis of the data utilizing the Bouwer Rice method, a straight-line plot of the ratio h/h_0 on log scale versus time is automatically fitted to the measured data in Aqtesolv (HydroSOLVE, 2007) or the Geoprobe Slug Test Analysis software (Geoprobe, 2005). Manual curve fitting was completed in overdamped cases where adjustments to the automatic curve matching were deemed necessary.

For wells that demonstrated an oscillatory (i.e., underdamped) response, the Springer and Gelhar, 1991 solution was utilized to evaluate the data. This solution accounts for inertial effects in the well and oscillatory slug test response in high-hydraulic conductivity aquifers by introducing a dimensionless dampening factor (C_d) to the Bouwer & Rice solution. The Springer and Gelhar equation used to calculate hydraulic conductivity is:

$$K = \left(\frac{t_d}{t}\right)\left(\frac{R_c^2 \ln\left(\frac{R_e}{R_s}\right)}{2L_e C_d}\right)$$

Where:

K = hydraulic conductivity
t_d = dimensionless time parameter
t = measured time
R_c = radius of the well casing
R_e = effective radius of boring, empirical parameter

R_s = effective radius of the screen
L_e = effective length of the screen
C_d = dampening parameter

4.5.2 Slug Test Analysis Results

Results of the slug testing analysis are summarized on Table 18 for the tests conducted at each monitoring well. As described in Section 3.7, two tests were generally completed at each location; therefore Table 18 also provides the geometric mean hydraulic conductivity based upon the multiple tests conducted at each well.

As described in Section 3.7, in general, each one-foot displacement and two-foot displacement test was conducted a second time to assess the reproducibility of the data and the hydraulic conductivity values. For each displacement interval, the relative percent difference (RPD) was calculated utilizing the hydraulic conductivity values from the initial displacement test and reproduced test. The RPD calculated for wells screened within the upper hydrogeologic unit ranged from 0% to a maximum of 52% RPD, with the maximum RPD occurring in the 1-foot displacement test at monitoring well CFMW-037. The median RPD calculated for wells screened in the upper hydrogeologic unit is 6%. The RPD calculated for wells screened below the upper hydrogeologic unit ranged from 0% to a maximum of 186% RPD, with the maximum RPD occurring in the 2-foot displacement test at monitoring well CFMW-057a. The median RPD calculated for wells screened below the upper hydrogeologic unit is 7.5%.

The table below provides a summary of the minimum, maximum, and geometric mean hydraulic conductivity values from slug tests of wells screened in the upper hydrogeologic unit and the wells screened below the upper hydrogeologic unit. The results suggest that the geometric mean hydraulic conductivity of the upper hydrogeologic unit is higher than the geometric mean hydraulic conductivity of the materials beneath the upper hydrogeologic unit. These hydraulic conductivity values appear to be consistent with geologic observations recorded in boring logs during drilling, which generally indicate wells below the upper hydrogeologic unit are screened in finer grained materials. Additionally, the wide range of estimated hydraulic conductivity values is indicative of the heterogeneous geological conditions that are encountered beneath the Site.

The geometric mean in the table below are reflective of geometric means from all displacement intervals at the respective upper hydrogeologic unit and below upper hydrogeologic unit monitoring well locations.

Hydrogeologic Unit	**Minimum Estimated Hydraulic Conductivity *(ft/day)***	**Maximum Estimated Hydraulic Conductivity *(ft/day)***	**Median Estimated Hydraulic Conductivity *(ft/day)***	**Geometric Mean Estimated Hydraulic Conductivity *(ft/day)***
Upper Hydrogeologic Unit	0.11	327.01	15.01	11.1
Below Upper Hydrogeologic Unit	0.004	113.60	0.05	0.27

5.0 SURFACE WATER MONITORING AND QUALITY RESULTS

This Section describes the results of the surface water investigation activities, including surface water discharge monitoring and surface water sampling.

5.1 Surface Water Discharge Monitoring

Discharge of Cedar Creek and Cedar Creek Drainage Overflow Ditch were measured utilizing a mechanical current-meter method as described in Section 3.6. Discharge was measured at the same locations where surface water samples were collected, as shown on Plate 2. Results of the discharge calculations are summarized in the table below. It should be noted that water was not observed to be present in the Cedar Creek Drainage Overflow Ditch throughout most of the field program. Discharge in the overflow ditch was measured on June 7, 2016 when water was observed to be present and surface water sampling was also conducted in tandem (pre-Round 1) as described in Section 3.4.1.

Location ID	Feature	June 7, 2016 Discharge (ft^3/s) Pre-Round 1	Aug 29/30, 2016 Discharge (ft^3/s) Round 1	Nov 30, 2016 Discharge (ft^3/s) Round 2	April 4, 2017 Discharge (ft^3/s) Round 3	June 12/13, 2017 Discharge (ft^3/s) Round 4
CFSWP-009	Cedar Creek Drainage Overflow Ditch	2.45	Dry	Dry	20.65	0.17
CFSWP-010	Cedar Creek Drainage Overflow Ditch	11.26	Dry	Dry	36.72	5.87
CFSWP-011	Cedar Creek Drainage Overflow Ditch	15.09	Dry	Dry	45.41	5.16
CFSWP-012	Cedar Creek Drainage Overflow Ditch	13.97	Dry	Dry	42.34	8.74
CFSWP-013	Cedar Creek Drainage Overflow Ditch	16.88	Dry	Dry	54.98	13.07
CFSWP-014	Cedar Creek	NM	7.09	12.01	10.87	19.94
CFSWP-015	Cedar Creek	NM	4.52	17.72	14.90	14.41

Location ID	Feature	June 7, 2016 Discharge (ft^3/s) Pre-Round 1	Aug 29/30, 2016 Discharge (ft^3/s) Round 1	Nov 30, 2016 Discharge (ft^3/s) Round 2	April 4, 2017 Discharge (ft^3/s) Round 3	June 12/13, 2017 Discharge (ft^3/s) Round 4
CFSWP-016	Cedar Creek	NM	5.87	17.06	11.87	17.89
CFSWP-025	Cedar Creek	NM	NM	NM	7.42	14.88

The discharge was evaluated at multiple points along the surface water bodies in an effort to confirm the preliminary conceptual site model, that both Cedar Creek and Cedar Creek Drainage Overflow are acting as losing streams as they flow through the Site. In the Cedar Creek Drainage Overflow Ditch, the discharge measured at locations on the north end of the Site were typically higher than the locations at the south parts of the Site. These data indicate that the ditch was acting as a losing stream throughout the entire year (when wet) and thus losing water infiltration into the groundwater system. These data are also supported by visual field observations throughout the program where the north end of the Cedar Creek Drainage Overflow Ditch was observed to be wet, while the south end of the ditch was dry at the same time.

In Cedar Creek, the stream discharge did not decrease consistently from upstream to downstream measurement locations. The increases could be attributed to local surface water inputs from the west and/or be within the margin of error of the field measurement method. As documented within the Phase I Data Summary Report (Roux Associates, 2017a), the creek bed of Cedar Creek is located above the water table in the upper hydrogeologic unit; indicating that it is not a groundwater discharge location.

Due to the size and flow of the Flathead River, discharge measurements could not be collected utilizing the mechanical flow meter method. As part of the Phase I Site Characterization, data was reviewed from the nearest USGS gauging station (Station No. 12363000) located approximately three miles downstream of the Site to understand the general conditions of the Flathead River between April 2016 and June 2017.

Appendix A presents two graphs depicting the discharge of the Flathead River over various periods of time. Appendix A1 shows the average annual daily discharge over the period of record

from 1952 to 2017. During this time, the peak average annual daily discharge for years 1952 through 2017 occurred in 1974, with an average annual daily discharge of 14,440 cubic feet per second (cfs). The lowest average annual daily discharge occurred in 2001, with a minimum average annual daily discharge of 5,261 cfs. This graph depicts a consistent pattern of discharge fluctuation occurs each year. During the Phase I Site Characterization, the average annual daily discharges for 2016 and 2017 were 8,850 cfs and 12,622 cfs, respectively (2017 average annual daily discharge is based on 2017 average through October 31, 2017).

Appendix A2 provides a more detailed look at the discharge and river elevation for 2016 and 2017. The data indicates that average daily discharge of the Flathead River during the four rounds of sampling (April 2016 through June 2017) peaked on May 13, 2017, with a value of 45,800 cubic feet per second (cfs); which was greater than the peak average daily discharge recorded in 2016 (i.e., 28,900 cfs on April 24, 2016). The lowest observed average daily discharge during all four rounds was 3,540 cfs on February 3, 2017. During the gauging events on August 30, 2016, November 29, 2016, March 14/15, 2017, and June 16, 2017, the daily mean discharge was 3,800 cfs, 7,970 cfs, 8,110 cfs, and 25,400 respectively.

A temporary staff gauge was also installed within the Flathead River to enable measurement of river level conditions immediately adjacent to the Site. The temporary staff gauge was surveyed as part of monitoring well surveying activities to allow for use of measured surface water elevations when evaluating groundwater flow directions, and potential groundwater / surface water interaction. Surface water elevations from the staff gauge provided in Table 2 are included in the table below:

Flathead River Surface Water Elevation measured on Staff Gauge *(ft-amsl)*

Round 1 August 30, 2016	Round 2 November 29, 2016	Round 3 March 14/15, 2017	Round 4 June 16, 2017
3014.24	3015.77	3015.67	3019.08

The data from the staff gauge indicate that water levels of the Flathead River next to the Site were highest during the fourth round of sampling in June 2017 and that the Flathead River elevations fluctuated by at least 4.5 feet over four rounds of measurements. Note that these single date

elevation measurements did not capture the absolute low and high-water levels as recorded by the USGS gauging station at Columbia Falls where an approximate 10 ft fluctuation in Flathead River water levels was observed.

5.2 Surface Water Quality

The following section provides a summary of surface water quality based on laboratory analytical data and field data that were generated during the four rounds of sampling. Data tables with surface water data generated during the work are provided in Appendix L. Additionally, laboratory data reports were provided to the USEPA as separate submittals throughout the work. EDDs with the surface water data were provided online for download by the USEPA from the CFAC RI/FS project database.

5.2.1 Field Parameters

Field parameters measured during surface water sampling activities are provided on field datasheets included in Appendix C and are summarized on Table 19. The field parameter data were reviewed to evaluate any potential anomalies in general surface water chemistry that could potentially be influencing the surface water sampling results. No anomalies were noted and the field parameters measured appear to be consistent with values expected to occur in the natural environment.

5.3 Overview of Surface Water Quality from Laboratory Data

Laboratory analytical data for the surface water samples collected from Site were evaluated to determine the presence, or lack thereof, of COPCs in Site surface water. Tables 20 through 29 provides a statistical summary of the analytical results for each round of sampling. These tables identify the frequency of detection; as well as the minimum, maximum and average detected concentrations, of each analyte in surface water. Where concentrations were non-detect, the statistics were calculated using ½ the method detection limit.

The statistical summary tables (Tables 20 through 24) provide the frequency that the measured concentration of each analyte in surface water exceeded the following human health screening criteria as noted in the RI/FS Work Plan (Roux Associates, 2015a), Phase I SAP (Roux

Associates, 2015b), Phase I SAP Addendum (Roux Associates, 2016a), and Screening Level Ecological Risk Assessment (SLERA) (Roux Associates, 2017b):

- MDEQ Circular DEQ-7, Human Health Numeric Water Quality Standards (MDEQ, 2012);
- USEPA Drinking Water Maximum Contaminant Levels (USEPA, 2016a); and
- USEPA Tapwater RSLs (USEPA, 2016b).

Like groundwater, surface water at the Site is also not used as drinking water. However, all comparisons of analytical results to screening criteria, including drinking water and tapwater criteria, are provided to enable better understanding of relative concentrations of various analytes and not for purposes of assessing remedial alternatives.

The statistical summary tables (Tables 25 through 29) also provide the frequency that the measured concentration of each analyte in surface water exceeded the minimum ecological screening value (ESV) for the ecological screening criteria as noted in the RI/FS Work Plan (Roux Associates, 2015a), Phase I SAP (Roux Associates, 2015b), Phase I SAP Addendum (Roux Associates, 2016a), and SLERA (Roux Associates, 2017b):

- MDEQ Circular DEQ-7 Acute Aquatic Life Standards (MDEQ, 2012);
- MDEQ Circular DEQ-7 Chronic Aquatic Life Standards (MDEQ, 2012);
- USEPA National Recommended Water Quality Criteria (USEPA, 2004);
- Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: (Suter and Tsao, 1996);
- Suter & Tsao, 1996. GLWQI Tier II SAV/SCVs and ORNL LCVs provided in Table 1 and ORNL Population EC20s provided in Table 2;
- USEPA Region 3 Freshwater Screening Benchmark (USEPA, 2006); and
- Canadian Water Quality Guidelines, Summary Table (CCME, 2008).

Based on the statistical summary and a review of the surface water conditions, thematic dot maps displaying data for cyanide, fluoride, and selected metals were created to visually evaluate the areal distribution and magnitude of exceedances of each compound and are provided in Appendix M. The sections below provide additional detail regarding the analytical results for the

surface water samples during each round of sampling. The following sections provide an evaluation of surface water results from all four sampling rounds.

5.3.1 Cyanide in Surface Water

The statistical summary of cyanide in surface water in Rounds 1 through 4 are shown in Tables 20 through 29. Thematic dot maps showing the concentrations of cyanide in surface water in Rounds 1 through 4 are provided in Appendix M, Plates 1 through 4. Table 30 presents a comparison of concentrations of total and dissolved cyanide and free cyanide collected during Round 4. These data indicate the following:

- Total cyanide was detected in approximately 24% of all the samples collected during the surface water sampling. Total cyanide was detected in all three locations within the Backwater Seep Sampling Area (CFSWP-003, 004, and 005) during all four rounds of sampling. Outside of the Backwater Seep Sampling Area, total cyanide was detected in one location in the main stem of the Flathead River (CFSWP-006 at an estimated concentration of 3.2 µg/L) during Round 1, but was not detected in main stem of the Flathead River during Rounds 2 through 4. Total cyanide was detected in two locations within Cedar Creek (CFSWP-014 during Round 2 and CFSWP-015 during Rounds 1 and 2) with a maximum estimated concentration of 15.3 µg/L. Total cyanide was detected at two locations in the South Percolation Ponds (CFSWP-018 during Round 4 and CFSWP-020 during all four rounds) with a maximum concentration of 68.2 µg/L. Total cyanide was not detected in any surface water samples collected within the Cedar Creek Reservoir Drainage Overflow Ditch and the Northern Surface Water Area during the four rounds of sampling.

- At all locations where total cyanide was detected, concentrations of total cyanide exceed the USEPA Tapwater RSL of 0.15 µg/L. Total cyanide concentrations exceeded the DEQ-7 Human Health Standard of 140 µg/L and/or the USEPA MCL of 200 µg/L only in the Backwater Seep Sampling Area at sample location CFSWP-004 (209 µg/L during Round 1 and 178 µg/L during Round 2), and CFSWP-005 (213 µg/L during Round 1, 192 µg/L during Round 2, and 197 µg/L during Round 4).

- Total cyanide concentrations exceeded the DEQ-7 Acute Aquatic Life Standard of 22 µg/L in the Backwater Seep Sampling Area at sample locations CFSWP-003 (36.2 µg/L during Round 2), CFSWP-004 (209 µg/L during Round 1 and 178 µg/L during Round 2), and CFSWP-005 (213 µg/L during Round 1, 192 µg/L during Round 2, 24.7 µg/L during Round 3, and 197 µg/L during Round 4). Total cyanide concentrations exceeded the DEQ-7 Acute Aquatic Life Standard of 22 µg/L in one sample from the South Percolation Ponds at sample location CFSWP-018 (77.2 µg/L during Round 4 only).

- Total cyanide concentrations exceeded the DEQ-7 Chronic Aquatic Life Standard of 5.2 µg/L in the Backwater Seep Sampling Area at all three sample locations during all four rounds, ranging in concentration from 7.7 µg/L to 213 µg/L, with the maximum concentration in the Round 1 sample from CFSWP-005. Total cyanide concentrations

exceeded the DEQ-7 Chronic Aquatic Life Standard of 5.2 µg/L in Cedar Creek at sample location CFSWP-014 (15.3 µg/L in Round 2), and CFSWP-15 (10.6 µg/L in Round 2). Total cyanide concentrations exceeded the DEQ-7 Chronic Aquatic Life Standard of 5.2 µg/L in one sample from the South Percolation Ponds at sample location CFSWP-020 during all four rounds, ranging in concentration from 5.3 µg/L to 16.4 µg/L with the maximum concentration in the sample from Round 3. Total cyanide concentrations exceeded the DEQ-7 Chronic Aquatic Life Standard of 5.2 µg/L in the North Percolation Pond at sample location CFSWP-023 with a concentration of 7.6 µg/L in Round 3. All sample locations with concentrations exceeding the DEQ-7 Chronic Aquatic Life Standard of 5.2 µg/L also exceeded the Minimum ESV of 5 µg/L.

- As discussed in Section 3.4.6, free cyanide was added to the sampling scope of work for Rounds 3 and 4. During both of these rounds, free cyanide was detected in the Backwater Seep Sampling Area. The maximum concentration of free cyanide was 45.6 µg/L at location CFSWP-005 during Round 4. Free cyanide did not exceed the DEQ-7 Human Health Standard of 140 µg/L / USEPA MCL of 200 µg/L in any surface water samples. In each location where free cyanide was detected, it exceeded the USEPA Tapwater RSL of 0.15 µg/L.

- Free cyanide concentrations exceeded the DEQ-7 Acute Aquatic Life Standard of 22 µg/L in the Backwater Seep Sampling Area at sample location CFSWP-005, with a concentration of 45.6 µg/L during Round 4. No other concentrations of free cyanide exceeded the DEQ-7 Acute Aquatic Life Standard.

- Free cyanide concentrations exceeded DEQ-7 Chronic Aquatic Life Standard of 5.2 µg/L in the Backwater Seep Sampling Area during different sampling rounds at all three locations, ranging in concentration from 5.4 µg/L to 45.6 µg/L, with the maximum concentration in the Round 4 sample from CFSWP-005. Free cyanide concentrations exceeded DEQ-7 Chronic Aquatic Life Standard of 5.2 µg/L in one sample from the South Percolation Ponds at sample location CFSWP-020 during Round 3 with a concentration of 9 µg/L. All sample locations with concentrations exceeding the DEQ-7 Chronic Aquatic Life Standard of 5.2 µg/L also exceeded the Minimum ESV of 5 µg/L for total cyanide.

- Concentrations of total and dissolved cyanide and free cyanide were similar, with the total concentrations in most instances being slightly higher than dissolved. Detected concentrations of free cyanide were less than detected concentrations of total cyanide at all locations.

5.3.2 Fluoride in Surface Water

The statistical summary of fluoride in surface water in Rounds 1 through 4 are shown in Tables 20 through 29. Thematic dot maps showing the concentrations of fluoride in surface water in Rounds 1 through 4 are provided in Appendix M, Plates 5 and 6. Table 30 presents a comparison of concentrations of total and dissolved fluoride collected during Round 4. These data indicate the following:

- Fluoride was detected in 100% of the surface water samples during all four rounds of sampling, which is expected based on background fluoride conditions in Montana (MDEQ, 2014). Concentrations of fluoride exceeded the USEPA Tapwater RSL of 80 µg/L in 85% of the samples collected during the four rounds of sampling. However, concentrations of fluoride only exceeded the DEQ-7 Human Health Standard / USEPA MCL of 4,000 µg/L in one sample collected from location CFSWP-024 (Northeast Percolation Pond) during Round 4 (22,400 µg/L). This location was dry during all other sampling rounds.

- Outside the North-East Percolation Pond, the highest concentrations of fluoride were observed during Round 1 at sample locations CFSWP-004 and CFSWP-005 within the Backwater Seep Sampling Area, at concentrations of 2,560 and 2,570 µg/L respectively, which are less than the DEQ-7 Human Health Standard / USEPA MCL of 4,000 µg/L.

- Fluoride was detected in all of the upstream samples including CFSWP-014 (Cedar Creek) at a maximum concentration of 137 µg/L during Round 4, CFSWP-013 (Cedar Creek Reservoir Drainage Overflow Ditch) at a maximum concentration of 473 µg/L during Round 2, and CFSWP-017 (Flathead River) at a maximum concentration of 119 µg/L during Round 4.

- Fluoride concentrations exceeded the Minimum ESV of 120 µg/L in 64% of the surface water samples collected during all four rounds (36% during Round 1, 58% during Round 2, 67% during Round 3, and 91% during Round 4). There is no DEQ-7 Acute Aquatic Life Standard or DEQ-7 Chronic Aquatic Life Standard for fluoride.

- Review of Table 30 shows that total and dissolved concentrations of fluoride were similar.

5.3.3 Metals in Surface Water

The statistical summary of metals in surface water in Rounds 1 through 4 are shown in Tables 20 through 29. Thematic dot maps showing the concentrations of select metals in surface water in Rounds 1 through 4 are provided in Appendix M, Plates 7 through 22. Table 30 presents a comparison of concentrations of total and dissolved metals exceeding DEQ-7 Human Health Standard / USEPA MCL screening levels collected during Round 4. These data indicate the following:

- Naturally occurring metals that were most frequently observed in groundwater samples were also detected most frequently in Site-wide surface water, including barium, calcium, magnesium, potassium, and sodium. Where metals were detected, concentrations of aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, iron, manganese, nickel, thallium, and vanadium exceed their respective USEPA Tapwater RSLs.

- Antimony and thallium were the only metals detected in surface water samples at concentrations exceeding their respective DEQ-7 Human Health Standard and/or USEPA MCL. Both exceedances occurred at sample location CFSWP-024 in the Northeast Percolation Pond during Round 4. Antimony was detected at a concentration of 7.7 µg/L, which exceeded the DEQ-7 Human Health Standard of 5.6 µg/L and the USEPA MCL of 6 µg/L. Thallium was detected at a concentration of 0.27 µg/L, which exceeded the DEQ-7 Human Health Standard of 0.24 µg/L. Zinc did not exceed the human health criteria, but was detected at a concentration of 537 µg/L at location CFSWP-024 during Round 4, which exceeded the DEQ-7 Aquatic Life Standard of 103 µg/L.

- Detected concentrations for dissolved metals including aluminum, cadmium, copper, and zinc exceeded their respective DEQ-7 Acute Aquatic Life Standards and DEQ-7 Chronic Aquatic Life Standards at a frequency of less than 5%. Detected concentrations for dissolved metals including aluminum, barium, cadmium, copper, iron, nickel, and zinc exceeded their respective Minimum ESVs.

- Review of Table 30 shows that total and dissolved concentrations of metals were similar, with the total concentrations in most instances being slightly higher than dissolved.

5.3.4 VOCs, SVOCs in Surface Water

The statistical summary of VOCs and SVOCs in surface water in Rounds 1 through 4 are shown in Tables 20 through 29. These data indicate the following:

- VOCs and SVOCs were analyzed as additional analyses on the three samples collected in the South Percolation Ponds during Round 1 (CFSWP-018, CFSWP-019, CFSWP-020) and the one sample collected in the North-East Percolation Pond during Round 4 (CFSWP-024), in accordance with the RI/FS Work Plan (Roux Associates, 2015a). Acetone and methylene chloride, which are both likely artifacts of the laboratory process, were detected at concentrations below all screening criteria. No other VOCs were detected in the four percolation pond samples.

- SVOCs (primarily polyaromatic hydrocarbon compounds [PAHs]) were detected in sample CFSWP-024 from the North-East Percolation Pond, at concentrations exceeding the DEQ-7 Human Health Standards for benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, chrysene and indeno[1,2,3-cd]pyrene. SVOCs were not detected in surface water in the South Percolation Ponds.

- Concentrations of benzo[a]anthracene, benzo[a]pyrene, fluoranthene, phenanthrene, and pyrene in sample CFSWP-024 from the North-East Percolation Pond were also detected at concentrations exceeding their respective Minimum ESVs. These SVOCs do not have DEQ-7 Acute Aquatic Life Standards or DEQ-7 Chronic Aquatic Life Standards.

5.3.5 PCBs and Pesticides in Surface Water

The statistical summary of polychlorinated biphenyls (PCBs) and pesticides in surface water in Rounds 1 through 4 are shown in Tables 20 through 29. These data indicate the following:

- There were no detections of PCBs or pesticides in any of the four percolation pond samples.

5.3.6 General Chemistry in Surface Water

General chemistry parameters including alkalinity, ammonia, chloride, hardness (as calcium carbonate), nitrate + nitrite (as nitrogen), orthophosphate (as phosphorus), sulfide, and sulfate were measured in surface water samples to obtain data that could be utilized in chemical fate and transport evaluations and modeling, if needed in the future as part of the RI/FS. General chemistry results were also compared to the standards and RSLs where available. The statistical summary of general chemistry results for surface water in Rounds 1 through 4 are shown in Tables 20 through 29. Thematic dot maps showing the concentrations of general chemistry results in surface water in Rounds 1 through 4 are provided in Appendix M, Plates 23 through 30. These data indicate the following:

- Nitrate + nitrite (as nitrogen) is the only general chemistry parameter with a DEQ-7 Human Health Standard / USEPA MCL (i.e., 10,000 µg/L). Nitrate + nitrite (as nitrogen) was detected in 52% of the surface water samples collected during the four rounds of sampling, but did not exceed the DEQ-7 Human Health Standard / EPA MCL of 10,000 µg/L. During Round 1, nitrate + nitrite (as nitrogen) was detected in 23% of surface water samples, with a maximum concentration of 1,680 µg/L in sample CFSWP-005 in the Backwater Seep Sampling Area. During Round 2, nitrate + nitrite (as nitrogen) was detected in 21% of surface water samples, with a maximum concentration of 1,620 in sample CFSWP-005 from the Backwater Seep Sampling Area. During Round 3, nitrate + nitrite (as nitrogen) was detected in 75% of surface water samples, with the maximum concentration of 273 µg/L in sample CFSWP-015 in Cedar Creek. During

Round 4, nitrate + nitrite (as nitrogen) was detected in 83% of surface water samples, with a maximum of 1,700 µg/L in sample CFSWP-018 from the South Percolation Ponds.

- Chloride is the only general chemistry parameter with a Minimum ESV screening level (i.e., 120,000 µg/L). Chloride did not exceed the Minimum ESV during Rounds 1 through 4 surface water sampling.

5.4 Seasonal Variability of Concentrations in Surface Water Samples

Concentrations of total cyanide and fluoride from the four surface water sampling rounds were tabulated for comparison to evaluate if COPC concentrations varied seasonally. For each analyte, the minimum and maximum concentrations were identified with their associated sampling round. The comparison table is provided as Table 31.

The seasonal data for fluoride indicate the minimum concentrations of fluoride most often occurred during Round 1 (Sept 2016) and the maximum concentrations of fluoride most often occurred during Round 4 (June 2017). The seasonal data for total cyanide indicate the minimum concentrations of total cyanide (when detected) most often occurred in Round 3 (March 2017) and the maximum concentrations of total cyanide (when detected), most often occurred in Round 2 (December 2016).

6.0 GEOCHEMICAL EVALUATION

This section discusses an evaluation of groundwater geochemistry and provides a summary of geochemical modeling that was completed to further evaluate the elevated pH conditions in certain monitoring wells as described in Section 4.3.1.1 and geochemistry in monitoring wells.

6.1 Piper Plots and Stiff Diagrams

Anion and cation concentrations determined from metals and general chemistry analyses in groundwater were plotted in Piper Plots and Stiff Diagrams to facilitate the evaluation of potential hydraulic flow and connectivity in the hydrogeologic regime and to further evaluate groundwater and surface water chemistry.

The cations and anions are shown by separate ternary plots in the Piper Plots. The apexes of the cation plot are calcium, magnesium, and sodium plus potassium cations. The apexes of the anion plot are sulfate, chloride, and carbonate plus bicarbonate anions. The two ternary plots are then projected to present a matrix transformation of a graph of the anions and cations. Piper Plots for groundwater and surface water are provided as Appendix N. Groundwater data from wells screened in the upper hydrogeologic unit were plotted separately from the wells screened below the upper hydrogeologic unit to assess if there was a relationship between the groundwater chemistry in the different water bearing zones. The distributions of major ions in Site groundwater are also illustrated through a set of Piper Plots on Figure 3.

The Piper Plots suggest that although groundwater in wells screened within the upper hydrogeologic unit is generally similar to wells screened below the upper hydrogeologic unit (i.e., the compositions of many of the samples from both datasets suggest a calcium bicarbonate water), some of the upper hydrogeologic unit wells appear to be relatively sodium-enriched. This pattern is particularly pronounced in a subset of samples collected in wells located near the landfills.

Stiff diagrams present segments proportional to each ion on either convergent or parallel half-lines and joining the ends, resulting in a polygon, where every line represents an ion or the sum of an anion and cation. Stiff diagrams for groundwater and surface water are provided as Appendix O.

A sample summary report for the general chemistry for monitoring wells and surface water are included as Appendix P. A summary of the general chemistry ion balance is provided as Appendix Q.

6.2 Geochemical Modeling

As noted in Section 4.3.1.1, a subset of monitoring wells was observed to have elevated pH values in groundwater (i.e., above pH 10). Elevated concentrations of calcium in these wells suggest reactions involving cement grout used in well construction is a possible cause of the elevated pH. To further evaluate the groundwater chemistry, geochemical modeling was performed utilizing USGS's pH Redox Equilibrium (in C language) (PHREEQC) geochemical model (Parkhurst and Appelo, 1999). A description of the analysis and the results of the geochemical modeling is provided in Appendix R. These results were used to evaluate whether the concentrations of cyanide and fluoride measured in the wells could be affected by the elevated pH conditions.

Wells yielding samples that are characterized by elevated pH (i.e., above 10) reflect chemical reactions involving the cement used in well construction. Overall, the speciation modeling revealed no evidence indicating phenomena that could reduce the concentrations of either cyanide or fluoride under the elevated pH conditions encountered in some monitoring wells. These findings confirm that the data from these wells are acceptable for monitoring of groundwater quality conditions at the Site.

7.0 PROJECT DATA VERIFICATION AND VALIDATION SUMMARY OF FINDINGS

Data verification and validation were performed to confirm that the project data met the data quality objectives (DQOs) outlined in the RI/FS Work Plan (Roux Associates, 2015a) and Phase I SAP (Roux Associates, 2015b). The following section describes the verification and validation procedures performed as part of the Phase I Site Characterization groundwater and surface water sampling.

Data verification was performed by Roux Associates to evaluate the completeness, correctness, and conformance/compliance of data against the specifications outlined in the RI/FS Work Plan (Roux Associates, 2015a) and Phase I SAP (Roux Associates, 2015b); and to evaluate how closely the procedures outlined in the RI/FS Work Plan (Roux Associates, 2015a) and Phase I SAP (Roux Associates, 2015b) were followed during data generation. Personnel involved in the collection of samples and generation of data, including field samplers and subcontractors, conducted initial verification of field data. Field data verification included ensuring that data was properly collected and handled according to the sampling procedures described in the SAP and the SOPs. Documents outlining project procedures, including the RI/FS Work Plan (Roux Associates, 2015a), Phase I SAP (Roux Associates, 2015b), and task-specific SOPs, were readily available to all project personnel for the duration of the Phase I Site Characterization groundwater and surface water sampling. All records were verified with multiple tiers of review by field staff, RI Project Manager, and Quality Assurance (QA) Officer, including, but not limited to, chains of custody, field notebooks, field forms, and daily reports.

Prior to data validation, sample receipts, sample logins, and sample analysis methods were reviewed and verified. Laboratory data were reviewed by Laboratory Data Consultants, Inc. of Carlsbad, California, a qualified, third-party data validator. Validation of laboratory data was performed in accordance with the following USEPA guidance:

- *National Functional Guidelines for Organic Data Review* (USEPA, 2014a);
- *National Functional Guidelines for Inorganic Data Review* (USEPA, 2014b); and
- *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (USEPA, 2009).

All laboratory data packages were verified and validated using a Stage 4 validation to evaluate whether the data meet the performance and acceptance criteria. The Stage 4 validation was performed on 100% of the laboratory data generated during the RI/FS. As described in the guidance (USEPA, 2009), the Stage 4 verification and validation included completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related Quality Control (QC) results, recalculation checks, and the review of actual instrument outputs. The analytical results were evaluated with respect to the following data quality indicators: precision, accuracy, representativeness, completeness, sensitivity, and comparability.

The data validator documented all findings by adding appropriate validation qualifiers (as necessary) to the sample results in the laboratory data packages based on the various verification and validation tasks. The following qualifiers were applied to the data where applicable to identify data limitations identified during validation:

J+ ..... (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however, the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- ..... (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however, the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J ..... (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however, the reported concentration is estimated due to it being below the laboratory quantitation limit or due to non-conformances discovered during data validation. Bias is indeterminate.

U ..... (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however, the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ ..... (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however, the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R ..... (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA..... (Not Applicable): The non-conformances discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant a qualification of the data.

Additionally, flags classified as P (Protocol) or A (Advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

7.1 Summary of Data Verification and Validation Results

Sample counts proposed in the Phase I SAP (Roux Associates, 2015b) were compared to groundwater and surface water samples collected during the Phase I Site Characterization. A summary count of all groundwater and surface water samples collected, not including field duplicates or Quality Assurance/Quality Control (QA/QC) samples, are included in the table below. Deviations from the proposed sample count provided in the Phase I SAP (Roux Associates, 2015b) and Phase I SAP Addendum (Roux Associates, 2016a) are also described in the table below.

Sample Type	Sample Quantity Proposed in Phase I SAP and/or SAP Addendum	Sample Quantity Collected Rounds 1 – 4	Notes
Surface Water	96	87	Two locations were dry during the Round; 1 sampling event; Seven locations were dry during the Round 2 sampling event and CFSWP-025 was collected as an opportunity sample; One location was dry during the Round 3 sampling event and CFSWP-025 was collected as an opportunity sample; and Two locations were dry during the Round 4 sampling event and CFSWP-025 was collected as an opportunity sample.
Groundwater	256	242	Four monitoring wells were dry during the Round 1 sampling event; Six monitoring wells were dry during the Round 2 sampling event; Three monitoring wells were dry during the Round 3 sampling event; and One monitoring well was dry during the Round 4 sampling event.

Approximately 54 laboratory sample delivery groups were submitted to Laboratory Data Consultants, Inc. for review as part of the data validation process. The results of the data

validation are summarized in data validation reports (Appendix S) produced by Laboratory Data Consultants, Inc. Data qualifiers added as a result of the data validation processes were imported to the CFAC RI/FS database and are included in the data summary tables in this GW/SW Data Summary Report.

A review of the data validation reports was completed by Roux Associates to evaluate the completeness of the data in accordance with the Phase I SAP (Roux Associates, 2015b) QA/QC procedures. Overall, approximately 42 analyses were rejected out of an estimated 32,937 analyses (approximately 1%) performed as part of the sampling activities summarized in this GW/SW Data Summary Report. This suggests that the overall data set generated during the work is usable and complete.

A summary of the data that was described in the data validation reports as rejected during the validation process is provided below. The analytical results that were rejected during data validation are not reliable and were thus excluded from the data evaluations described throughout this GW/SW Data Summary Report.

Groundwater Samples

Round 1

- Pentachlorophenol was rejected in 17 samples because laboratory control samples percent recovery was not within QC limits.
- Orthophosphate was rejected in 11 samples due to Matrix Spike/Matrix Spike Duplicate (MS/MSD) percent recovery not within QC limits.

Round 2

- 3,3'-Dichlorobenzidine, 3-nitroaniline, and 4-nitroaniline were rejected in one sample due to MS/MSD percent recovery not within QC limits.

Round 3

- No results were rejected in Round 3 groundwater samples.

Round 4

- Orthophosphate was rejected in six samples due to MS/MSD percent recovery not within QC limits.

Surface Water Samples

Round 1

- Orthophosphate was rejected in five samples due to MS/MSD percent recovery not within QC limits.

Round 2

- No results were rejected in Round 2 surface water samples.

Round 3

- No results were rejected in Round 3 surface water samples.

Round 4

- No results were rejected in Round 4 surface water samples.

Based on the evaluation of the data rejections, no gaps were identified in the data. The most commonly rejected analytes include orthophosphaste and pentachlorophenol. As these are not key COPCs identified, these rejections should not be considered a data gap that requires corrective action with the laboratory.

7.2 Evaluation of Method Detection Limits

A review of analytical method detection limits achieved by the laboratory in groundwater and surface water samples that were non-detect during the Phase I Site Characterization program was performed to evaluate the adequacy of the method detection limits relative to the various human health screening criteria. Tables providing minimum, maximum, mean, and median detection limits for all non-detect analytes in groundwater and surface water compared to all screening criteria are provided in Appendix T. The method detection limit summary tables indicate the following about the limits achieved for groundwater and surface water.

Groundwater

- The mean and median of all method detection limits achieved in all non-detect groundwater samples is greater than the lowest screening criteria (i.e., USEPA Tapwater RSLs) for 22% of all analytes (39 out of 181 analytes).

- The mean and median of all method detection limits achieved in all non-detect groundwater samples exceeds the MDEQ Circular 7 standards for 6% of all analytes (10 of 181 analytes).

- The mean and median of all method detection limits achieved in all non-detect groundwater samples exceeds the USEPA MCLs for 1% of all analytes (2 of 181 analytes, including pentachlorophenol and 1,2-dibromo-3-chloropropane).

Surface Water

- The mean and median of all method detection limits achieved in all in all non-detect surface water samples is greater than the lowest screening criteria (i.e., USEPA Tapwater RSLs) for 27% of all analytes (57 out of 211 analytes).

- The mean and median of all method detection limits achieved in all non-detect groundwater samples exceeds the MDEQ Circular 7 standards for 16% of all analytes (34 of 211 analytes).

- The mean and median of all method detection limits achieved in all non-detect groundwater samples exceeds the USEPA MCLs for 1% of all analytes (2 of 211 analytes, including pentachlorophenol and 1,2-dibromo-3-chloropropane).

- The mean and median of all method detection limits achieved in all non-detect groundwater samples exceeds the MDEQ Circular 7 Acute Aquatic Life Standards for 2% of all analytes (4 of 211 analytes, including total and dissolved silver and cadmium).

- The mean of all method detection limits achieved in all non-detect groundwater samples exceeds the MDEQ Circular 7 Chronic Aquatic Life Standards for 33% of all analytes (70 of 211 analytes).

- The median of all method detection limits achieved in all non-detect groundwater samples exceeds the MDEQ Circular 7 Chronic Aquatic Life Standards for 34% of all analytes (71 of 211 analytes).

- The mean and median of all method detection limits achieved in all in all non-detect surface water samples is greater than the lowest ecological screening criteria (i.e., Minimum ESV) for 41% of all analytes (86 out of 211 analytes).

Overall, the evaluation of method detection limits indicates that the method detection limits for non-detect results are sometimes above the lowest screening criteria (i.e., the USEPA Tapwater RSLs or Minimum ESV), for multiple analytes including COPCs such as cyanide. As noted above, these RSLs are designed to be conservative screening levels, and these RSLs are often not attainable in the laboratory. However, the method detection limits are almost always adequate for the other screening levels evaluated during the four rounds of groundwater and surface water sampling. It should be noted that during scoping of the RI/FS, CFAC and Roux Associates required that each laboratory being considered for use on the project provide a list of attainable method detection limits. During the analytical laboratory selection process, Roux Associates

evaluated the proposed method detection limits against the desired limits based on the screening criteria. This information was provided in the Phase I SAP (Roux Associates, 2015b) and Phase I SAP Addendum (Roux Associates, 2016a). TestAmerica was selected to be the primary analytical laboratory primarily because of their ability to achieve the most desired detection limits of all laboratories considered.

8.0 SUMMARY OF FINDINGS AND CSM REVIEW

The Phase I Site Characterization Data Summary Report (Roux Associates, 2017a) concluded with a "Summary of Findings and Conceptual Site Model (CSM) Review" section. That section summarized the results of the soil and sediment sampling, and Round 1 of groundwater and surface water sampling, in the context of the an updated CSM for the Site. Because only one round of groundwater and surface water sampling had been completed at that time, the discussions regarding potential source areas, COPCs, and contaminant migration were identified as preliminary findings; to be further evaluated based upon the additional rounds of sampling specified in the Phase I SAP (Roux Associates, 2015b), and where necessary, Phase II Site Characterization activities. The majority of the preliminary CSM as it relates to groundwater and surface water has been confirmed by the additional three rounds of monitoring. The sections below provide a supplemental review and update of the CSM, now that all four rounds of sampling originally proposed in the Phase I SAP (Roux Associates, 2015b) have been completed. As stated in the RI/FS Work Plan (Roux Associates, 2015a), the CSM will be updated on an ongoing basis throughout the performance of the RI/FS.

8.1 Discussion of COPCs

This section provides an update on the COPCs in groundwater and surface water.

8.1.1 Groundwater

Cyanide and fluoride were identified as the primary COPCs in Site groundwater based on historical data collected at the Site and based on the Phase I Site Characterization Data. The sampling results described in this data summary report confirm cyanide and fluoride as the primary COPCs in groundwater, with elevated concentrations of both constituents observed in Site groundwater during all four rounds of sampling. The measured concentrations observed across the Site varied during each sampling round; however, the highest concentrations were generally observed near the same suspected source areas during each round (see discussion of source areas in Section 8.2). It should be noted that the average concentrations of fluoride reported for public water and community water supply wells in the in the Flathead Valley is estimated to be approximately 160 µg/L (MDEQ, 2014) and that some detections of fluoride within the Site are similar to concentrations measured in public and community water supply wells.

The four rounds of groundwater sampling confirmed that many naturally occurring metals were detected frequently in groundwater samples. The most commonly detected metals in groundwater in all four sampling rounds were barium, calcium, magnesium, potassium, and sodium, which were detected in 100% of groundwater samples. Arsenic, antimony, barium, and zinc were the only metals detected in groundwater samples at concentrations exceeding their respective DEQ-7 Human Health Standard and/or USEPA MCL. The exceedances were limited to one sampling location for each metal in each sampling round; except for arsenic which exceeded the USEPA MCL at a maximum of four locations during Round 4.

The four rounds of sampling also confirmed that VOCs and SVOCs were found infrequently in groundwater at the Site. VOCs and SVOCs were detected in less than 10% and 4% respectively, of all groundwater samples collected from monitoring wells screened in the upper hydrogeologic unit throughout the sampling. VOC and SVOC detections did not exceed DEQ-7 Human Health Standards / USEPA MCLs in any groundwater samples.

Consistent with the Round 1 results, PAHs were not detected in any groundwater samples collected during Rounds 2 thru 4. This confirms the preliminary finding from the Round 1, that PAHs observed in soil are not impacting groundwater quality.

8.1.2 Surface Water

Cyanide was identified as the primary COPC in Site Surface water in the CSM. Cyanide concentrations exceeded the DEQ-7 Human Health Standard and/or the USEPA MCL in the Backwater Seep Sampling Area during sampling Rounds 1, 2 and 4. Concentrations of cyanide measured in the Backwater Seep Sampling Area are consistent with historical data collected in the Backwater Seep Sampling Area as part of the Montana Pollutant Discharge Elimination system (MPDES) permit for the Site.

Cyanide was also detected in surface water in Cedar Creek, the North-West Percolation Pond, and the South Percolation ponds during the sampling efforts; however, concentrations did not exceed the DEQ-7 Human Health Standard and/or the USEPA MCL in any of these locations.

Similar to groundwater, the four rounds of surface water sampling confirmed that many naturally occurring metals were detected frequently in surface water samples. Antimony and thallium were the only metals detected in surface water samples at concentrations exceeding their respective DEQ-7 Human Health Standard and/or USEPA MCL, and both exceedances occurred at sample in the North-East Percolation Pond during Round 4.

VOCs and SVOCs were analyzed in samples collected from the North and South Percolation Ponds. Acetone and methylene chloride were the only VOCs detected in the samples from the ponds (at concentrations below all screening criteria), which are both likely artifacts of the laboratory process. SVOCs (primarily PAHs) were detected in the sample from the North-East Percolation Pond, at concentrations exceeding the DEQ-7 Human Health Standards for benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, chrysene and indeno[1,2,3-cd]pyrene. SVOCs were not detected in surface water in the South Percolation ponds.

8.2 Discussion of Potential Source Areas

This section provides an update on the potential source areas for COPCs in groundwater and surface water.

8.2.1 Groundwater

The Phase I Site Characterization Data Summary Report identified that the highest concentrations of cyanide and fluoride in groundwater in Round 1 of sampling were observed adjacent to, and/or downgradient of, the West Landfill, the Wet Scrubber Sludge Pond, and the Former Drum Storage Area. The data from Round 1 indicated that these Site features are the primary source of the elevated cyanide and fluoride concentrations in groundwater, which would be consistent with the historical use of these features as disposal locations for wastes containing cyanide and fluoride (i.e., cyanide in spent potliner (SPL) disposed in the West Landfill; and fluoride within the calcium fluoride sludge disposed in Wet Scrubber Sludge Pond), as well as with current understanding that both landfills are unlined.

As discussed in Section 4.3.2, Plates 7 and 10 show contours of cyanide and fluoride concentrations, respectively, in groundwater based on the four rounds of sampling. The contour maps indicate that highest cyanide and fluoride concentrations in groundwater appear to originate

adjacent to and downgradient of the Wet Scrubber Sludge Pond and the West Landfill consistently during all four rounds of sampling. These data further support that these Site features are the source area of elevated cyanide and fluoride concentrations in groundwater. Plates 7 also indicates variable concentrations of cyanide downgradient of the West Landfill / Wet Scrubber Sludge Pond, in the area located around the North-East Percolation Pond and to the west of the Main Plant Area.

Additionally, during Rounds 1 and 2, the monitoring well located at the Center Landfill (CFMW-017) did not have sufficient volume to collect a groundwater sample. However, groundwater samples collected from CFMW-017 during Rounds 3 and 4 indicate that concentrations of cyanide and fluoride are elevated in groundwater at this well location during both sampling rounds as compared to the surrounding wells. The concentrations indicate that the Center Landfill may also be a source area for the observed elevated cyanide and fluoride concentrations in groundwater.

The Phase I Site Characterization Data Summary Report also noted that the North-East Percolation Pond and North-West Percolation Pond are located hydraulically downgradient of the West Landfill and Wet Scrubber Sludge Pond source area, and that the concentrations of cyanide and fluoride in groundwater downgradient (south) of the ponds are less than those measured in wells upgradient of the ponds. Similar concentrations were observed upgradient and downgradient of the ponds during Rounds 2 through 4. The continued decrease in concentrations as groundwater flows beneath the ponds supports that, currently, the ponds are not a significant source of the cyanide and fluoride concentrations observed in groundwater (i.e., if the ponds were a significant source, an increase in cyanide and fluoride concentrations would be expected).

8.2.2 Surface Water

The Backwater Seep Sampling area is a location where groundwater is expressed from the upper hydrogeologic unit to the Flathead River. Historically, groundwater in this area has consistently been observed to discharge from the banks and has been sampled as part of the requirements for the Site MPDES Permit (#MT00300066). The hydrogeologic studies (i.e., groundwater elevation data and surface water elevation data) indicate that groundwater discharges to Flathead River. The elevated concentrations of cyanide measured in the Backwater Seep Sampling Area are

consistent with the observed concentrations of cyanide in groundwater for this area, as shown on the cyanide contour maps (Plate 7). These concentrations indicate the groundwater is the source of the cyanide concentrations measured in the Backwater Seep Sampling Area. Additionally, concentrations of cyanide up-river in the Flathead River were typically non-detect, further supporting that groundwater discharge is the source of the cyanide in the Backwater Seep Sampling Area.

As noted in the Phase I Data Summary Report, there was an isolated detection of cyanide in Cedar Creek surface water during Round 1. This was further investigated by adding an additional location slightly upstream and by conducting additional sampling in Rounds 2 through 4. In Round 2, cyanide was detected at two locations, including the original location and the most upstream location; however, cyanide was non-detect in Cedar Creek in Rounds 3 and 4. The maximum concentration measured in Cedar Creek during the four rounds of sampling was 15.3 µg/L. As documented in the Phase I Data Summary Report and this GW/SW Data Summary Report, Cedar Creek is not a groundwater discharge point. In addition, based upon site topography and field observations, there is no storm water runoff from the former operational areas of the Site to Cedar Creek. The sporadic and isolated detections of cyanide, including one detection at the upstream location, suggest that the detections may attributable to entrained sediment in the sample; as all of the samples with detections were unfiltered. During Round 4, both filtered and unfiltered samples were collected for analysis and all samples from Cedar Creek were non-detect for cyanide.

As noted in Section 8.1.2, the only concentrations of metals in surface water that exceeded their respective DEQ-7 Human Health Standard and/or USEPA MCL occurred in the North-East Percolation Pond sample. Additionally, SVOCs (primarily PAHs) were also detected in the surface water sample from the North-East Percolation Pond at concentrations exceeding the DEQ-7 Human Health Standards. Based on Site reconnaissance and observations during drilling (black, coal tar pitch soil/sediment), and based on the elevated levels of PAHs observed in soil samples (as described in the Phase I Site Characterization), it's likely that the soils/sediments within the pond are the source of the COPCs in the surface water from the pond.

8.3 Migration of COPCs from Source Areas

This section provides an update on the migration of COPCs in groundwater and surface water.

8.3.1 Groundwater

As described above, the four rounds of groundwater sampling indicate that the West Landfill, Wet Scrubber Sludge Pond, the Former Drum Storage Area, and the Center Landfill appear to be the primary sources of the cyanide and fluoride in groundwater.

As shown in Plates 7 and 10, impacted groundwater in the upper hydrogeologic unit appears to generally migrate southward from the sources areas, and flow towards the Flathead River. Cyanide concentrations above 200 µg/L (USEPA MCL) extend as far south as the Flathead River during all four rounds. These concentrations of cyanide are consistent with similarly observed concentrations of cyanide in surface water from the Backwater Seep Sampling Area of the Flathead River, which is a location where groundwater is expressed from the upper hydrogeologic unit to the Flathead River.

Cyanide and fluoride concentrations measured in monitoring wells outside of the contours shown on Plates 7 and 10 are less than half of the MCL in all four rounds of sampling. Cyanide and fluoride concentrations are non-detect in the north, west and southwest portions of the Site (e.g., near Aluminum City) during all four rounds of sampling. The data support that migration of the cyanide and fluoride is not in the direction towards Aluminum City, but rather follows the southerly groundwater flow patterns towards the Flathead River as depicted during all four rounds of groundwater elevation gauging (Plates 3 through 6).

The cyanide and fluoride contour maps were also utilized to evaluate groundwater quality conditions upgradient and downgradient of the Main Plant Area and the North Percolation Ponds. The data indicates variable concentrations of cyanide downgradient of the West Landfill / Wet Scrubber Sludge Pond, in the area located around the North-East Percolation Pond and to the west of the Main Plant buildings. Immediately south and southwest of the NE Percolation Pond, an area of lower cyanide concentrations is typically observed. The lower concentrations may be attributable to increased recharge to the upper hydrogeologic unit in this area; as all storm water from the concrete covered main plant area is directed into the NE Pond. The size of the lower concentration area varies from round to round, but appears largest (as delineated by the closed

300 µg/l contour) in the June 2017 sampling event. The contour maps for all four rounds indicate no increase in concentrations in monitoring wells located downgradient of the Main Plant.

During all four rounds of sampling, the cyanide and fluoride concentrations in groundwater decrease with depth within the upper hydrogeologic unit, and concentrations were generally non-detect in monitoring wells screened below the upper hydrogeologic unit. These non-detect findings indicate there is limited vertical migration and that the cyanide and fluoride are primarily migrating horizontally within the upper hydrogeologic unit. These findings are consistent with observed hydrogeologic conditions described in Sections 4.1 and 4.2, which indicate that there is only limited, if any, hydraulic connectivity between the upper hydrogeologic unit and the water bearing zones screened in the underlying glacial till.

8.3.2. Surface Water

As noted in Section 8.2.2, the Backwater Seep Sampling Area is a location where groundwater is expressed from the upper hydrogeologic unit to the Flathead River, and thus the source of the COPCs in the Backwater Seep Sampling Area is the groundwater. This groundwater likely originates in the West Landfill/Wet Scrubber Sludge Pond area and migrates south towards the Backwater Seep Sampling Area, as described in Section 8.3.1. All samples collected within the main stem of the Flathead River downgradient of the Backwater Seep Sampling Area during all four rounds of sampling were non-detect for cyanide. These findings confirm the preliminary CSM, that the elevated levels of cyanide and fluoride found in groundwater, the Backwater Seep Sampling Area, and the South Percolation Ponds, are not impacting surface water quality within the main channel of the Flathead River.

Respectfully submitted,

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9.0 REFERENCES

Administrative Settlement Agreement and Order on Consent between CFAC and the United States Environmental Protection Agency, CERCLA Docket No. 08-2016-0002.

Butler, James J., 1997. The Design, Performance, and Analysis of Slug Tests. Edition 1. Boca Raton, Florida: Lewis Publishers.

Canadian Water Quality Guidelines (CCME), 2008. Summary Table.

Ecology and Environment, Inc.(EE), 1988. Draft Analytical Results Report, Columbia Falls Aluminum Company, Columbia Falls, Montana. November 11, 1988.

Geoprobe Systems, 1997. Slug Test Analysis Software, V2.0.

HydroSOLVE, Inc, 2007. Aqtesolv, Advanced Aquifer Test Analysis Software.

Interstate Technology and Regulatory Council, 2012. Incremental Sampling Methodology. Technical and Regulatory Guidance Document.

Konizeski et al., 1968. Geology and Groundwater Resources of the Kalispell Valley, Northwestern Montana. Montana College of Mineral Science and Technology, Butte, Montana.

MDEQ, 2012. Circular DEQ-7, Montana Numeric Water Quality Standards. Montana Department of Environmental Quality, Water Quality Planning Bureau, Water Quality Standards Section. October 2012.

MDEQ, 2014. Average Concentration of Fluoride in Public Water in the Flathead Valley. Montana Department of Environmental Quality, Water Quality Planning Bureau

Montana Bureau of Mines and Geology (MBMG) Website Database, 2017. Groundwater Information Center. http://mbmggwic.mtech.edu/.

Parkhurst, Appelo, 1999. pH Redox Equilibrium (in C Language) Geochemical Model (PHREEQC).

Roux Associates, 2015a. Remedial Investigation/Feasibility Study Work Plan, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company, LLC.

Roux Associates, 2015b. Phase I Site Characterization Sampling and Analysis Plan, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company, LLC.

Roux Associates, 2016a. Phase I Site Characterization Sampling and Analysis Plan Addendum, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company, LLC.

Roux Associates, 2016b. Investigation Derived Waste Management Plan, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company, LLC.

Roux Associates, 2017a. Phase I Site Characterization Data Summary Report, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company, LLC.

Roux Associates, 2017b. Screening Level Ecological Risk Assessment, Former Primary Aluminum Reduction Facility, Columbia Falls Aluminum Company, LLC.

Suter and Tsao, 1996a. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota. Table 1 and Table 2.

Suter and Tsao, 1996b. GLWQI Tier II SAV/SCVs and ORNL LCVs provided in Table 1 and ORNL Population EC20s provided in Table 2.

U.S. Department of Labor, Occupational Safety and Health Standards, OSHA 29 CFR 1910.120(b).

USEPA, 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.

USEPA, 1994. National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule 40 CFR Parts 9 and 300.

USEPA, 2004. National Recommended Water Quality Criteria.

USEPA, 2006. Region 3 Freshwater Screening Benchmark.

USEPA, 2009. Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use.

USEPA, 2010. Ground Water Sampling Procedure, Low Stress (Low Flow) Purging and Sampling. Quality Assurance Unit, Region 1, Revision 3.

USEPA, 2014a. National Functional Guidelines for Organic Data Review.

USEPA, 2014b. National Functional Guidelines for Inorganic Data Review.

USEPA, 2016a. Maximum Contaminant Levels (MCLs) Generic Tables, May 2016.

USEPA, 2016b. Regional Screening Levels (RSLs) Generic Tables, May 2016.

USEPA, 2016c. VISL Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 Calculator.

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Notes Utilized Throughout Tables and Appendices	
DEQ-7 Human Health Standards	Montana Department Of Environmental Quality- DEQ Circular 7 Human Health Standards
EPA	United States Environmental Protection Agency
EPA Drinking MCL	United States Environmental Protection Agency Risk Based Screening Level Drinking Water MCL
EPA Tapwater RSL	United States Environmental Protection Agency Risk Based Screening Level Tapwater RSL
Surface Water ESV Sources	
A	MDEQ Aquatic Life Standard (MDEQ, 2012. Montana Department of Environmental Quality Circular DEQ-7)
B	EPA National Recommended Water Quality Criteria (USEPA. 2004b. National Recommended Water Quality Criteria, 2004)
C	Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota (Suter II, G.W. and Tsao, C.L. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision)
D	Suter & Tsao, 1996. GLWQI Tier II SAV/SCVs and ORNL LCVs provided in Table 1. ORNL Population EC20s provided in Table 2.
E	USEPA Region 3 Freshwater Screening Benchmark (USEPA 2006)
F	Canadian Water Quality Guidelines [Canadian Council of Ministers of the Environment (CCME), 2008]
DI	Dissolved
DO	Dissolved Oxygen
Dry	Groundwater Was Not Present In Well
DUP	Duplicate Sample
ESV	Ecological Screening Value
ft-amsl	Feet Above Mean Sea Level
ft-bls	Feet Below Land Surface
LOD	Limit Of Detection
MBSI	Montana Background Soils Investigation
MCL	Maximum Contaminant Level
MDEQ	Montana Department of Environmental Quality
NA	Compound Was Not Analyzed By Laboratory
ND	Non Detect
ND	Not Measured
NI	Not Installed
ORP	Oxidation-Reduction Potential
T	Total
TCLP	Toxicity Characteristic Leaching Procedure
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit
% LEL	% Lower Explosive Limit
µg/kg	Micrograms Per Kilogram
µg/L	Micrograms Per Liter
uS/cm	MicroSiemens Per Centimeter
cfs	Cubic Feet per Second
ft/day	Feet Per Day
ft/s	Feet Per Second
g/cc	Grams Per Cubic Centimeter
meq/L	Milliequivalent of Solute Per Liter
mg/l	Milligrams Per Liter
mg/kg	Milligrams Per Kilogram
ppm	Parts Per Million
J-	Estimated Low Bias
J	Estimated Value
J+	Estimated High Bias
R	Result Is Rejected
U	Indicates That Analyte Was Not Detected At The Limit Reported
All Statistics And Counts Of Exceedances In The Statistical Summaries Include Non-Detects With ½ MDL Value.	
For All Screening Levels The Target Risk Level For Cancer Is 1E-06 And For Non-Cancer The Target Hazard Quotient Is 0.1.	
USEPA and MDEQ ESVs for analytes including cadmium, chromium, copper, lead, nickel, and zinc are hardness (as calcium carbonate) dependent and were calculated using the minimum hardness value measured during the Phase I Site Characterization, which was 84 mg/L in the Flathead River.	

Ecological Screening Value Source Table											
Analyte Group	CAS ID #	Parameter	MDEQ Aquatic Life Standard (MDEQ, 2012. Montana Department of Environmental Quality Circular DEQ-7)	MDEQ)Circular DEQ-7 (MDEQ, 2012) Chronic Aquatic Life Standards;	EPA National Recommended Water Quality Criteria (USEPA. 2004b. National Recommended Water Quality Criteria, 2004)	Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota (Suter II, G.W. and Tsao, C.L. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision)	Suter & Tsao, 1996. GLWQI Tier II SAV/SCVs and ORNL LCVs provided in Table 1. ORNL Population EC20s provided in Table 2.	USEPA Region 3 Freshwater Screening Benchmark (USEPA 2006)	Canadian Water Quality Guidelines [Canadian Council of Ministers of the Environment (CCME), 2008]	Minimum ESV	Minimum ESV Source
			A		B	C	D	E	F		
GENCHEM	STL00171	Alkalinity (bicarbonate and carbonate									
GENCHEM	7664-41-7	Ammonia nitrogen									
GENCHEM	16887-00-6	Chloride			230000				120000	120000	F
GENCHEM	16984-48-8	Fluoride							120	120	F
GENCHEM	STL00217	Nitrate Nitrite as N									
GENCHEM	14797-55-8	Nitrate, as N							13000	13000	F
GENCHEM	14797-65-0	Nitrite, as N							60	60	F
GENCHEM	STL00599	Orthophosphate, as P									
GENCHEM	14808-79-8	Sulfate									
GENCHEM	7727-37-9	Total Kjeldahl Nitrogen									
METALS	7429-90-5	Aluminum (d)	87	750	87	460		87		87	A
METALS	7440-36-0	Antimony				610	30	30		30	DE
METALS	7440-38-2	Arsenic (d)	150	340	150	48	3.1	5	5	3.1	D
METALS	7440-39-3	Barium					4	4		4	DE
METALS	7440-41-7	Beryllium				5.3	0.66	0.66		0.66	DE
METALS	7440-43-9	Cadmium (d, h)	0.237828	0.520000	0.217921	0.15			0.09	0.09	F
METALS	7440-70-2	Calcium				116000		116000		116000	CE
METALS	16065-83-1	Chromium III	27.7	579	23.8	44		85		23.8	B
METALS	18540-29-9	Chromium VI	11	16	11	2		85		2	C
METALS	7440-47-3	Chromium,Total	74.7		64.3			85		64.3	B
METALS	7440-48-4	Cobalt				5.1	23	23		5.1	C
METALS	7440-50-8	Copper (d,h,BLM)	8.037619	3.790000	7.716115	0.23		9		0.23	C
METALS	STL02227	Cyanide, Free			5.2					5.2	B
METALS	57-12-5	Cyanide, Total	5.2	22		7.8		5	5	5	EF
METALS	7439-89-6	Iron	1000		1000	158		300	300	158	C
METALS	7439-92-1	Lead	2.548308	13.980000	2.080456	12.26		2.5		0.54	A
METALS	7439-95-4	Magnesium				82000		82000		82000	CE
METALS	7439-96-5	Manganese				1100	120	120		120	DE
METALS	7439-97-6	Mercury	0.91	1.7	0.77	0.23	1.3	0.026	0.026	0.026	EF
METALS	7440-02-0	Nickel	45.009384	145.000000	44.874356	5		52		5	C
METALS	7440-09-7	Potassium				53000		53000		53000	CE
METALS	7782-49-2	Selenium	5	20	5	88.32		1	1	1	EF
METALS	7440-22-4	Silver	0.374		0.067	0.12	0.36	3.2	0.25	0.067	B
METALS	7440-23-5	Sodium				680000		680000		680000	CE
METALS	7440-28-0	Thallium				57	12	0.8	0.8	0.8	EF
METALS	7440-62-2	Vanadium				80	20	20		20	DE
METALS	7440-66-6	Zinc	103.361347	37.000000	101.914288	30		120	30	30	CF
OC_PEST	72-54-8	4,4'-DDD				1.69	0.011	0.011	0.001	0.001	F
OC_PEST	72-55-9	4,4'-DDE							0.001	0.001	F
OC_PEST	50-29-3	4,4'-DDT	0.001	0.5	0.001	0.3	0.013	0.0005	0.001	0.0005	E
OC_PEST	309-00-2	Aldrin	1.5	1.5	0.3			3	0.004	0.004	F
OC_PEST	319-84-6	alpha-BHC				95	2.2			2.2	D

Ecological Screening Value Source Table											
Analyte Group	CAS ID #	Parameter	MDEQ Aquatic Life Standard (MDEQ, 2012. Montana Department of Environmental Quality Circular DEQ-7)	MDEQ)Circular DEQ-7 (MDEQ, 2012) Chronic Aquatic Life Standards;	EPA National Recommended Water Quality Criteria (USEPA. 2004b. National Recommended Water Quality Criteria, 2004)	Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota (Suter II, G.W. and Tsao, C.L. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision)	Suter & Tsao, 1996. GLWQI Tier II SAV/SCVs and ORNL LCVs provided in Table 1. ORNL Population EC20s provided in Table 2.	USEPA Region 3 Freshwater Screening Benchmark (USEPA 2006)	Canadian Water Quality Guidelines [Canadian Council of Ministers of the Environment (CCME), 2008]	Minimum ESV	Minimum ESV Source
			A		B	C	D	E	F		
OC_PEST	319-85-7	beta-BHC				95	2.2			2.2	D
OC_PEST	5103-71-9	cis-Chlordane	0.0043		0.0043	1.09				0.0043	ABE
OC_PEST	319-86-8	delta-BHC				95	2.2	141		2.2	D
OC_PEST	60-57-1	Dieldrin	0.056	0.24	0.056			0.056		0.056	ABE
OC_PEST	959-98-8	Endosulfan I	0.056	0.11	0.056		0.051	0.051	0.003	0.003	F
OC_PEST	33213-65-9	Endosulfan II	0.056	0.11	0.056		0.051	0.051		0.051	DE
OC_PEST	1031-07-8	Endosulfan sulfate			0.056		0.051			0.051	D
OC_PEST	72-20-8	Endrin	0.036	0.086	0.036			0.036	0.0023	0.0023	F
OC_PEST	7421-93-4	Endrin aldehyde			0.036					0.036	B
OC_PEST	53494-70-5	Endrin ketone			0.036					0.036	B
OC_PEST	58-89-9	gamma-BHC (Lindane)	0.95		0.095	3.3		0.01	0.01	0.01	EF
OC_PEST	76-44-8	Heptachlor	0.0038	0.26	0.0038	1.26	0.0069	0.0019	0.01	0.0019	E
OC_PEST	1024-57-3	Heptachlor epoxide	0.0038	0.26	0.0038	1.26	0.0069	0.0019		0.0019	E
OC_PEST	72-43-5	Methoxychlor	0.03		0.03		0.019	0.019		0.019	DE
OC_PEST	8001-35-2	Toxaphene	0.0002	0.73	0.0002			0.0002	0.008	0.0002	ABE
OC_PEST	5103-74-2	trans-Chlordane	0.0043		0.0043	1.09				0.0043	ABE
PCB	12674-11-2	Aroclor-1016	0.014					0.000074		0.000074	E
PCB	11104-28-2	Aroclor-1221	0.014			60	0.28	0.000074		0.000074	E
PCB	11141-16-5	Aroclor-1232	0.014			124	0.58	0.000074		0.000074	E
PCB	53469-21-9	Aroclor-1242	0.014			4.9	0.053	0.000074		0.000074	E
PCB	12672-29-6	Aroclor-1248	0.014				0.081	0.000074		0.000074	E
PCB	11097-69-1	Aroclor-1254	0.014			0.1	0.033	0.000074		0.000074	E
PCB	11096-82-5	Aroclor-1260	0.014			2.3	94	0.000074		0.000074	E
PCB	37324-23-5	Aroclor-1262									
PCB	11100-14-4	Aroclor-1268	0.014							0.014	A
PCB	1336-36-3	Total PCBs (5)	0.014		0.014	0.1	0.14	0.000074	0.001	0.000074	E
SVOC	92-52-4	1,1'-Biphenyl					14	14		14	DE
SVOC	95-94-3	1,2,4,5-Tetrachlorobenzene						3		3	E
SVOC	123-91-1	1.4-Dioxane									
SVOC	108-60-1	2,2'-Oxybis(1-choloropropane)									
SVOC	58-90-2	2,3,4,6-Tetrachlorophenol						1.2	1	1	F
SVOC	95-95-4	2,4,5-Trichlorophenol									
SVOC	88-06-2	2,4,6-Trichlorophenol						4.9		4.9	E
SVOC	120-83-2	2,4-Dichlorophenol						11		11	E
SVOC	105-67-9	2,4-Dimethylphenol									
SVOC	51-28-5	2,4-Dinitrophenol									
SVOC	121-14-2	2,4-Dinitrotoluene						44		44	E
SVOC	606-20-2	2,6-Dinitrotoluene						81		81	E
SVOC	91-58-7	2-Chloronaphthalene									
SVOC	95-57-8	2-Chlorophenol						24		24	E
SVOC	91-57-6	2-Methylnaphthalene						4.7		4.7	E
SVOC	95-48-7	2-Methylphenol				489	13	13		13	DE

Ecological Screening Value Source Table											
Analyte Group	CAS ID #	Parameter	MDEQ Aquatic Life Standard (MDEQ, 2012. Montana Department of Environmental Quality Circular DEQ-7)	MDEQ)Circular DEQ-7 (MDEQ, 2012) Chronic Aquatic Life Standards;	EPA National Recommended Water Quality Criteria (USEPA. 2004b. National Recommended Water Quality Criteria, 2004)	Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota (Suter II, G.W. and Tsao, C.L. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision)	Suter & Tsao, 1996. GLWQI Tier II SAV/SCVs and ORNL LCVs provided in Table 1. ORNL Population EC20s provided in Table 2.	USEPA Region 3 Freshwater Screening Benchmark (USEPA 2006)	Canadian Water Quality Guidelines [Canadian Council of Ministers of the Environment (CCME), 2008]	Minimum ESV	Minimum ESV Source
			A		B	C	D	E	F		
SVOC	88-74-4	2-Nitroaniline									
SVOC	88-75-5	2-Nitrophenol				481	300	1920		300	D
SVOC	15831-10-4	3 & 4 Methylphenol									
SVOC	91-94-1	3,3'-Dicholorobenzidine						4.5		4.5	E
SVOC	99-09-2	3-Nitroaniline									
SVOC	534-52-1	4,6-Dinitro-2-methylphenol									
SVOC	101-55-3	4-Bromophenyl-phenylether					1.5	1.5		1.5	DE
SVOC	59-50-7	4-Chloro-3-methylphenol									
SVOC	106-47-8	4-Chloroaniline						232		232	E
SVOC	7005-72-3	4-Chlorophenyl-phenyl ether									
SVOC	100-01-6	4-Nitroaniline									
SVOC	100-02-7	4-Nitrophenol				481	300	60		60	E
SVOC	83-32-9	Acenaphthene				74		5.8	5.8	5.8	EF
SVOC	208-96-8	Acenaphthylene									
SVOC	98-86-2	Acetophenone									
SVOC	120-12-7	Anthracene				0.09	0.73	0.012	0.012	0.012	EF
SVOC	1912-24-9	Atrazine						1.8	1.8	1.8	EF
SVOC	100-52-7	Benzaldehyde									
SVOC	50-32-8	Benzo(a) pyrene				0.3	0.014	0.015	0.015	0.014	D
SVOC	56-55-3	Benzo(a)anthracene				0.65	0.027	0.018	0.018	0.018	EF
SVOC	205-99-2	Benzo(b) fluoranthene									
SVOC	191-24-2	Benzo(g,h,i) perylene									
SVOC	207-08-9	Benzo(k) fluoranthene									
SVOC	111-91-1	Bis(2-chloroethoxy) methane									
SVOC	111-44-4	Bis(2-chloroethyl) ether									
SVOC	117-81-7	Bis(2-ethylhexyl) phthalate				912	3	16		3	D
SVOC	85-68-7	Butylbenzylphthalate					19	19		19	ED
SVOC	105-60-2	Caprolactam									
SVOC	86-74-8	Carbazole									
SVOC	218-01-9	Chrysene									
SVOC	53-70-3	Dibenzo(a,h) anthracene									
SVOC	132-64-9	Dibenzofuran				1003	3.7	3.7		3.7	DE
SVOC	84-66-2	Diethylphthalate				85600	210	210		210	DE
SVOC	131-11-3	Dimethylphthalate									
SVOC	84-74-2	Di-n-butylphthalate				697	35	19	19	19	EF
SVOC	117-84-0	Di-n-octylphthalate				708		22		22	E
SVOC	206-44-0	Fluoranthene				=		0.04	0.04	0.04	EF
SVOC	86-73-7	Fluorene					3.9	3	3	3	EF
SVOC	118-74-1	Hexachlorobenzene						0.0003		0.0003	E
SVOC	87-68-3	Hexachlorobutadiene						1.3	1.3	1.3	EF
SVOC	77-47-4	Hexachlorocyclopentadiene									
SVOC	67-72-1	Hexachloroethane					12	12		12	DE

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			A		B	C	D	E	F		
SVOC	193-39-5	Indeno(1,2,3,-cd) pyrene									
SVOC	78-59-1	Isophorone									
SVOC	91-20-3	Naphthalene				620	12	1.1	1.1	1.1	EF
SVOC	98-95-3	Nitrobenzene									
SVOC	621-64-7	N-Nitrosodi-n-propylamine									
SVOC	86-30-6	N-Nitrosodiphenylamine				332	210	210		210	DE
SVOC	87-86-5	Pentachlorophenol	4	5.3	15			0.5	0.5	0.5	EF
SVOC	85-01-8	Phenanthrene				200		0.4	0.4	0.4	EF
SVOC	108-95-2	Phenol				200		4	4	4	EF
SVOC	129-00-0	Pyrene						0.025	0.025	0.025	EF
VOC	71-55-6	1,1,1-Trichloroethane				3493	11	11		11	DE
VOC	79-34-5	1,1,2,2-Tetrachloroethane				2400	610	610		610	DE
VOC	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane									
VOC	79-00-5	1,1,2-Trichloroethane				9400	1200	1200		1200	DE
VOC	75-34-3	1,1-Dichloroethane				14680	47	47		47	DE
VOC	75-35-4	1,1-Dichloroethene				2800	25	25		25	DE
VOC	87-61-6	1,2,3-Trichlorobenzene							8	8	F
VOC	120-82-1	1,2,4-Trichlorobenzene					110	24	24	24	EF
VOC	96-12-8	1,2-Dibromo-3-chloropropane									
VOC	95-50-1	1,2-Dichlorobenzene					14	0.7		0.7	E
VOC	107-06-2	1,2-Dichloroethane				15200	910	100	100	100	EF
VOC	78-87-5	1,2-Dichloropropane									
VOC	541-73-1	1,3-Dichlorobenzene					71	150	150	71	D
VOC	106-46-7	1,4-Dichlorobenzene					15	26	26	15	D
VOC	78-93-3	2-Butanone				282170	14000	14000		14000	DE
VOC	591-78-6	2-Hexanone				32783	99	99		99	DE
VOC	108-10-1	4-Methyl-2-pentanone				77400	170	170		170	ED
VOC	67-64-1	Acetone				507640	1500	1500		1500	DE
VOC	71-43-2	Benzene				525000	130	370	370	130	D
VOC	75-25-2	Bromoform					320	320		320	DE
VOC	74-83-9	Bromomethane									
VOC	75-15-0	Carbon disulfide				244	0.92	0.92		0.92	DE
VOC	56-23-5	Carbon tetrachloride				1970	9.8	13.3		9.8	D
VOC	108-90-7	Chlorobenzene				1203	64	1.3		1.3	E
VOC	74-97-5	Chlorobromomethane									
VOC	75-00-3	Chloroethane									
VOC	67-66-3	Chloroform				1240	28	1.8		1.8	E
VOC	74-87-3	Chloromethane									
VOC	156-59-2	cis-1,2-Dichloroethene					590			590	D
VOC	10061-01-5	cis-1,3-Dichloropropene					0.055			0.055	D
VOC	110-82-7	Cyclohexane									
VOC	124-48-1	Dibromochloromethane									

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			A		B	C	D	E	F		
VOC	75-27-4	Dichlorobromomethane									
VOC	75-71-8	Dichlorodifluoromethane									
VOC	100-41-4	Ethylbenzene				440	7.3	90	90	7.3	D
VOC	106-93-4	Ethylene Dibromide									
VOC	98-82-8	Isopropylbenzene						2.6		2.6	E
VOC	179601-23-1	m,p-Xylene					1.8			1.8	D
VOC	79-20-9	Methyl acetate									
VOC	1634-04-4	Methyl tert-butyl ether						11070	10000	10000	F
VOC	108-87-2	Methylcyclohexane									
VOC	75-09-2	Methylene chloride				42667	2200	98.1		98.1	E
VOC	95-47-6	o-Xylene					13			13	D
VOC	100-42-5	Styrene						72	72	72	EF
VOC	127-18-4	Tetrachloroethene				750	98	111		98	D
VOC	108-88-3	Toluene				1269	9.8	2	2	2	EF
VOC	156-60-5	trans-1,2-Dichloroethene					590	970		590	D
VOC	10061-02-6	trans-1,3-Dichloropropene					0.055			0.055	D
VOC	79-01-6	Trichloroethene				7257	47	21		21	E
VOC	75-69-4	Trichlorofluoromethane									
VOC	75-01-4	Vinyl chloride						930		930	E

Table 1. Construction Details for Monitoring Wells at the Site
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Location ID	Previous Well ID	Existing or Phase 1 Well	Unit	Closest Site Feature	Date Surveyed	Surveyor	Northing (Y)	Easting (X)	Top of Casing Elevation (ft-amsl)	Well Pad/ Ground Elevation (ft-amsl)	Well Depth (ft-bls)	Well Screen Top Depth (ft-bls)	Well Screen Top Elevation (ft-amsl)	Well Screen Bottom Depth (ft-bls)	Well Screen Bottom Elevation (ft-amsl)	Well Construction Source
CFMW-001	W2-CFMW1	Existing Monitoring Well	Upper Hydrogeologic Unit	Industrial Landfill	8/1/2016	Sands	1549228.859	842170.366	3173.783	3170.907	152.5	132.5	3038.407	152.5	3018.407	EPA Report/Old Well Log
CFMW-002	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Drum Storage Area	7/6/2016	Sands	1546021.158	843027.354	3145.580	3142.750	80	70	3072.75	80	3062.75	CFAC Phase I
CFMW-003	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Industrial Landfill	7/6/2016	Sands	1547594.617	841640.301	3144.950	3142.320	54	44	3098.32	54	3088.32	CFAC Phase I
CFMW-003a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Industrial Landfill	7/6/2016	Sands	1547603.170	841647.493	3145.570	3143.010	200	190	2953.01	200	2943.01	CFAC Phase I
CFMW-007	TW3	Existing Monitoring Well	Upper Hydrogeologic Unit	West Landfill	8/1/2016	Sands	1546426.597	843029.760	3149.199	3147.958	160	91	3056.958	102	3045.958	EPA Report/Old Well Log
CFMW-008	TW9	Existing Monitoring Well	Upper Hydrogeologic Unit	Sanitary Landfill	7/6/2016	Sands	1546564.756	844032.614	3192.970	3191.769	38.5	No Screen	No Screen	Open Bottom	Open Bottom	EPA Report/Old Well Log
CFMW-008a	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Sanitary Landfill	7/6/2016	Sands	1546575.278	844043.577	3196.440	3194.690	98	88	3106.69	98	3096.69	CFAC Phase I
CFMW-010	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Drum Storage Area	7/6/2016	Sands	1546115.479	842986.314	3147.060	3144.690	86	76	3068.69	86	3058.69	CFAC Phase I
CFMW-011	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Drum Storage Area	7/6/2016	Sands	1545989.982	842462.741	3103.410	3100.980	50	40	3060.98	50	3050.98	CFAC Phase I
CFMW-011a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Drum Storage Area	7/6/2016	Sands	1545990.300	842455.026	3103.650	3100.770	166	156	2944.77	166	2934.77	CFAC Phase I
CFMW-012	W11-TW17	Existing Monitoring Well	Upper Hydrogeologic Unit	Wet Scrubber Sludge Pond	7/6/2016	Sands	1545999.738	843116.466	3142.480	3140.472	90	70	3070.472	85	3055.472	EPA Report/Old Well Log
CFMW-012a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Wet Scrubber Sludge Pond	7/6/2016	Sands	1545978.652	843111.473	3142.760	3140.290	210	200	2940.29	210	2930.29	CFAC Phase I
CFMW-014	W3-TW20	Existing Monitoring Well	Upper Hydrogeologic Unit	Drum Storage Area	8/1/2016	Sands	1545822.378	842858.322	3142.310	3139.968	92	72	3067.968	87	3052.968	EPA Report/Old Well Log
CFMW-015	W4-TW21	Existing Monitoring Well	Upper Hydrogeologic Unit	Wet Scrubber Sludge Pond	8/1/2016	Sands	1545790.290	843070.037	3140.650	3138.933	94	72	3066.933	87	3051.933	EPA Report/Old Well Log
CFMW-016	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Center Landfill	7/6/2016	Sands	1545847.943	843955.534	3166.590	3163.840	95	85	3078.84	95	3068.84	CFAC Phase I
CFMW-016a	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Center Landfill	7/6/2016	Sands	1545856.544	843955.402	3167.110	3164.290	126	121	3043.29	126	3038.29	CFAC Phase I
CFMW-017	TW14	Existing Monitoring Well	Upper Hydrogeologic Unit	Center Landfill	8/1/2016	Sands	1545913.137	844140.867	3210.569	3207.893	141	137	3070.893	141	3066.893	EPA Report/Old Well Log
CFMW-018	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	East Landfill	7/6/2016	Sands	1545750.745	844586.938	3212.810	3210.040	122	112	3098.04	122	3088.04	CFAC Phase I
CFMW-019	W5-TW15	Existing Monitoring Well	Upper Hydrogeologic Unit	Wet Scrubber Sludge Pond	8/1/2016	Sands	1545555.121	843277.960	3137.810	3136.232	96	78	3058.232	88	3048.232	EPA Report/Old Well Log
CFMW-019a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Wet Scrubber Sludge Pond	7/6/2016	Sands	1545565.436	843291.647	3138.980	3136.510	220	210	2926.51	220	2916.51	CFAC Phase I
CFMW-020	TW8	Existing Monitoring Well	Upper Hydrogeologic Unit	Wet Scrubber Sludge Pond	8/1/2016	Sands	1545748.365	844071.614	3168.737	3166.624	130	113	3053.624	118	3048.624	EPA Report/Old Well Log
CFMW-021	W6-TW18	Existing Monitoring Well	Upper Hydrogeologic Unit	Wet Scrubber Sludge Pond	8/1/2016	Sands	1545558.392	843505.246	3138.155	3136.090	90	70	3066.09	85	3051.09	EPA Report/Old Well Log
CFMW-022	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	East Landfill	7/6/2016	Sands	1545314.578	843942.176	3137.320	3134.390	80	70	3064.39	80	3054.39	CFAC Phase I
CFMW-023	TW10	Existing Monitoring Well	Upper Hydrogeologic Unit	South Leachate Pond	8/1/2016	Sands	1545521.210	844694.956	3209.982	3208.638	144.5	137.5	3071.138	143.25	3065.388	EPA Report
CFMW-023a	--	Phase 1 Monitoring Well		South Leachate Pond	*Monitoring well will not be installed - summarized in field modification#2*											CFAC Phase I
CFMW-025	TW23	Existing Monitoring Well	Upper Hydrogeologic Unit	North-West Percolation Pond	8/1/2016	Sands	1545240.341	840912.165	3103.541	3101.160	24.5	9.5	3091.66	24.5	3076.66	EPA Report/Old Well Log
CFMW-025a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	North-West Percolation Pond	8/1/2016	Sands	1545217.964	840914.892	3104.198	3101.489	95	85	3016.489	95	3006.489	CFAC Phase I
CFMW-025b	W10-TW22	Existing Monitoring Well	Upper Hydrogeologic Unit	Norht-West Percolation Pond	7/6/2016	Sands	1545233.747	840916.756	3103.660	3101.599	60	45	3056.599	60	3041.599	EPA Report/Old Well Log
CFMW-026	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	North-West Percolation Pond	7/6/2016	Sands	1545199.463	841222.779	3104.260	3101.580	45	35	3066.58	45	3056.58	CFAC Phase I
CFMW-027	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Overflow Ditch	7/6/2016	Sands	1545251.431	842166.064	3097.110	3094.380	45	35	3059.38	45	3049.38	CFAC Phase I
CFMW-028	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	North-East Percolation Pond	8/1/2016	Sands	1544970.966	843041.414	3108.699	3105.991	60	50	3055.991	60	3045.991	CFAC Phase I
CFMW-028a	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	North-East Percolation Pond	8/1/2016	Sands	1544970.077	843049.717	3108.660	3105.916	120	110	2995.916	120	2985.916	CFAC Phase I
CFMW-029	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	North-East Percolation Pond	7/6/2016	Sands	1545108.045	843463.411	3133.040	3130.520	76	66	3064.52	76	3054.52	CFAC Phase I
CFMW-031	W0-CFMW2	Existing Monitoring Well	Upper Hydrogeologic Unit	North-East Percolation Pond	8/1/2016	Sands	1544867.601	842797.671	3109.490	3107.820	50	35	3072.82	50	3057.82	EPA Report/Old Well Log
CFMW-032	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Raw Materials Loading/ Unloading	8/29/2016	Sands	1544745.320	843964.007	3116.578	3114.020	55	45	3069.02	55	3059.02	CFAC Phase I
CFMW-032a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Raw Materials Loading/ Unloading	8/29/2016	Sands	1544744.536	843973.334	3116.805	3114.095	205	195	2919.095	205	2909.095	CFAC Phase I
CFMW-033	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Paste Plant	7/6/2016	Sands	1544545.111	842408.017	3110.640	3107.970	60	50	3057.97	60	3047.97	CFAC Phase I
CFMW-034	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Fueling Area	7/6/2016	Sands	1544513.493	843342.204	3109.990	3107.450	60	50	3057.45	60	3047.45	CFAC Phase I
CFMW-035	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Main Plant Area	7/6/2016	Sands	1544499.012	844447.319	3109.920	3107.120	70	60	3047.12	70	3037.12	CFAC Phase I
CFMW-036	W1-PW7	Existing Former Production Well	Production Well	South Percolation Ponds	EPA Report	EPA Report	1541629.329	843914.647	3021.600	3030.000	61.6	53.6	2968.00	61.60	2960.00	EPA Report
CFMW-037	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Main Plant Area	7/6/2016	Sands	1543140.324	844473.946	3113.640	3110.870	100	90	3020.87	100	3010.87	CFAC Phase I
CFMW-038	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Rectifier Yards	7/6/2016	Sands	1543075.138	843981.359	3113.770	3110.880	105	95	3015.88	105	3005.88	CFAC Phase I
CFMW-040	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Rectifier Yards	7/6/2016	Sands	1543076.822	842863.264	3113.720	3111.050	90	80	3031.05	90	3021.05	CFAC Phase I
CFMW-042	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Main Plant Area	7/6/2016	Sands	1543285.825	842383.655	3110.340	3107.520	60	50	3057.52	60	3047.52	CFAC Phase I
CFMW-043	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	West Percolation Pond	7/6/2016	Sands	1544078.364	842157.850	3109.910	3106.970	60	50	3056.97	60	3046.97	CFAC Phase I
CFMW-044	W8-TW2	Existing Monitoring Well	Upper Hydrogeologic Unit	West Percolation Pond	8/1/2016	Sands	1543941.726	841700.388	3108.093	3105.883	53	No Screen	No Screen	Open Bottom	Open Bottom	EPA Report/Old Well Log
CFMW-044a	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	West Percolation Pond	8/1/2016	Sands	1543941.659	841685.038	3108.716	3106.109	110	100	3006.109	110	2996.109	CFAC Phase I
CFMW-044b	TW1	Existing Monitoring Well	Below Upper Hydrogeologic Unit	Main Plant Area	8/1/2016	Sands	1543937.612	841699.554	3107.979	3105.262	>200	No Screen	No Screen	Open Bottom	Open Bottom	EPA Report/Old Well Log
CFMW-045	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Rectifier Yards	8/29/2016	Sands	1542768.892	842543.665	3113.750	3111.261	96	86	3025.261	96	3015.261	CFAC Phase I
CFMW-045a	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Rectifier Yards	8/29/2016	Sands	1542768.562	842554.018	3113.934	3111.284	160	150	2961.284	160	2951.284	CFAC Phase I
CFMW-047	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Rectifier Yards	7/6/2016	Sands	1542470.126	844332.708	3117.180	3114.480	120	110	3004.48	120	2994.48	CFAC Phase I
CFMW-048	PW3	Existing Former Production Well	Production Well	Rectifier yards	EPA Report	EPA Report	1542485.180	844497.403	3106.850	3120.000	119.89	109.89	2996.960	119.89	2986.960	EPA Report
CFMW-049	W7-TW19	Existing Monitoring Well	Upper Hydrogeologic Unit	Rectifier yards	8/1/2016	Sands	1542470.637	844793.481	3122.693	3120.165	113	100	3020.165	111	3009.165	EPA Report/Old Well Log
CFMW-049a	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Rectifier Yards	8/29/2016	Sands	1542484.164	844793.737	3122.691	3120.493	148.5	138.5	2981.993	148.5	2971.993	CFAC Phase I
CFMW-050	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Main Plant Area	7/6/2016	Sands	1542299.178	844928.802	3123.120	3120.240	120	110	3010.24	120	3000.24	CFAC Phase I
CFMW-051	W9-PW5	Existing Former Production Well	Production Well	South Percolation Ponds	EPA Report	EPA Report	1542149.083	845500.048	3123.250	3136.000	162.07	137.9	2985.350	162.07	2961.180	EPA Report/Old Well Log
CFMW-052	PW4	Existing Former Production Well	Production Well	South Percolation Ponds	EPA Report	EPA Report	1542121.449	846201.695	3139.470	3152.000	174.98	154.19	2985.280	174.98	2964.490	Old Well Log
CFMW-053	TW16	Existing Monitoring Well	Upper Hydrogeologic Unit	Rod Mill	8/1/2016	Sands	1542974.491	841601.392	3111.227	3109.649	77	47	3062.649	77	3032.649	EPA Report/Old Well Log
CFMW-053a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Rod Mill	8/29/2016	Sands	1542988.456	841600.660	3112.061	3109.666	160	150	2959.666	160	2949.666	CFAC Phase I
CFMW-054	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Rod Mill	7/6/2016	Sands	1542966.021	841003.141	3112.670	3109.920	85	75	3034.92	85	3024.92	CFAC Phase I
CFMW-056	TW11	Existing Monitoring Well	Below Upper Hydrogeologic Unit	Aluminum City	8/1/2016	Sands	1544572.964	839789.319	3101.349	3098.851	181.08	No Screen	No Screen	Open Bottom	Open Bottom	EPA Report/Old Well Log
CFMW-056a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Aluminum City	8/1/2016	Sands	1544587.443	839786.440	3101.079	3098.671	135	125	2973.671	135	2963.671	CFAC Phase I
CFMW-056b	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Aluminum City	8/1/2016	Sands	1544590.852	839778.849	3101.199	3098.599	50	40	3058.599	50	3048.599	CFAC Phase I

Table 1. Construction Details for Monitoring Wells at the Site
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Location ID	Previous Well ID	Existing or Phase 1 Well	Unit	Closest Site Feature	Date Surveyed	Surveyor	Northing (Y)	Easting (X)	Top of Casing Elevation (ft-amsl)	Well Pad/ Ground Elevation (ft-amsl)	Well Depth (ft-bls)	Well Screen Top Depth (ft-bls)	Well Screen Top Elevation (ft-amsl)	Well Screen Bottom Depth (ft-bls)	Well Screen Bottom Elevation (ft-amsl)	Well Construction Source
CFMW-001	W2-CFMW1	Existing Monitoring Well	Upper Hydrogeologic Unit	Industrial Landfill	8/1/2016	Sands	1549228.859	842170.366	3173.783	3170.907	152.5	132.5	3038.407	152.5	3018.407	EPA Report/Old Well Log
CFMW-057	TW12	Existing Monitoring Well	Below Upper Hydrogeologic Unit	Aluminum City	8/1/2016	Sands	1543626.421	837706.038	3094.937	3092.563	185.75	Uknown	Uknown	Uknown	Uknown	EPA Report
CFMW-057a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Aluminum City	8/29/2016	Sands	1543635.868	837689.701	3094.774	3092.778	138	128	2964.778	138	2954.778	CFAC Phase I
CFMW-059	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	Aluminum City	8/1/2016	Sands	1542120.760	837611.730	3119.421	3117.387	90	80	3037.387	90	3027.387	CFAC Phase I
CFMW-059a	--	Phase 1 Monitoring Well	Below Upper Hydrogeologic Unit	Aluminum City	8/1/2016	Sands	1542123.943	837619.424	3119.178	3117.047	168	158	2959.047	168	2949.047	CFAC Phase I
CFMW-061	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	South Percolation Ponds	8/1/2016	Sands	1541698.045	843728.230	3027.378	3024.323	23	13	3011.323	23	3001.323	CFAC Phase I
CFMW-062	PW6	Existing Former Production Well	Production Well	South Percolation Ponds	EPA Report	EPA Report	1541841.609	843927.216	3021.600	3031.000	70.2	62.2	2959.400	70.2	2951.400	Old Well Log
CFMW-064	--	Phase 1 Monitoring Well	Upper Hydrogeologic Unit	South Percolation Ponds	8/29/2016	Sands	1541612.776	844718.875	3029.141	3026.002	30	20	3006.002	30	2996.002	CFAC Phase I
Flathead Staff				Flathead River	8/1/2016	Sands	1541453.873	843980.286	3014.719	1.600	NA	NA	NA	NA	NA	CFAC Phase I

Table 2. Groundwater and Flathead River Elevation Data Measured Throughout the Phase I Site Characterization
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Sample Date	Sample Designation	Sample Type	Antimony		Arsenic		Barium		Cyanide, Free		Cyanide, Total		Zinc		Fluoride	
				Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
CFMW-001	06/19/2017	CFMW-001-GW	N	0.62 U	0.62 U	1.9 J	0.84 J	94.1	75	2 U	2 U	1.5 U	1.5 U	7.7 J	7 U	159	120
CFMW-002	06/27/2017	CFMW-002-GW	N	0.62 U	0.62 U	0.84 J	0.81 J	199	184	**985**	**883**	119	47.9	7 U	7 U	**4930**	**5150 J+**
CFMW-003	06/27/2017	CFMW-003-GW	N	0.62 U	0.62 U	1.6 J	0.65 J	26	20.1	13.2	12	1.5 U	1.5 U	7 U	7 U	60 U	60 U
CFMW-003a	06/19/2017	CFMW-003a-GW	N	0.62 U	0.62 U	3.6	2.8	63.8	45.5	2 U	2 U	1.5 U	1.5 U	14.2 J	7 U	276	274
CFMW-007	06/19/2017	CFMW-007-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	218	170	2 U	2 U	1.5 U	1.5 U	7 U	7 U	152	126
CFMW-008	06/20/2017	CFMW-008-GW	N	1.2 J	0.62 U	1.9 J	0.64 U	505	434	2 U	2 U	1.5 U	1.5 U	**3990**	1220	527	431
CFMW-008a	06/28/2017	CFMW-008a-GW	N	1.3 J	0.91 J	0.64 U	0.64 U	953	888	2 U	2 U	1.5 UJ	1.5 UJ	24.5	15.8 J	304 J-	277 J+
CFMW-010	06/27/2017	CFMW-010-GW	N	0.62 U	0.62 U	2.9	2.5	141	126	**1190**	**1120**	117	56.8	7 U	7 U	**6810**	**6980 J+**
CFMW-011	06/28/2017	CFMW-DUP15-GW	FD	0.62 U	0.62 U	0.64 U	0.64 U	197	186	123	126	9.8 J	3.1 J-	7 U	7 U	297 J-	298 J+
CFMW-011	06/28/2017	CFMW-011-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	199	181	125	125	6.6 J	3.3 J-	7 U	7 U	289 J-	296 J+
CFMW-011a	06/29/2017	CFMW-011a-GW	N	0.62 U	0.62 U	2.1	1.3 J	83	57.9	2 U	2 U	NM	NM	8.3 J	7 U	197	170 J+
CFMW-012	06/23/2017	CFMW-012-GW	N	0.86 J	0.62 U	**80.2**	**92.6**	145	129	**5780**	**5860**	35.2	40.6	7 U	7 U	**30600**	**31900**
CFMW-012a	06/20/2017	CFMW-012a-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	85.7	79.3	2 U	2 U	NM	NM	7 U	7 U	139	90.2
CFMW-014	06/27/2017	CFMW-014-GW	N	0.62 U	0.62 U	2.2	2.1	169	158	**720**	**720**	111	27.4	7 U	7 U	3960	**4110 J+**
CFMW-015	06/27/2017	CFMW-015-GW	N	0.82 J	0.62 U	**77.7**	**92.1**	76.5	67	**8120**	**7780**	97.3	36.9	7 U	7 U	**52900**	**55300 J+**
CFMW-016	06/29/2017	CFMW-016-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	213	199	2 U	2 U	1.5 UJ	1.5 UJ	7 U	7 U	338	352 J+
CFMW-016a	06/26/2017	CFMW-016a-GW	N	4.4	2.6	0.64 U	0.64 U	141	97.1	2.1 J	2 U	1.5 U	1.5 U	7 U	7 U	293 J+	275
CFMW-017	06/26/2017	CFMW-017-GW	N	0.62 U	0.62 U	1.1 J	0.67 J	87.9	88.9	103	93.6	1.5 U	1.5 U	7 U	7 U	1160 J+	1220
CFMW-018	06/20/2017	CFMW-018-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	168	155	78	74.9 J-	3.3 J	3.7 J	7 U	7 U	451	475
CFMW-019	06/29/2017	CFMW-019-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	131	122	**1230**	**1250**	67.8 J-	44.5 J-	24.9	7 U	3720	3390 J+
CFMW-019a	06/26/2017	CFMW-019a-GW	N	1 J	0.62 U	1.8 J	1.3 J	54.5	46.8	2 U	2.8 J	NM	NM	7.9 J	7 U	179 J+	145
CFMW-020	06/26/2017	CFMW-020-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	193	199	2 J	2 U	1.5 U	1.5 U	18.4	7 U	489 J+	517
CFMW-021	06/26/2017	CFMW-021-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	110	109	**321**	**302**	18.9	7.5	7 U	7 U	1930 J+	1810
CFMW-022	06/26/2017	CFMW-022-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	171	170	13.3	11.8	1.5 U	1.5 U	7 U	7 U	573 J+	607
CFMW-023	06/27/2017	CFMW-023-GW	N	0.62 U	0.62 U	0.72 J	0.64 U	186	170	5.9 J	5.7 J	1.5 U	1.5 U	10.2 J	7 U	736	708 J+
CFMW-025a	06/22/2017	CFMW-025a-GW	N	0.62 U	0.62 U	5.3	1.6 J	232	122	2 U	2 U	NM	NM	45.5	7 U	413	422
CFMW-025b	06/22/2017	CFMW-025b-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	313	295	2 U	2 U	NM	NM	23.5	7 U	515	525
CFMW-026	06/22/2017	CFMW-026-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	272	266	2 U	2 U	1.5 U	1.5 U	7 U	7 U	1150	1260
CFMW-027	06/26/2017	CFMW-027-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	146	148	**560**	**520**	62	46.3	7 U	7 U	**5160**	**5190**
CFMW-028	06/26/2017	CFMW-028-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	181	177	**315**	**304**	10.7	10.5	7 U	7 U	3800 J+	3770
CFMW-028a	06/27/2017	CFMW-028a-GW	N	0.62 U	0.62 U	**10.2**	9.4	53.5	40.2	2 U	2 U	1.5 U	1.5 U	7 U	7 U	286	293 J+
CFMW-029	06/26/2017	CFMW-029-GW	N	0.62 U	0.62 U	0.66 J	0.64 U	147	141	128	116	19.7	5.4	7 U	7 U	2570 J+	2570
CFMW-031	06/21/2017	CFMW-DUP13-GW	FD	0.62 U	0.62 U	0.64 U	0.64 U	147	150	103	100	3.5 J	3.1 J	7 U	7 U	2770 J-	2900
CFMW-031	06/21/2017	CFMW-031-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	150	151	104	101	2.8 J	2.4 J	7 U	7 U	2800 J-	2900
CFMW-032	06/20/2017	CFMW-DUP12-GW	FD	0.62 U	0.62 U	0.64 U	0.64 U	158	145	**470**	**483 J-**	129 J	135 J	7 U	7 U	**8570**	**8400**
CFMW-032	06/20/2017	CFMW-032-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	156	146	**478**	**494 J-**	46.1 J	45.9 J	7 U	7 U	**8460**	**8420**
CFMW-032a	06/27/2017	CFMW-032a-GW	N	0.64 J	0.62 U	0.64 U	0.64 U	464	412	2 U	2 U	1.5 U	1.5 U	11.3 J	7 U	241	193 J+
CFMW-033	06/19/2017	CFMW-033-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	143	134	181	190	10.6	5.7	7 U	7 U	3250	3220
CFMW-034	06/19/2017	CFMW-034-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	176	157	**287**	**287**	24.9	6.7	7 U	7 U	**6590**	**6500**
CFMW-035	06/20/2017	CFMW-035-GW	N	0.62 U	0.62 U	**13.2**	**11.3**	745	702	53	51.4 J-	4.4 J-	4.6 J	47.3	7 U	209	190
CFMW-037	06/20/2017	CFMW-037-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	298	288	75.8	6 J-	2.1 J	1.5 U	7 U	7 U	1030	1100
CFMW-038	06/27/2017	CFMW-038-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	266	231	**298**	197	4.8 J	4.4 J	7 U	7 U	2810	2830 J+
CFMW-040	06/20/2017	CFMW-040-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	184	175	**385**	**391 J-**	40.4	45	7 U	7 U	2830	2560
CFMW-042	06/20/2017	CFMW-042-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	178	171	**395**	**391 J-**	27.6 J-	21.1	7 U	7 U	2780	2590

Table 2. Groundwater and Flathead River Elevation Data Measured Throughout the Phase I Site Characterization
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Sample Date	Sample Designation	Sample Type	Antimony		Arsenic		Barium		Cyanide, Free		Cyanide, Total		Zinc		Fluoride	
				Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
CFMW-043	06/21/2017	CFMW-043-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	171	169	**535**	**530**	120	66.2	7 U	7 U	2020 J-	2210
CFMW-044	06/21/2017	CFMW-044-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	125	147	69.5	89.4	4.5 J	2.8 J	15.9 J	7 U	1400 J-	1580
CFMW-044a	06/23/2017	CFMW-044a-GW	N	0.62 U	0.62 U	1.5 J	1.5 J	35.5	31	119	120	7.8	10.3	12.9 J	7 U	2250 J+	2350
CFMW-044b	06/23/2017	CFMW-044b-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	374	352	10.5	10.1	1.5 U	1.5 U	384	7.2 J	138 J+	116
CFMW-045	06/28/2017	CFMW-045-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	175	156	**450**	**428**	33.7 J-	14.4 J-	7 U	7 U	2150 J-	2370 J+
CFMW-045a	06/23/2017	CFMW-045a-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	127	124	63.2	67.3	1.6 J	2.4 J	7 U	7 U	3400 J+	3230
CFMW-047	06/21/2017	CFMW-047-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	209	201	119	120	10	4.1 J	7 U	7 U	1920	2100
CFMW-049	06/21/2017	CFMW-049-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	276	276	89.7	89.8	5.5	4.7 J	7 U	7 U	720 J-	815
CFMW-049a	06/21/2017	CFMW-049a-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	371	275	58.6	38.2	1.8 J	1.6 J	7 U	7 U	405 J-	444
CFMW-050	06/21/2017	CFMW-050-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	276	271	106	105	4.5 J	3.9 J	7 U	7 U	744 J-	808
CFMW-053	06/28/2017	CFMW-053-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	145	132	**239**	**238**	5.2 J-	3.3 J-	7 U	7 U	1610 J-	1740 J+
CFMW-053a	06/28/2017	CFMW-053a-GW	N	**10**	**8.2**	0.64 U	0.64 U	**2310**	**2120**	2 U	2 U	NM	NM	15.5 J	7.8 J	487 J-	595 J+
CFMW-054	06/21/2017	CFMW-054-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	148	145	**302**	**284**	40.3	19.1	7 U	7 U	1880	1910
CFMW-056	06/22/2017	CFMW-056-GW	N	0.62 U	0.62 U	0.74 J	0.64 U	144	135	2 U	2 U	NM	NM	907	7 U	194	180
CFMW-056a	06/22/2017	CFMW-056a-GW	N	0.62 U	0.62 U	1.9 J	0.99 J	186	170	2 U	2 U	1.5 U	1.5 U	11.6 J	7 U	569	649
CFMW-056b	06/22/2017	CFMW-056b-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	152	149	2 U	2 U	NM	NM	7 U	7 U	188	188
CFMW-057	06/28/2017	CFMW-057-GW	N	0.62 U	0.62 U	1.7 J	0.64 U	121	111	2 U	2 U	NM	NM	770	8.8 J	204 J-	209
CFMW-057a	06/28/2017	CFMW-057a-GW	N	1.6 J	0.62 U	0.64 J	0.64 U	98	89.7	2 U	2 U	NM	NM	7 U	7 U	322 J-	337 J+
CFMW-059	06/21/2017	CFMW-059-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	158	145	2 U	2 U	NM	NM	7 U	7 U	124	96
CFMW-059a	06/28/2017	CFMW-059a-GW	N	0.62 U	0.62 U	4.6	3.7	147	125	2 U	2 U	NM	NM	7 U	7 U	185 J-	157 J+
CFMW-061	06/23/2017	CFMW-061-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	232	226	2 U	2 U	1.5 U	1.5 U	7 U	7 U	601 J+	638
CFMW-064	06/23/2017	CFMW-DUP14-GW	FD	0.62 U	0.62 U	0.64 U	0.64 U	344	336	60.5	61.5	1.5 U	1.5 U	7 U	7 U	288 J+	312
CFMW-064	06/23/2017	CFMW-064-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	345	339	60.1	62.6	1.5 U	1.5 U	7 U	7 U	302 J+	307

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Table 3. Summary of Groundwater Samples Collected During Rounds 1 through 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Location Type	Screen Type	Date Completed Round 1	Date Completed Round 2	Date Completed Round 3	Date Completed Round 4
CFMW-001	Existing Monitoring Well	Upper Hydrogeologic Unit	9/20/2016	12/12/2017	3/20/2017	6/19/2017
CFMW-002	New Monitoring Well	Upper Hydrogeologic Unit	9/12/2016	Insufficient Water to sample	3/24/2017	6/27/2017
CFMW-003	New Monitoring Well	Upper Hydrogeologic Unit	9/14/2016	12/9/2016	3/22/2017	6/27/2017
CFMW-003a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/20/2016	12/12/2016	3/20/2017	6/19/2017
CFMW-007	Existing Monitoring Well	Upper Hydrogeologic Unit	9/21/2016	12/12/2016	3/28/2017	6/19/2017
CFMW-008	Existing Monitoring Well	Upper Hydrogeologic Unit	9/21/2016	12/16/2016	3/28/2017	6/20/2017
CFMW-008a	New Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/16/2016	3/28/2017	6/28/2017
CFMW-010	New Monitoring Well	Upper Hydrogeologic Unit	9/12/2016	12/15/2016	3/24/2017	6/27/2017
CFMW-011	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/8/2016	3/27/2017	6/28/2017
CFMW-011a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/20/2016	12/14/2016	3/21/2017	6/29/2017
CFMW-012	Existing Monitoring Well	Upper Hydrogeologic Unit	9/12/2016	12/14/2016	3/22/2017	6/23/2017
CFMW-012a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/15/2016	12/13/2016	3/20/2017	6/20/2017
CFMW-014	Existing Monitoring Well	Upper Hydrogeologic Unit	9/12/2016	12/15/2016	3/29/2017	6/27/2017
CFMW-015	Existing Monitoring Well	Upper Hydrogeologic Unit	9/12/2016	12/15/2016	3/29/2017	6/27/2017
CFMW-016	New Monitoring Well	Upper Hydrogeologic Unit	Insufficient Water to sample	Insufficient Water to sample	3/28/2017	6/29/2017
CFMW-016a	New Monitoring Well	Upper Hydrogeologic Unit	9/21/2016	12/14/2016	3/27/2017	6/26/2017
CFMW-017	Existing Monitoring Well	Upper Hydrogeologic Unit	Insufficient Water to sample	Insufficient Water to sample	3/28/2017	6/26/2017
CFMW-018	New Monitoring Well	Upper Hydrogeologic Unit	Insufficient Water to sample	Insufficient Water to sample	3/28/2017	6/20/2017
CFMW-019	Existing Monitoring Well	Upper Hydrogeologic Unit	9/12/2016	12/15/2016	3/29/2017	6/29/2017
CFMW-019a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/20/2016	12/14/2016	3/27/2017	6/26/2017
CFMW-020	Existing Monitoring Well	Upper Hydrogeologic Unit	9/20/2016	12/13/2016	3/21/2017	6/26/2017
CFMW-021	Existing Monitoring Well	Upper Hydrogeologic Unit	9/12/2016	12/14/2016	3/29/2017	6/26/2017
CFMW-022	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/9/2016	3/28/2017	6/26/2017
CFMW-023	Existing Monitoring Well	Upper Hydrogeologic Unit	9/21/2016	12/19/2016	3/21/2017	6/27/2017
CFMW-025	Existing Monitoring Well	Upper Hydrogeologic Unit	Insufficient Water to sample	Insufficient Water to sample	Well Destroyed, unable to sample	Insufficient Water to sample
CFMW-025a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/13/2016	12/5/2016	3/24/2017	6/22/2017
CFMW-025b	Existing Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/7/2016	3/20/2017	6/22/2017
CFMW-026	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/5/2016	3/20/2017	6/22/2017
CFMW-027	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/14/2016	3/27/2017	6/26/2017
CFMW-028	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/5/2016	3/20/2017	6/26/2017
CFMW-028a	New Monitoring Well	Upper Hydrogeologic Unit	9/20/2016	12/9/2016	3/21/2017	6/27/2017
CFMW-029	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/14/2016	3/24/2017	6/26/2017
CFMW-031	Existing Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/9/2016	3/21/2017	6/21/2017
CFMW-032	New Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/13/2016	3/27/2017	6/20/2017
CFMW-032a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/16/2016	12/16/2016	3/29/2017	6/27/2017
CFMW-033	New Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/6/2016	3/21/2017	6/19/2017
CFMW-034	New Monitoring Well	Upper Hydrogeologic Unit	9/14/2016	12/13/2016	3/21/2017	6/19/2017
CFMW-035	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/13/2016	3/21/2017	6/20/2017
CFMW-037	New Monitoring Well	Upper Hydrogeologic Unit	9/16/2016	12/8/2016	3/23/2017	6/20/2017
CFMW-038	New Monitoring Well	Upper Hydrogeologic Unit	9/14/2016	12/9/2016	3/24/2017	6/27/2017

Table 3. Summary of Groundwater Samples Collected During Rounds 1 through 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Location Type	Screen Type	Date Completed Round 1	Date Completed Round 2	Date Completed Round 3	Date Completed Round 4
CFMW-040	New Monitoring Well	Upper Hydrogeologic Unit	9/14/2016	12/13/2016	3/30/2017	6/20/2017
CFMW-042	New Monitoring Well	Upper Hydrogeologic Unit	9/14/2016	Insufficient Water to sample	Insufficient Water to sample	6/20/2017
CFMW-043	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/14/2016	3/20/2017	6/21/2017
CFMW-044	Existing Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/9/2016	3/28/2017	6/21/2017
CFMW-044a	New Monitoring Well	Upper Hydrogeologic Unit	9/19/2016	12/19/2016	3/21/2017	6/23/2017
CFMW-044b	Existing Monitoring Well	Below Upper Hydrogeologic Unit	9/19/2016	12/19/2016	3/24/2017	6/23/2017
CFMW-045	New Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/14/2016	3/23/2017	6/28/2017
CFMW-045a	New Monitoring Well	Upper Hydrogeologic Unit	9/19/2016	12/9/2016	3/24/2017	6/23/2017
CFMW-047	New Monitoring Well	Upper Hydrogeologic Unit	9/14/2016	12/15/2016	3/23/2017	6/21/2017
CFMW-049	Existing Monitoring Well	Upper Hydrogeologic Unit	9/21/2016	12/15/2016	3/23/2017	6/21/2017
CFMW-049a	New Monitoring Well	Upper Hydrogeologic Unit	9/16/2016	12/15/2016	3/23/2017	6/21/2017
CFMW-050	New Monitoring Well	Upper Hydrogeologic Unit	9/19/2016	12/15/2016	3/23/2017	6/21/2017
CFMW-053	Existing Monitoring Well	Upper Hydrogeologic Unit	9/14/2016	12/12/2016	Insufficient Water to sample	6/28/2017
CFMW-053a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/19/2016	12/19/2016	3/27/2017	6/28/2017
CFMW-054	New Monitoring Well	Upper Hydrogeologic Unit	9/14/2016	12/12/2016	3/22/2017	6/21/2017
CFMW-056	Existing Monitoring Well	Below Upper Hydrogeologic Unit	9/20/2016	12/13/2016	3/22/2017	6/22/2017
CFMW-056a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/20/2016	12/6/2016	3/30/2017	6/22/2017
CFMW-056b	New Monitoring Well	Upper Hydrogeologic Unit	9/13/2016	12/12/2016	3/21/2017	6/22/2017
CFMW-057	Existing Monitoring Well	Below Upper Hydrogeologic Unit	9/19/2016	12/5/2016	3/29/2017	6/28/2017
CFMW-057a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/19/2016	12/16/2016	3/22/2017	6/28/2017
CFMW-059	New Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/12/2016	3/23/2017	6/21/2017
CFMW-059a	New Monitoring Well	Below Upper Hydrogeologic Unit	9/19/2016	12/16/2016	3/29/2017	6/28/2017
CFMW-061	New Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/7/2016	3/23/2017	6/23/2017
CFMW-064	New Monitoring Well	Upper Hydrogeologic Unit	9/15/2016	12/7/2016	3/23/2017	6/23/2017

Table 4. Summary of Surface Water Samples Collected During Rounds 1 through 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Site Feature	Date Completed Round 1	Date Completed Round 2	Date Completed Round 3	Date Completed Round 4
CFSWP-001	Flathead River	9/16/2016	12/2/2016	4/4/2017	6/14/2017
CFSWP-002	Flathead River	9/16/2016	12/2/2016	4/4/2017	6/14/2017
CFSWP-003	Seep Area	9/9/2016	12/1/2016	3/16/2017	6/14/2017
CFSWP-004	Seep Area	9/9/2016	12/1/2016	3/16/2017	6/14/2017
CFSWP-005	Seep Area	9/9/2016	12/1/2016	3/16/2017	6/14/2017
CFSWP-006	Flathead River	9/9/2016	12/1/2016	3/16/2017	6/14/2017
CFSWP-007	Flathead River	9/16/2016	12/2/2016	3/16/2017	6/14/2017
CFSWP-008	Flathead River	9/16/2016	12/2/2016	4/4/2017	6/14/2017
CFSWP-009	Cedar Creek Reservoir Overflow Ditch	6/7/2016	DRY	4/3/2017	6/12/2017
CFSWP-010	Cedar Creek Reservoir Overflow Ditch	6/7/2016	DRY	3/15/2017	6/12/2017
CFSWP-011	Cedar Creek Reservoir Overflow Ditch	6/7/2016	DRY	4/3/2017	6/12/2017
CFSWP-012	Cedar Creek Reservoir Overflow Ditch	6/7/2016	DRY	4/3/2017	6/12/2017
CFSWP-013	Cedar Creek Reservoir Overflow Ditch	6/7/2016	11/30/2016	3/15/2017	6/12/2017
CFSWP-014	Cedar Creek	8/29/2016	11/30/2016	3/13/2017	6/13/2017
CFSWP-015	Cedar Creek	8/29/2016	11/30/2016 and 12/20/2016	3/13/2017	6/13/2017
CFSWP-016	Cedar Creek	8/29/2016	11/30/2016	3/13/2017	6/12/2017
CFSWP-017	Flathead River	9/16/2016	12/2/2016	4/4/2017	6/14/2017
CFSWP-018	South Percolation Ponds	6/6/2016	12/1/2016	4/3/2017	6/15/2017
CFSWP-019	South Percolation Ponds	6/6/2016	12/1/2016	4/3/2017	6/15/2017
CFSWP-020	South Percolation Ponds	6/6/2016	12/1/2016	3/16/2017	6/15/2017
CFSWP-021	Northern SW Area	6/6/2016	11/30/2016	3/15/2017	6/15/2017
CFSWP-022	Northern SW Area	6/6/2016	DRY	4/3/2017	DRY
CFSWP-023	Northwest Percolation Pond	DRY	DRY	4/3/2017	DRY
CFSWP-024	Northeast Percolation Pond	DRY	DRY	DRY	6/15/2017
CFSWP-025	Cedar Creek	NA	12/20/2016	3/13/2017	6/13/2017

Table 5. Summary of Field Parameters Measured during Groundwater Sampling
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Temperature				Conductivity				DO				pH				ORP				Turbidity			
	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
CFMW-001	12.28	6.62	8.47	11.3	0.347	0.431	0.361	0.411	0	1.08	0.64	0.38	6.67	6.81	7.67	8.04	-31	5	-156	-53	508	928	411.00	106
CFMW-002	8.45	DRY	7.48	11.06	0.909	DRY	1.07	0.377	1.96	DRY	11.63	0	8.1	DRY	7.72	7.94	319	DRY	331	335	20.5	DRY	15.3	38
CFMW-003	8.37	7.94	8.69	11.28	2.62	2.56	2.63	2.54	0.97	0.51	1.01	0	7.36	7.09	6.94	6.83	350	98	152	155	184	987	55.6	79.6
CFMW-003a	9.77	7.99	8.78	11.9	0.281	0.312	0.244	0.29	1.59	0.85	0.59	0.47	9.1	8.58	8.94	8.92	-514	-132	-223	-168	1000	30.2	0	149
CFMW-007	8.24	5.67	6.47	9.73	0.362	0.435	0.417	0.394	2.33	0.64	0.29	0.44	8.46	7.41	8.03	8.41	330	-78	-134	-105	99.6	198	155.00	52
CFMW-008	10.16	6.99	5.88	10.37	0.63	0.832	0.802	0.727	1.23	1.98	2.07	0.88	9.32	7.15	7.06	5.91	181	-216	-214	38	183	36.9	207	339
CFMW-008a	9.82	5.52	7.1	12.22	4.9	5.73	6.08	5.61	4.25	3.15	1.7	0	14	13.14	12.73	12.59	-360	-285	-258	-153	46	15.7	2.84	0
CFMW-010	9.97	8.12	7.7	9.94	2.01	1.06	0.964	0.658	1	3.18	4.79	0	9	9.25	8.38	8.29	252	225	294	315	393	899	16.2	123
CFMW-011	8.5	5.86	7.1	9.06	0.385	0.451	0.509	0.387	12.83	9.98	8.31	0.53	7.28	7.7	7.6	7.55	299	279	347	307	299	0	0	0
CFMW-011a	8.9	6.04	7.43	9	0.271	0.392	0.362	0.383	1.31	1.21	0.69	0.55	10.18	7.67	7.97	7.46	-599	-53	-151	-70	514	584	259	114
CFMW-012	8.58	6.56	7.13	9.33	1.05	1.14	1.3	3.86	4.31	11.33	6.75	0	9.04	9.2	8.06	9.56	223	269	341	184	1.07	0	0	0
CFMW-012a	8.23	6.22	5.73	8.96	0.378	0.398	0.374	0.395	0	1.57	1.5	1.1	7.13	7.49	7.06	7.57	-53	-48	-10	-10	67.7	64.1	NA	73
CFMW-014	8.99	7.63	7.36	13	1.04	1.38	1.25	0.456	0	1.67	8.01	0.37	7.33	7.7	7.36	7.91	296	336	374	343	0	0	0	0
CFMW-015	11.24	7.71	7.34	10.5	2.56	1.76	2.63	3.25	0	0.87	1.52	0	9.47	9.83	9.29	9.63	102	111	202	162	6.26	0	0	0
CFMW-016	DRY	DRY	7.82	10.87	DRY	DRY	0.385	0.344	DRY	DRY	10.02	9.31	DRY	DRY	7.13	7.81	DRY	DRY	209	189	DRY	DRY	0	138
CFMW-016a	9.04	6.47	8.2	9.69	0.371	0.319	0.44	0.318	0	8.86	9.5	8.08	11.39	8.84	7.34	11.53	-67	103	183	19	41.4	30.7	18.7	81.2
CFMW-017	DRY	DRY	7.99	10.59	DRY	DRY	0.892	0.357	DRY	DRY	7.92	7.47	DRY	DRY	8.52	8.12	DRY	DRY	292	305	DRY	DRY	6.72	0
CFMW-018	DRY	DRY	7.64	10.95	DRY	DRY	0.396	0.448	DRY	DRY	10.93	9.87	DRY	DRY	7.46	7.47	DRY	DRY	275	282	DRY	DRY	35.70	109
CFMW-019	10.62	7.09	7.37	10.19	0.839	0.962	1.18	1.05	3.37	1.2	2.99	2.45	7.69	7.86	7.27	7.42	306	251	347	357	10.9	34	0	36.4
CFMW-019a	11.79	7.25	7.51	10.59	0.374	0.342	0.317	0.346	1.23	1.97	0.41	0.72	10.24	8.38	8.62	7.96	-624	-137	-244	-116	1000	301	794	88.7
CFMW-020	11.5	7.73	7.94	9.66	0.408	0.491	0.528	0.365	4.79	9.82	9.50	8.62	7.22	7.54	7.14	7.81	115	123	69	175	0	0	21.70	0
CFMW-021	9.09	9.6	7.84	10.94	0.631	0.927	1.17	0	6.71	4.49	5.68	0.481	7.11	7.84	7.69	7.64	256	302	326	309	4.7	0	0.00	18.1
CFMW-022	11.64	5.16	8.09	10.5	0.394	0.514	0.498	0.338	3.6	10.65	9.63	3.53	7.61	7.24	7.48	7.56	287	310	316	278	48.7	0	0	0
CFMW-023	10.38	7.26	7.6	9.08	0.449	0.385	0.458	0.396	6.29	9.38	9.64	10.57	7.59	6.72	7.35	7.31	140	119	77	250	8.24	0	23.10	0
CFMW-025	DRY	DRY	DESTROYED	DRY	DRY	DRY	DESTROYED	DRY	DRY	DRY	DESTROYED	DRY	DRY	DRY	DESTROYED	DRY	DRY	DRY	DESTROYED	DRY	DRY	DRY	DESTROYED	DRY
CFMW-025a	9.13	8.15	8.45	13.17	0.386	1.15	0.385	0.393	1.13	4.25	1.22	0	7.92	6.16	7.71	7.62	-80	-153	-183	-93	0	NA	99.30	773
CFMW-025b	9.52	10.1	8.55	10.89	0.43	0.402	0.431	0.401	0.99	4.98	2.11	0	8.3	7.77	7.72	7.95	-89	73	-55	-188	39.4	NA	29.40	43.5
CFMW-026	9.26	7.03	8.49	10.28	0.468	0.523	0.425	0.433	5.54	10.03	9.96	0	7.94	7.64	7.49	7.43	155	135	142	91	0	36.8	1.3	1.52
CFMW-027	8.9	5.55	7.5	15.06	0.612	0.626	0.674	0.562	2.34	7.08	8.96	0	7.7	7.78	7.03	7.64	291	315	383	332	89.6	312	0	0
CFMW-028	8.7	6.33	7.72	12.28	0.427	0.496	0.434	0.45	0	3.07	6.91	0	7.93	7.96	7.65	7.56	225	285	295	329	4.76	63.7	22.10	352
CFMW-028a	9.3	5.71	7.99	9.67	0.203	0.464	0.245	0.248	0	1.22	0.44	0.35	9.02	11.72	10.54	10.07	-399	-162	-92	-68	0	167	374	106
CFMW-029	8.34	8.2	8.06	12.17	0.496	0.476	0.545	0.383	10.88	8.71	9.11	1.92	7.38	7.66	7.39	7.71	276	289	303	298	0	0	3.13	0
CFMW-031	8.4	7.03	8.36	11.17	0.482	0.595	0.576	0.39	8.22	6.11	6.71	0	8.12	7.67	7.52	7.07	332	318	312	331	0	0	0.07	0
CFMW-032	8.43	7.18	8.28	10.5	0.965	1.22	1.13	1.08	4.33	3.71	6.05	0	7.77	6.8	7.13	6.74	353	290	322	327	0	0	7.27	71.5
CFMW-032a	12.17	5.73	7.61	12.24	6.4	3.91	6.44	5.15	2.51	2.51	0.09	0.73	14	12.74	13.11	12.63	-532	-89	-264	-146	0	80.1	23.90	0
CFMW-033	8.54	4.48	7.35	9.06	0.565	0.599	0.58	0.473	7.54	6.84	6.99	0	8.08	4.49	7.57	7.43	336	332	332	338	0	0	0	0
CFMW-034	8.53	7.83	9.46	11.89	0.509	0.676	0.645	0.498	34.64	2.88	6.17	0	7.2	7.32	7.19	7.27	267	270	243	338	0	0	0	337
CFMW-035	9.34	8.38	8.11	16.33	0.7	0.745	0.738	0.757	1.24	1.08	3.12	0	7.1	7.44	7.44	6.8	-204	-172	-185	-61	0	220	27.8	273
CFMW-037	13.44	7.76	8.46	10.67	0.376	0.401	0.413	0.431	7.64	8.16	4.93	10.84	8.25	7.74	7.66	7.83	261	245	239	310	97	0	39.6	7.82
CFMW-038	12.62	8.15	8.84	10.7	0.579	0.568	0.571	0.576	5.21	6.46	4.5	7.66	8.18	6.44	7.26	7.63	198	310	306	335	0	0	0	0
CFMW-040	10.29	7.81	9.05	12.67	0.558	0.522	0.519	0.574	6.89	7.08	7.19	3.44	7.47	7.61	6.99	7.22	329	255	304	362	0	0	27.8	0
CFMW-042	9.93	DRY	DRY	10.78	0.543	DRY	DRY	0.587	13.84	DRY	DRY	0	7.41	DRY	DRY	7.09	252	DRY	DRY	374	0	DRY	DRY	67.5
CFMW-043	9.34	5.98	8.02	10.94	0.561	0.562	0.535	0.619	7.76	10.96	6.8	2.48	7.33	7.65	7.48	7.02	325	253	291	350	0	102	19.6	49.6
CFMW-044	8.87	7.01	7.7	10.44	0.566	0.664	0.604	0.739	5.06	2.5	4.29	0	8.09	7.49	7.37	7.57	54	-128	-44	-196	0	0	0	13.5
CFMW-044a	9.5	7.75	8.64	9.31	2.01	0.312	0.382	0.428	0	0.94	0.42	0.55	12.25	9.1	9.18	8.5	-199	-95	37	105	0	4.17	NA	63.5
CFMW-044b	10.76	6.1	8.09	13.05	0.255	0.305	0.386	0.406	2.78	1.82	0.43	0.47	8.26	7.54	8.41	8.56	-340	-282	-275	-189	7.16	0	23.70	31.3
CFMW-045	14.01	8.39	7.37	10.94	0.552	0.595	0.559	0.569	6.74	8.04	7.58	0.84	7.49	7.58	7.01	7.36	322	309	279	322	0	58.9	22.3	0
CFMW-045a	11.08	7.42	8.42	11.2	0.394	0.25	0.484	0.543	0.85	9.24	0.12	0.38	9.85	9.63	7.99	8.1	56	63	-166	-122	25.3	37	14.80	0
CFMW-047	17.01	8.56	9.05	11.34	0.308	0.532	0.53	0.484	5.57	7.76	3.51	9.23	10.86	7.81	7.44	7.91	-20	305	276	327	0	0	62.1	3.72
CFMW-049	9.76	8.41	8.12	10.28	0.399	0.415	0.407	0.441	5.98	10.31	7.37	8.89	7.37	7.73	7.16	8.05	236	280	263	307	0	0	0.00	0.91
CFMW-049a	13.57	8.18	7.67	10.41	2.63	0.302	5.48	1.05	4.95	8.83	0.55	7.27	12.46	10.49	12.84	12.08	-178	212	-131	18	6.85	126	13.60	93.4
CFMW-050	9.44	7.97	8.39	10.74	0.392	0.415	0.408	0.459	6.87	10.3	7.59	9.79	8.18	7.79	7.5	8.07	247	252	228	289	0	25.2	9.23	16.9

Table 5. Summary of Field Parameters Measured during Groundwater Sampling
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Temperature				Conductivity				DO				pH				ORP				Turbidity			
	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
CFMW-053	11.06	6.06	DRY	9.83	0.536	0.577	DRY	0.516	6.92	8.94	DRY	0	7.55	7.64	DRY	7.49	259	297	DRY	316	0	612	DRY	0
CFMW-053a	9.16	8.38	8.47	12.3	9.3	5.52	9.52	7.15	1.01	6.35	0.51	0.62	14	12.46	13.22	10.53	-255	-129	-173	41	0	0.17	1.96	0
CFMW-054	12.91	8.79	8.6	12.44	0.534	0.558	0.582	0.521	13.02	8.51	7.24	3.53	7.51	7.67	7.49	7.46	259	303	327	293	0	0	0	0
CFMW-056	8.49	7.28	7.86	9.72	0.379	0.12	0.4	0.399	0	0.52	2.44	1.43	7.21	9.57	7.87	8.3	-211	-174	-214	-169	27	0	197.00	36.1
CFMW-056a	7.62	5.76	7.19	11.14	0.298	0.298	0.343	0.315	0	1.7	1.54	0.42	8.11	9.63	8.15	9.68	-390	-460	-318	-264	452	409	36.50	165
CFMW-056b	8.7	7.18	7.6	9.5	0.495	0.47	0.436	0.521	7.65	8.89	9.15	1.82	7.98	7.52	7.4	7.32	275	205	236	150	0	0	1.80	26.1
CFMW-057	13.48	5.34	6.82	8.47	0.212	0.26	0.298	0.394	4.71	3.32	2.68	2.02	8.01	8.36	8.21	7.97	-329	-235	-304	-184	9.16	14.1	39.50	43.1
CFMW-057a	12.31	4.77	6.79	11.76	8.32	2.89	2.95	1.52	0	6.03	1.90	2.63	12.8	12.91	12.24	12.57	-289	-146	-210	-96	6.85	45	57.70	3.86
CFMW-059	9.67	7.01	8	13.78	0.563	0.558	0.593	0.534	16.9	10.14	9.31	4.1	7.48	7.08	7.24	7.31	78	235	240	130	0	0	20.60	87.5
CFMW-059a	10.32	7.38	7.62	10.62	5.01	0.258	0.251	0.252	1.94	0.52	0.00	0.3	14	8.86	9.32	9.38	-595	-159	-287	-125	0	58.1	73.10	67.8
CFMW-061	13.91	10.59	9.6	11.06	0.4	0.526	0.398	0.413	0.2	0.3	3.18	0	7.6	7.21	7.54	7.39	-91	65	230	179	0	23.2	13.60	0
CFMW-064	10.21	8.05	7.02	12.28	0.406	0.434	0.399	0.431	0	4.72	3.71	0	7.66	7.8	7.54	7.5	236	223	273	295	0	370	142.00	649

Table 6. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	190	ug/l	26,700	1,570,000	330,604	255,500	245,834	146,550	824,150	190	100.00	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WG	T	189	ug/l	<72	34,100	920.2709	ND	4,447	ND	977.2	55	29.10	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WG	T	190	ug/l	<30	91,000	4,183	2,130	9,048	592.3	9,473	188	98.95	-	-	-	-	-	-	-	-	-
GENCHEM	Fluoride	WG	DI	50	ug/l	<60	55,300	3,575	1,420	8,798	122.7	7,761	49	98.00	8	16	4000	8	16	4000	49	98	80
GENCHEM	Fluoride	WG	T	190	ug/l	<60	52,900	3,045	1,630	6,221	121.35	12,820	186	97.89	26	14	4000	26	14	4000	184	97	80
GENCHEM	Hardness as calcium carbonate	WG	T	190	ug/l	28,000	1,240,000	241,868	211,000	175,305	88,100	582,400	190	100.00	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WG	T	189	ug/l	<100	62,800	4,363	1,300	9,420	ND	24,960	164	86.77	17	9	10000	17	9	10000	-	-	-
GENCHEM	Orthophosphate as P	WG	T	174	ug/l	<48	325.0	ND	ND	ND	ND	ND	2	1.15	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WG	T	190	ug/l	2,420	961,000	37,300	13,900	116,449	3,315	91,580	190	100.00	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WG	T	190	mg/l	63.0	2,440	424.2368	303.5	401.0619	168.25	1,328	190	100.00	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WG	T	190	mg/l	<1	782.0	42.9663	9.55	93.8228	n.d.	177.1	179	94.21	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WG	T	50	ug/l	<18.2	6,950	275.714	38.7	1,000	ND	929.55	34	68.00	-	-	-	-	-	-	1	2	2000
METALS	Aluminum	WG	DI	190	ug/l	<18.2	1,850	ND	ND	ND	ND	102.77	24	12.63	-	-	-	-	-	-	0	0	2000
METALS	Antimony	WG	T	50	ug/l	<0.62	4.4	ND	ND	ND	ND	1.047	5	10.00	0	0	6	0	0	6	5	10	0.78
METALS	Antimony	WG	DI	190	ug/l	<0.62	2.6	ND	ND	ND	ND	ND	5	2.63	0	0	6	0	0	6	3	2	0.78
METALS	Arsenic	WG	T	50	ug/l	<0.64	80.2	4.1628	ND	15.5924	ND	11.85	14	28.00	4	8	10	4	8	10	50	100	0.052
METALS	Arsenic	WG	DI	190	ug/l	<0.64	92.6	2.684	ND	11.062	ND	9.455	43	22.63	9	5	10	9	5	10	190	100	0.052
METALS	Barium	WG	DI	190	ug/l	18.7	1,010	212.6547	173.0	158.781	35.86	518.2	190	100.00	1	1	1000	0	0	2000	14	7	380
METALS	Barium	WG	T	50	ug/l	26.0	953.0	209.61	171.0	158.3607	63.85	444.7	50	100.00	0	0	1000	0	0	2000	3	6	380
METALS	Beryllium	WG	T	50	ug/l	<0.24	0.4	ND	ND	ND	ND	ND	1	2.00	0	0	4	0	0	4	0	0	2.5
METALS	Beryllium	WG	DI	190	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	4	0	0	2.5
METALS	Cadmium	WG	DI	190	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.92
METALS	Cadmium	WG	T	50	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.92
METALS	Calcium	WG	DI	190	ug/l	1,410	431,000	61,677	52,550	60,266	13,370	160,500	190	100.00	-	-	-	-	-	-	-	-	-
METALS	Calcium	WG	T	50	ug/l	3,730	407,000	59,476	49,900	57,407	26,725	105,385	50	100.00	-	-	-	-	-	-	-	-	-
METALS	Chromium	WG	T	50	ug/l	<1.3	8.2	1.06	ND	1.2522	ND	3.11	8	16.00	0	0	100	0	0	100	50	100	0.035
METALS	Chromium	WG	DI	190	ug/l	<1.3	7.3	ND	ND	ND	ND	2.11	19	10.00	0	0	100	0	0	100	190	100	0.035
METALS	Cobalt	WG	T	50	ug/l	<1.3	39.5	2.46	ND	6.6833	ND	5.93	16	32.00	-	-	-	-	-	-	50	100	0.6
METALS	Cobalt	WG	DI	190	ug/l	<1.3	37.5	1.9617	ND	4.591	ND	7.065	46	24.21	-	-	-	-	-	-	189	99	0.6
METALS	Copper	WG	T	50	ug/l	<1.4	59.5	3.594	ND	9.1866	ND	15.77	21	42.00	0	0	1300	0	0	1300	0	0	80
METALS	Copper	WG	DI	190	ug/l	<1.4	50.9	2.8079	ND	6.4279	ND	8.025	75	39.47	0	0	1300	0	0	1300	0	0	80
METALS	Cyanide, Free	WG	DI	47	ug/l	<1.5	66.2	13.0085	3.9	18.3704	ND	47.42	31	65.96	0	0	200	0	0	200	47	100	0.15
METALS	Cyanide, Free	WG	T	88	ug/l	<1.5	306.0	21.096	4.5	42.3556	ND	106.205	55	62.50	1	1	200	1	1	200	88	100	0.15
METALS	Cyanide, Total	WG	T	190	ug/l	<2	8,120	503.7821	105.0	1,207	ND	2,313	159	83.68	78	41	200	78	41	200	190	100	0.15
METALS	Cyanide, Total	WG	DI	50	ug/l	<2	7,780	469.434	97.3	1,354	ND	1,192	37	74.00	17	34	200	17	34	200	50	100	0.15
METALS	Iron	WG	T	50	ug/l	<42.4	72,900	2,860	309.5	10,731	ND	11,700	44	88.00	-	-	-	-	-	-	9	18	1400
METALS	Iron	WG	DI	190	ug/l	<42.4	99,600	1,147	91.75	7,882	ND	1,558	112	58.95	-	-	-	-	-	-	11	6	1400
METALS	Lead	WG	T	50	ug/l	<0.38	14.0	ND	ND	ND	ND	1.575	6	12.00	0	0	15	0	0	15	0	0	15

Table 6. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WG	DI	190	ug/l	<0.38	2.8	ND	ND	ND	ND	0.2945	10	5.26	0	0	15	0	0	15	0	0	15
METALS	Magnesium	WG	T	50	ug/l	65.6	56,500	15,677	15,650	8,110	7,078	20,210	50	100.00	-	-	-	-	-	-	-	-	-
METALS	Magnesium	WG	DI	190	ug/l	<63.6	49,800	14,772	15,300	7,272	3,972	22,650	186	97.89	-	-	-	-	-	-	-	-	-
METALS	Manganese	WG	T	50	ug/l	<2.5	1,270	72.244	2.55	222.438	ND	395.3	26	52.00	-	-	-	-	-	-	9	18	43
METALS	Manganese	WG	DI	190	ug/l	<2.5	1,450	55.3611	ND	192.699	ND	210.1	81	42.63	-	-	-	-	-	-	36	19	43
METALS	Mercury	WG	DI	190	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	190	100	0.063
METALS	Mercury	WG	T	50	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	50	100	0.063
METALS	Nickel	WG	T	50	ug/l	<1.4	10.2	1.56	ND	2.384	ND	8.305	8	16.00	0	0	100	-	-	-	0	0	39
METALS	Nickel	WG	DI	190	ug/l	<1.4	9.0	ND	ND	ND	ND	2.91	19	10.00	0	0	100	-	-	-	0	0	39
METALS	Potassium	WG	DI	190	ug/l	318.0	23,200	1,733	958.5	3,172	580.8	3,337	190	100.00	-	-	-	-	-	-	-	-	-
METALS	Potassium	WG	T	50	ug/l	476.0	19,100	1,586	926.5	2,651	567.5	3,320	50	100.00	-	-	-	-	-	-	-	-	-
METALS	Selenium	WG	DI	190	ug/l	<0.73	17.1	ND	ND	ND	ND	3.905	28	14.74	0	0	50	0	0	50	2	1	10
METALS	Selenium	WG	T	50	ug/l	<0.73	13.0	ND	ND	ND	ND	4.5705	5	10.00	0	0	50	0	0	50	1	2	10
METALS	Silver	WG	DI	190	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	0	0	9.4
METALS	Silver	WG	T	50	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	0	0	9.4
METALS	Sodium	WG	T	50	ug/l	3,510	834,000	75,114	33,100	156,160	4,021	293,700	50	100.00	-	-	-	-	-	-	-	-	-
METALS	Sodium	WG	DI	190	ug/l	<69	707,000	65,950	31,050	114,159	4,136	269,800	189	99.47	-	-	-	-	-	-	-	-	-
METALS	Thallium	WG	DI	190	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	190	100	0.02
METALS	Thallium	WG	T	50	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	50	100	0.02
METALS	Vanadium	WG	T	50	ug/l	<1.9	457.0	18.292	ND	82.7295	ND	10.575	8	16.00	-	-	-	-	-	-	4	8	8.6
METALS	Vanadium	WG	DI	190	ug/l	<1.9	397.0	ND	ND	ND	ND	12.06	23	12.11	-	-	-	-	-	-	12	6	8.6
METALS	Zinc	WG	T	50	ug/l	<7	3,990	86.306	ND	563.3914	ND	24.72	10	20.00	1	2	2000	-	-	-	1	2	600
METALS	Zinc	WG	DI	190	ug/l	<7	1,220	ND	ND	ND	ND	8.49	12	6.32	0	0	2000	-	-	-	1	1	600
SVOC	1,1'-Biphenyl	WG	T	154	ug/l	<0.63	<0.66	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	154	100	0.083
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	154	ug/l	<0.43	<0.45	ND	ND	ND	ND	ND	0	0.00	0	0	0.97	-	-	-	154	100	0.17
SVOC	1,4-Dioxane	WG	T	154	ug/l	<3.1	<3.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	154	100	0.46
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	154	ug/l	<0.93	<0.97	ND	ND	ND	ND	ND	0	0.00	0	0	1400	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	154	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	24
SVOC	2,4,5-Trichlorophenol	WG	T	154	ug/l	<0.49	<0.51	ND	ND	ND	ND	ND	0	0.00	0	0	1800	-	-	-	0	0	120
SVOC	2,4,6-Trichlorophenol	WG	T	154	ug/l	<0.53	<0.55	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	1.2
SVOC	2,4-Dichlorophenol	WG	T	154	ug/l	<0.63	<0.66	ND	ND	ND	ND	ND	0	0.00	0	0	77	-	-	-	0	0	4.6
SVOC	2,4-Dimethylphenol	WG	T	154	ug/l	<0.91	<0.95	ND	ND	ND	ND	ND	0	0.00	0	0	380	-	-	-	0	0	36
SVOC	2,4-Dinitrophenol	WG	T	154	ug/l	<2.4	<2.5	ND	ND	ND	ND	ND	0	0.00	0	0	69	-	-	-	0	0	3.9
SVOC	2,4-Dinitrotoluene	WG	T	154	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	0	0	1.1	-	-	-	154	100	0.24
SVOC	2,6-Dinitrotoluene	WG	T	154	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	154	100	0.049
SVOC	2-Chloronaphthalene	WG	T	154	ug/l	<0.61	<0.64	ND	ND	ND	ND	ND	0	0.00	0	0	1000	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	154	ug/l	<0.74	<0.77	ND	ND	ND	ND	ND	0	0.00	0	0	81	-	-	-	0	0	9.1
SVOC	2-Methylnaphthalene	WG	T	154	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.6

Table 6. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2-Methylphenol	WG	T	154	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	154	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	19
SVOC	2-Nitrophenol	WG	T	154	ug/l	<0.59	<0.62	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	154	ug/l	<0.88	42.0	ND	ND	ND	ND	ND	2	1.30	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	154	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	154	100	0.21	-	-	-	154	100	0.13
SVOC	3-Nitroaniline	WG	T	154	ug/l	<0.82	<0.86	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	154	ug/l	<2	2.2	ND	ND	ND	ND	ND	1	0.65	0	0	13	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	154	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	154	ug/l	<0.76	<0.79	ND	ND	ND	ND	ND	0	0.00	0	0	3000	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	154	ug/l	<0.73	<0.76	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	34	22	0.37
SVOC	4-Chlorophenyl phenyl ether	WG	T	154	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	154	ug/l	<0.48	<0.5	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.8
SVOC	4-Nitrophenol	WG	T	154	ug/l	<4.7	<4.9	ND	ND	ND	ND	ND	0	0.00	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	154	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0.00	0	0	670	-	-	-	0	0	53
SVOC	Acenaphthylene	WG	T	154	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	154	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	190
SVOC	Anthracene	WG	T	154	ug/l	<0.57	<0.6	ND	ND	ND	ND	ND	0	0.00	0	0	2100	-	-	-	0	0	180
SVOC	Atrazine	WG	T	154	ug/l	<0.77	<0.81	ND	ND	ND	ND	ND	0	0.00	0	0	3	0	0	3	154	100	0.3
SVOC	Benzaldehyde	WG	T	154	ug/l	<0.86	<0.9	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	190
SVOC	Benzo[a]anthracene	WG	T	154	ug/l	<0.55	<0.58	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	154	ug/l	<0.16	<0.17	ND	ND	ND	ND	ND	0	0.00	154	100	0.05	0	0	0.2	154	100	0.003
SVOC	Benzo[b]fluoranthene	WG	T	154	ug/l	<0.44	<0.46	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	154	100	0.034
SVOC	Benzo[g,h,i]perylene	WG	T	154	ug/l	<0.75	<0.78	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	154	ug/l	<0.18	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	0	0	0.34
SVOC	Bis(2-chloroethoxy)methane	WG	T	154	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	5.9
SVOC	Bis(2-chloroethyl)ether	WG	T	154	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0.00	0	0	0.3	-	-	-	154	100	0.014
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	154	ug/l	<0.72	2.4	ND	ND	ND	ND	ND	6	3.90	0	0	6	0	0	6	0	0	5.6
SVOC	Butyl benzyl phthalate	WG	T	154	ug/l	<0.6	<0.63	ND	ND	ND	ND	ND	0	0.00	0	0	1500	-	-	-	0	0	16
SVOC	Caprolactam	WG	T	154	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	990
SVOC	Carbazole	WG	T	154	ug/l	<0.85	<0.89	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	154	ug/l	<0.67	<0.7	ND	ND	ND	ND	ND	0	0.00	0	0	50	-	-	-	0	0	3.4
SVOC	Dibenz(a,h)anthracene	WG	T	154	ug/l	<0.09	<0.094	ND	ND	ND	ND	ND	0	0.00	0	0	0.05	-	-	-	154	100	0.003
SVOC	Dibenzofuran	WG	T	154	ug/l	<0.85	<0.89	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	0.79
SVOC	Diethyl phthalate	WG	T	154	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	0	0	17000	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	154	ug/l	<0.98	<1	ND	ND	ND	ND	ND	0	0.00	0	0	270000	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	154	ug/l	<0.82	1.3	ND	ND	ND	ND	ND	3	1.95	0	0	2000	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	154	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	20
SVOC	Fluoranthene	WG	T	154	ug/l	<0.72	<0.75	ND	ND	ND	ND	ND	0	0.00	0	0	130	-	-	-	0	0	80

Table 6. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Fluorene	WG	T	154	ug/l	<0.8	<0.84	ND	ND	ND	ND	ND	0	0.00	0	0	1100	-	-	-	0	0	29
SVOC	Hexachlorobenzene	WG	T	154	ug/l	<0.47	<0.49	ND	ND	ND	ND	ND	0	0.00	154	100	0.2	0	0	1	154	100	0.01
SVOC	Hexachlorobutadiene	WG	T	154	ug/l	<0.76	<0.79	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	154	100	0.14
SVOC	Hexachlorocyclopentadiene	WG	T	154	ug/l	<0.61	<0.64	ND	ND	ND	ND	ND	0	0.00	0	0	50	0	0	50	154	100	0.041
SVOC	Hexachloroethane	WG	T	154	ug/l	<0.09	<0.094	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	0.33
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	154	ug/l	<0.21	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	154	100	0.034
SVOC	Isophorone	WG	T	154	ug/l	<0.67	<0.7	ND	ND	ND	ND	ND	0	0.00	0	0	400	-	-	-	0	0	78
SVOC	Naphthalene	WG	T	154	ug/l	<0.8	<0.84	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	154	100	0.17
SVOC	Nitrobenzene	WG	T	154	ug/l	<0.49	<0.51	ND	ND	ND	ND	ND	0	0.00	0	0	17	-	-	-	154	100	0.14
SVOC	N-Nitrosodi-n-propylamine	WG	T	154	ug/l	<0.83	<0.87	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	154	100	0.011
SVOC	N-Nitrosodiphenylamine	WG	T	154	ug/l	<0.74	<0.77	ND	ND	ND	ND	ND	0	0.00	0	0	33	-	-	-	0	0	12
SVOC	Pentachlorophenol	WG	T	153	ug/l	<2.2	<2.3	ND	ND	ND	ND	ND	0	0.00	153	100	1	153	100	1	153	100	0.041
SVOC	Phenanthrene	WG	T	154	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	154	ug/l	<0.41	3.9	ND	ND	ND	ND	ND	2	1.30	0	0	300	-	-	-	0	0	580
SVOC	Pyrene	WG	T	154	ug/l	<0.83	<0.87	ND	ND	ND	ND	ND	0	0.00	0	0	830	-	-	-	0	0	12
VOC	1,1,1-Trichloroethane	WG	T	154	ug/l	<0.28	3.8	ND	ND	ND	ND	ND	4	2.60	0	0	200	0	0	200	0	0	800
VOC	1,1,2,2-Tetrachloroethane	WG	T	154	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	2	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	154	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	5500
VOC	1,1,2-Trichloroethane	WG	T	154	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0.00	0	0	3	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	154	ug/l	<0.24	0.95	ND	ND	ND	ND	ND	4	2.60	0	0	4	-	-	-	0	0	2.8
VOC	1,1-Dichloroethene	WG	T	154	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0.00	0	0	7	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	154	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0.00	0	0	0.7	-	-	-	0	0	0.7
VOC	1,2,4-Trichlorobenzene	WG	T	154	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0.00	0	0	70	-	-	-	0	0	0.4
VOC	1,2-Dibromo-3-Chloropropane	WG	T	154	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0.00	0	0	0.2	0	0	0.2	154	100	3E-04
VOC	1,2-Dichlorobenzene	WG	T	154	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	600	0	0	600	0	0	30
VOC	1,2-Dichloroethane	WG	T	154	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	5	0	0	0.17
VOC	1,2-Dichloropropane	WG	T	154	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.44
VOC	1,3-Dichlorobenzene	WG	T	154	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	600	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	154	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	75	0	0	75	0	0	0.48
VOC	2-Butanone (MEK)	WG	T	154	ug/l	<2.2	2.3	ND	ND	ND	ND	ND	1	0.65	-	-	-	-	-	-	0	0	560
VOC	2-Hexanone	WG	T	154	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.8
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	154	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	630
VOC	Acetone	WG	T	154	ug/l	<1.1	13.0	ND	ND	ND	ND	3.2	12	7.79	-	-	-	-	-	-	0	0	1400
VOC	Benzene	WG	T	154	ug/l	<0.09	0.17	ND	ND	ND	ND	ND	4	2.60	0	0	5	0	0	5	0	0	0.46
VOC	Bromoform	WG	T	154	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	80	0	0	80	0	0	3.3
VOC	Bromomethane	WG	T	154	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	10	-	-	-	0	0	0.75
VOC	Carbon disulfide	WG	T	154	ug/l	<0.22	3.0	ND	ND	ND	ND	ND	2	1.30	-	-	-	-	-	-	0	0	81
VOC	Carbon tetrachloride	WG	T	154	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	3	0	0	5	0	0	0.46

Table 6. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Chlorobenzene	WG	T	154	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	100	0	0	100	0	0	7.8
VOC	Chlorobromomethane	WG	T	154	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	8.3
VOC	Chlorodibromomethane	WG	T	154	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	80	0	0	0.87
VOC	Chloroethane	WG	T	154	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	2100
VOC	Chloroform	WG	T	154	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	70	0	0	80	0	0	0.22
VOC	Chloromethane	WG	T	154	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	19
VOC	cis-1,2-Dichloroethene	WG	T	154	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	70	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	154	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0.00	0	0	4	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	154	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	1300
VOC	Dichlorobromomethane	WG	T	154	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0.00	0	0	10	0	0	80	0	0	0.13
VOC	Dichlorodifluoromethane	WG	T	154	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0.00	0	0	1000	-	-	-	0	0	20
VOC	Ethylbenzene	WG	T	154	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0.00	0	0	700	0	0	700	0	0	1.5
VOC	Ethylene Dibromide	WG	T	154	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	154	100	0.004	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	154	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	154	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	2000
VOC	Methyl tert-butyl ether	WG	T	154	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	14
VOC	Methylcyclohexane	WG	T	154	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	154	ug/l	<0.21	1.8	ND	ND	ND	ND	ND	5	3.25	0	0	5	0	0	5	0	0	11
VOC	m-Xylene & p-Xylene	WG	T	154	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	154	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0.00	0	0	10000	-	-	-	0	0	19
VOC	Styrene	WG	T	154	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	100	0	0	100	0	0	120
VOC	Tetrachloroethene	WG	T	154	ug/l	<0.12	0.69	ND	ND	ND	ND	0.2705	15	9.74	0	0	5	-	-	-	-	-	-
VOC	Toluene	WG	T	154	ug/l	<0.25	2.2	ND	ND	ND	ND	ND	5	3.25	0	0	1000	0	0	1000	0	0	110
VOC	trans-1,2-Dichloroethene	WG	T	154	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	154	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	2	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	154	ug/l	<0.22	0.76	ND	ND	ND	ND	ND	4	2.60	0	0	5	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WG	T	154	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0.00	0	0	10000	-	-	-	0	0	520
VOC	Vinyl chloride	WG	T	154	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0.00	0	0	0.2	0	0	2	154	100	0.019

Table 7. Round 1 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	47	ug/l	46,000	1,190,000	322,619	254,000	219,541	193,200	811,700	47	100	-	-	-	-	-	-	-	-	-	42	89	200000
GENCHEM	Ammonia	WG	T	47	ug/l	<72	23,600	605.4489	ND	3,433	ND	568.4	15	32	-	-	-	-	-	-	-	-	-	15	32	72
GENCHEM	Chloride	WG	T	47	ug/l	<30	39,100	4,489	2,600	7,004	768.3	14,359	46	98	-	-	-	-	-	-	-	-	-	45	96	611
GENCHEM	Fluoride	WG	T	47	ug/l	<15	38,400	3,685	1,920	7,426	81.41	16,950	46	98	7	15	4000	7	15	4000	44	94	80	43	91	91.7
GENCHEM	Hardness as calcium carbonate	WG	T	47	ug/l	28,000	1,000,000	222,894	206,000	150,765	67,200	386,400	47	100	-	-	-	-	-	-	-	-	-	23	49	206000
GENCHEM	Nitrate Nitrite as N	WG	T	47	ug/l	<100	46,200	4,309	1,520	9,289	ND	17,620	40	85	5	11	10000	5	11	10000	-	-	-	40	85	100
GENCHEM	Orthophosphate as P	WG	T	47	ug/l	<42	267.0	ND	ND	ND	ND	ND	1	2.1	-	-	-	-	-	-	-	-	-	1	2	42
GENCHEM	Sulfate	WG	T	47	ug/l	3,320	694,000	35,818	18,300	100,101	4,581	80,080	47	100	-	-	-	-	-	-	-	-	-	37	79	6600
GENCHEM	Total Dissolved Solids	WG	T	47	mg/l	63.0	1,730	411.6809	307.0	359.5954	176.1	1,308	47	100	-	-	-	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WG	T	47	mg/l	<1	543.0	36.7872	5.6	89.1562	n.d.	130.0	43	91	-	-	-	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WG	DI	47	ug/l	<9.1	1,850	ND	ND	ND	ND	107.7	7	15	-	-	-	-	-	-	0	0	2000	7	15	18.2
METALS	Antimony	WG	DI	47	ug/l	<0.31	1.0	ND	ND	ND	ND	0.569	3	6.4	0	0	6	0	0	6	1	2	0.78	3	6	0.62
METALS	Arsenic	WG	DI	47	ug/l	<0.32	47.7	1.9732	ND	7.2341	ND	5.62	9	19	2	4	10	2	4	10	47	100	0.052	8	17	0.64
METALS	Barium	WG	DI	47	ug/l	28.6	701.0	198.0745	163.0	128.8237	65.66	464.8	47	100	0	0	1000	0	0	2000	3	6	380	16	34	228
METALS	Beryllium	WG	DI	47	ug/l	<0.12	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0	2.5	0	0	0.24
METALS	Cadmium	WG	DI	47	ug/l	<0.36	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Calcium	WG	DI	47	ug/l	2,710	388,000	62,820	51,600	60,370	9,722	171,100	47	100	-	-	-	-	-	-	-	-	-	10	21	60300
METALS	Chromium	WG	DI	47	ug/l	<0.66	4.2	ND	ND	ND	ND	3.12	6	13	0	0	100	0	0	100	47	100	0.035	6	13	1.3
METALS	Cobalt	WG	DI	47	ug/l	<0.65	27.8	2.2304	ND	5.2442	ND	7.36	13	28	-	-	-	-	-	-	46	98	0.6	8	17	1.3
METALS	Copper	WG	DI	47	ug/l	<1.4	46.8	3.9617	3.1	7.0429	ND	10.53	31	66	0	0	1300	0	0	1300	0	0	80	21	45	3.2
METALS	Cyanide, Total	WG	T	47	ug/l	<2	7,320	603.1085	104.0	1,443	ND	2,609	43	91	21	45	200	21	45	200	47	100	0.15	39	83	2.4
METALS	Iron	WG	DI	47	ug/l	<42.4	4,710	312.4404	55.1	785.1055	ND	1,090	26	55	-	-	-	-	-	-	2	4	1400	25	53	42.4
METALS	Lead	WG	DI	47	ug/l	<0.19	2.8	ND	ND	ND	ND	0.428	3	6.4	0	0	15	0	0	15	0	0	15	3	6	0.38
METALS	Magnesium	WG	DI	47	ug/l	<63.6	45,800	14,157	15,500	7,627	1,407	19,640	46	98	-	-	-	-	-	-	-	-	-	28	60	14100
METALS	Manganese	WG	DI	47	ug/l	<1.2	1,450	75.3681	3.1	228.8807	ND	348.0	25	53	-	-	-	-	-	-	12	26	43	24	51	2.5
METALS	Mercury	WG	DI	47	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	47	100	0.063	0	0	0.17
METALS	Nickel	WG	DI	47	ug/l	<0.68	7.7	ND	ND	ND	ND	2.55	5	11	0	0	100	-	-	-	0	0	39	4	9	1.4
METALS	Potassium	WG	DI	47	ug/l	318.0	19,700	2,018	1,000	3,674	585.3	3,939	47	100	-	-	-	-	-	-	-	-	-	40	85	740
METALS	Selenium	WG	DI	47	ug/l	<0.37	13.5	ND	ND	ND	ND	4.07	7	15	0	0	50	0	0	50	1	2	10	7	15	0.73
METALS	Silver	WG	DI	47	ug/l	<0.64	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Sodium	WG	DI	47	ug/l	3,050	620,000	69,978	31,100	118,972	4,894	293,200	47	100	-	-	-	-	-	-	-	-	-	41	87	8360
METALS	Thallium	WG	DI	47	ug/l	<0.13	<0.26	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	47	100	0.02	0	0	0.26
METALS	Vanadium	WG	DI	47	ug/l	<0.95	50.4	ND	ND	ND	ND	9.37	7	15	-	-	-	-	-	-	3	6	8.6	5	11	1.9
METALS	Zinc	WG	DI	47	ug/l	<3.5	27.8	ND	ND	ND	ND	10.3	4	8.5	0	0	2000	-	-	-	0	0	600	4	9	7
SVOC	1,1'-Biphenyl	WG	T	38	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	38	100	0.083	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	38	ug/l	<0.43	<0.47	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	38	100	0.17	-	-	-
SVOC	1,4-Dioxane	WG	T	38	ug/l	<3.1	<3.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	38	100	0.46	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	38	ug/l	<0.93	<1	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-	-	-	-

Table 7. Round 1 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	38	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	24	-	-	-
SVOC	2,4,5-Trichlorophenol	WG	T	38	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0	120	-	-	-
SVOC	2,4,6-Trichlorophenol	WG	T	38	ug/l	<0.53	<0.58	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	1.2	-	-	-
SVOC	2,4-Dichlorophenol	WG	T	38	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0	4.6	-	-	-
SVOC	2,4-Dimethylphenol	WG	T	38	ug/l	<0.91	<0.99	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0	36	-	-	-
SVOC	2,4-Dinitrophenol	WG	T	38	ug/l	<2.4	<2.6	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0	3.9	-	-	-
SVOC	2,4-Dinitrotoluene	WG	T	38	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	38	100	0.24	-	-	-
SVOC	2,6-Dinitrotoluene	WG	T	38	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	38	100	0.049	-	-	-
SVOC	2-Chloronaphthalene	WG	T	38	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	38	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0	9.1	-	-	-
SVOC	2-Fluorobiphenyl	WG	T	38	ug/l	55.0	82.0	68.6053	67.5	6.3991	57.85	79.3	38	100	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Methylnaphthalene	WG	T	38	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.6	-	-	-
SVOC	2-Methylphenol	WG	T	38	ug/l	<1.3	<1.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	38	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	19	-	-	-
SVOC	2-Nitrophenol	WG	T	38	ug/l	<0.59	<0.64	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	38	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	38	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	38	100	0.21	-	-	-	38	100	0.13	-	-	-
SVOC	3-Nitroaniline	WG	T	38	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	38	ug/l	<2	2.2	ND	ND	ND	ND	ND	1	2.6	0	0	13	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	38	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	38	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	38	ug/l	<0.73	<0.79	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	10	26	0.37	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WG	T	38	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	38	ug/l	<0.48	<0.52	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
SVOC	4-Nitrophenol	WG	T	38	ug/l	<4.7	<5.1	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	38	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0	53	-	-	-
SVOC	Acenaphthylene	WG	T	38	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	38	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Anthracene	WG	T	38	ug/l	<0.57	<0.62	ND	ND	ND	ND	ND	0	0	0	0	2100	-	-	-	0	0	180	-	-	-
SVOC	Atrazine	WG	T	38	ug/l	<0.77	<0.84	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	38	100	0.3	-	-	-
SVOC	Benzaldehyde	WG	T	38	ug/l	<0.86	<0.93	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Benzo[a]anthracene	WG	T	38	ug/l	<0.55	<0.6	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	38	ug/l	<0.16	<0.17	ND	ND	ND	ND	ND	0	0	38	100	0.05	0	0	0.2	38	100	0.0034	-	-	-
SVOC	Benzo[b]fluoranthene	WG	T	38	ug/l	<0.44	<0.48	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	38	100	0.034	-	-	-
SVOC	Benzo[g,h,i]perylene	WG	T	38	ug/l	<0.75	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	38	ug/l	<0.18	<0.2	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	0	0	0.34	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WG	T	38	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5.9	-	-	-
SVOC	Bis(2-chloroethyl)ether	WG	T	38	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	38	100	0.014	-	-	-

Table 7. Round 1 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	38	ug/l	<0.72	1.1	ND	ND	ND	ND	0.4965	2	5.3	0	0	6	0	0	6	0	0	5.6	-	-	-
SVOC	Butyl benzyl phthalate	WG	T	38	ug/l	<0.6	<0.65	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0	16	-	-	-
SVOC	Caprolactam	WG	T	38	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	990	-	-	-
SVOC	Carbazole	WG	T	38	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	38	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	-	-	-	0	0	3.4	-	-	-
SVOC	Dibenz(a,h)anthracene	WG	T	38	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	0	0	0.05	-	-	-	38	100	0.0034	-	-	-
SVOC	Dibenzofuran	WG	T	38	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.79	-	-	-
SVOC	Diethyl phthalate	WG	T	38	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	38	ug/l	<0.98	<1.1	ND	ND	ND	ND	ND	0	0	0	0	3E+05	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	38	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	38	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	20	-	-	-
SVOC	Fluoranthene	WG	T	38	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	0	0	80	-	-	-
SVOC	Fluorene	WG	T	38	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0	29	-	-	-
SVOC	Hexachlorobenzene	WG	T	38	ug/l	<0.47	<0.51	ND	ND	ND	ND	ND	0	0	38	100	0.2	0	0	1	38	100	0.0098	-	-	-
SVOC	Hexachlorobutadiene	WG	T	38	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	38	100	0.14	-	-	-
SVOC	Hexachlorocyclopentadiene	WG	T	38	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	38	100	0.041	-	-	-
SVOC	Hexachloroethane	WG	T	38	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	0.33	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	38	ug/l	<0.21	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	38	100	0.034	-	-	-
SVOC	Isophorone	WG	T	38	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	0	0	400	-	-	-	0	0	78	-	-	-
SVOC	Naphthalene	WG	T	38	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	38	100	0.17	-	-	-
SVOC	Nitrobenzene	WG	T	38	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	38	100	0.14	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WG	T	38	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	38	100	0.011	-	-	-
SVOC	N-Nitrosodiphenylamine	WG	T	38	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0	12	-	-	-
SVOC	Pentachlorophenol	WG	T	37	ug/l	<2.2	<2.4	ND	ND	ND	ND	ND	0	0	37	100	1	37	100	1	37	100	0.041	-	-	-
SVOC	Phenanthrene	WG	T	38	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	38	ug/l	<0.41	<0.45	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0	580	-	-	-
SVOC	Pyrene	WG	T	38	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	0	0	830	-	-	-	0	0	12	-	-	-
VOC	1,1,1-Trichloroethane	WG	T	38	ug/l	<0.28	3.8	ND	ND	ND	ND	ND	1	2.6	0	0	200	0	0	200	0	0	800	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WG	T	38	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	38	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5500	-	-	-
VOC	1,1,2-Trichloroethane	WG	T	38	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	38	ug/l	<0.24	0.71	ND	ND	ND	ND	ND	1	2.6	0	0	4	-	-	-	0	0	2.8	-	-	-
VOC	1,1-Dichloroethene	WG	T	38	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	38	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	0	0	0.7	-	-	-
VOC	1,2,4-Trichlorobenzene	WG	T	38	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	0	0	0.4	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WG	T	38	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	38	100	0.00033	-	-	-
VOC	1,2-Dichlorobenzene	WG	T	38	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	600	0	0	600	0	0	30	-	-	-
VOC	1,2-Dichloroethane	WG	T	38	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	5	0	0	0.17	-	-	-

Table 7. Round 1 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	1,2-Dichloropropane	WG	T	38	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.44	-	-	-
VOC	1,3-Dichlorobenzene	WG	T	38	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	600	-	-	-	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	38	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0	0.48	-	-	-
VOC	2-Butanone (MEK)	WG	T	38	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	560	-	-	-
VOC	2-Hexanone	WG	T	38	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
VOC	4-Bromofluorobenzene	WG	T	38	ug/l	43.0	55.0	51.1053	51.0	2.3225	48.85	55.0	38	100	-	-	-	-	-	-	-	-	-	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	38	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	630	-	-	-
VOC	Acetone	WG	T	38	ug/l	<1.1	10.0	ND	ND	ND	ND	1.7125	2	5.3	-	-	-	-	-	-	0	0	1400	-	-	-
VOC	Benzene	WG	T	38	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.46	-	-	-
VOC	Bromoform	WG	T	38	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	80	0	0	80	0	0	3.3	-	-	-
VOC	Bromomethane	WG	T	38	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	10	-	-	-	0	0	0.75	-	-	-
VOC	Carbon disulfide	WG	T	38	ug/l	<0.22	3.0	ND	ND	ND	ND	ND	1	2.6	-	-	-	-	-	-	0	0	81	-	-	-
VOC	Carbon tetrachloride	WG	T	38	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	5	0	0	0.46	-	-	-
VOC	Chlorobenzene	WG	T	38	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	7.8	-	-	-
VOC	Chlorobromomethane	WG	T	38	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	8.3	-	-	-
VOC	Chlorodibromomethane	WG	T	38	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0	0.87	-	-	-
VOC	Chloroethane	WG	T	38	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2100	-	-	-
VOC	Chloroform	WG	T	38	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	70	0	0	80	0	0	0.22	-	-	-
VOC	Chloromethane	WG	T	38	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	19	-	-	-
VOC	cis-1,2-Dichloroethene	WG	T	38	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	38	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	38	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1300	-	-	-
VOC	Dichlorobromomethane	WG	T	38	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10	0	0	80	0	0	0.13	-	-	-
VOC	Dichlorodifluoromethane	WG	T	38	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	0	0	20	-	-	-
VOC	Ethylbenzene	WG	T	38	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	700	0	0	700	0	0	1.5	-	-	-
VOC	Ethylene Dibromide	WG	T	38	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	38	100	0.004	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	38	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	38	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2000	-	-	-
VOC	Methyl tert-butyl ether	WG	T	38	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	14	-	-	-
VOC	Methylcyclohexane	WG	T	38	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	38	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	11	-	-	-
VOC	m-Xylene & p-Xylene	WG	T	38	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	38	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	19	-	-	-
VOC	Styrene	WG	T	38	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	120	-	-	-
VOC	Tetrachloroethene	WG	T	38	ug/l	<0.12	0.56	0.0934	ND	0.0991	ND	0.2355	6	16	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Toluene	WG	T	38	ug/l	<0.25	2.2	ND	ND	ND	ND	ND	1	2.6	0	0	1000	0	0	1000	0	0	110	-	-	-
VOC	trans-1,2-Dichloroethene	WG	T	38	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	38	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-

Table 7. Round 1 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Trichloroethene	WG	T	38	ug/l	<0.22	0.76	ND	ND	ND	ND	ND	1	2.6	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WG	T	38	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	520	-	-	-
VOC	Vinyl chloride	WG	T	38	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	2	38	100	0.019	-	-	-

Table 8. Round 2 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 2		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	45	ug/l	47,200	1,320,000	313,913	258,000	216,194	86,160	672,800	45	100.00	-	-	-	-	-	-	-	-	-	37	82	206000
GENCHEM	Ammonia	WG	T	44	ug/l	<72	17,500	668.7023	ND	2,832	ND	808.15	15	34.09	-	-	-	-	-	-	-	-	-	15	34	72
GENCHEM	Chloride	WG	T	45	ug/l	442.0	33,400	3,371	1,930	5,928	524.6	8,714	45	100.00	-	-	-	-	-	-	-	-	-	35	78	799
GENCHEM	Fluoride	WG	T	45	ug/l	<60	17,300	2,127	1,440	3,480	124.8	5,436	44	97.78	4	9	4000	4	9	4000	44	98	80	41	91	132
GENCHEM	Hardness as calcium carbonate	WG	T	45	ug/l	30,000	1,150,000	251,867	224,000	181,045	71,200	584,000	45	100.00	-	-	-	-	-	-	-	-	-	18	40	228000
GENCHEM	Nitrate Nitrite as N	WG	T	44	ug/l	<100	33,500	3,472	1,350	6,433	ND	17,244	37	84.09	3	7	10000	3	7	10000	-	-	-	37	84	100
GENCHEM	Orthophosphate as P	WG	T	37	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WG	T	45	ug/l	2,820	618,000	32,190	13,900	91,753	3,666	75,200	45	100.00	-	-	-	-	-	-	-	-	-	37	82	4980
GENCHEM	Total Dissolved Solids	WG	T	45	mg/l	83.0	1,760	388.8889	302.0	310.5224	163.6	986.8	45	100.00	-	-	-	-	-	-	-	-	-	37	82	202
GENCHEM	Total Suspended Solids	WG	T	45	mg/l	<1	434.0	70.38	13.9	141.4427	1.36	297.6	43	95.56	-	-	-	-	-	-	-	-	-	1	2	434
METALS	Aluminum	WG	DI	45	ug/l	<18.2	310.0	ND	ND	ND	ND	37.26	6	13.33	-	-	-	-	-	-	0	0	2000	6	13	18.2
METALS	Antimony	WG	DI	45	ug/l	<0.62	<0.62	ND	ND	ND	ND	ND	0	0.00	0	0	6	0	0	6	0	0	0.78	0	0	0.62
METALS	Arsenic	WG	DI	45	ug/l	<0.64	50.8	2.3249	ND	7.8131	ND	9.96	11	24.44	3	7	10	3	7	10	45	100	0.052	7	16	1.2
METALS	Barium	WG	DI	45	ug/l	18.7	970.0	219.7111	189.0	162.5285	26.24	483.6	45	100.00	0	0	1000	0	0	2000	3	7	380	39	87	76.6
METALS	Beryllium	WG	DI	45	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	4	0	0	2.5	0	0	0.24
METALS	Cadmium	WG	DI	45	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Calcium	WG	DI	45	ug/l	1,410	431,000	61,402	52,900	62,358	12,320	86,900	45	100.00	-	-	-	-	-	-	-	-	-	18	40	54900
METALS	Chromium	WG	DI	45	ug/l	<1.3	5.0	ND	ND	ND	ND	1.3	4	8.89	0	0	100	0	0	100	45	100	0.035	2	4	1.3
METALS	Cobalt	WG	DI	45	ug/l	<1.3	17.2	1.6922	ND	2.98	ND	7.14	10	22.22	-	-	-	-	-	-	45	100	0.6	9	20	1.3
METALS	Copper	WG	DI	45	ug/l	<1.4	29.2	2.4889	ND	4.5929	ND	8.92	21	46.67	0	0	1300	0	0	1300	0	0	80	13	29	1.8
METALS	Cyanide, Total	WG	T	45	ug/l	<2	3,360	403.3556	132.0	747.3105	ND	2,008	36	80.00	18	40	200	18	40	200	45	100	0.15	35	78	2
METALS	Iron	WG	DI	45	ug/l	<42.4	99,600	2,519	80.1	14,823	ND	1,310	24	53.33	-	-	-	-	-	-	2	4	1400	24	53	42.4
METALS	Lead	WG	DI	45	ug/l	<0.38	0.65	ND	ND	ND	ND	ND	1	2.22	0	0	15	0	0	15	0	0	15	1	2	0.38
METALS	Magnesium	WG	DI	45	ug/l	<63.6	49,800	15,368	15,600	7,621	2,272	21,800	44	97.78	-	-	-	-	-	-	-	-	-	36	80	13100
METALS	Manganese	WG	DI	45	ug/l	<2.5	1,320	70.3044	ND	224.992	ND	210.6	22	48.89	-	-	-	-	-	-	9	20	43	11	24	15.7
METALS	Mercury	WG	DI	45	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	45	100	0.063	0	0	0.17
METALS	Nickel	WG	DI	45	ug/l	<1.4	6.8	ND	ND	ND	ND	3.0	5	11.11	0	0	100	-	-	-	0	0	39	5	11	1.4
METALS	Potassium	WG	DI	45	ug/l	532.0	23,200	1,773	982.0	3,349	677.8	3,388	45	100.00	-	-	-	-	-	-	-	-	-	39	87	737
METALS	Selenium	WG	DI	45	ug/l	<0.73	9.6	0.8696	ND	1.8561	ND	1.56	7	15.56	0	0	50	0	0	50	0	0	10	7	16	0.73
METALS	Silver	WG	DI	45	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Sodium	WG	DI	45	ug/l	2,870	365,000	61,601	31,500	89,398	6,094	238,000	45	100.00	-	-	-	-	-	-	-	-	-	43	96	4380
METALS	Thallium	WG	DI	45	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	45	100	0.02	0	0	0.26
METALS	Vanadium	WG	DI	45	ug/l	<1.9	108.0	ND	ND	ND	ND	14.04	5	11.11	-	-	-	-	-	-	3	7	8.6	5	11	1.9
METALS	Zinc	WG	DI	45	ug/l	<7	23.6	ND	ND	ND	ND	8.14	3	6.67	0	0	2000	-	-	-	0	0	600	3	7	7
SVOC	1,1'-Biphenyl	WG	T	36	ug/l	<0.63	<0.66	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	36	100	0.083	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	36	ug/l	<0.43	<0.45	ND	ND	ND	ND	ND	0	0.00	0	0	0.97	-	-	-	36	100	0.17	-	-	-
SVOC	1,4-Dioxane	WG	T	36	ug/l	<3.1	<3.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	36	100	0.46	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	36	ug/l	<0.93	<0.98	ND	ND	ND	ND	ND	0	0.00	0	0	1400	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	36	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	24	-	-	-
SVOC	2,4,5-Trichlorophenol	WG	T	36	ug/l	<0.49	<0.51	ND	ND	ND	ND	ND	0	0.00	0	0	1800	-	-	-	0	0	120	-	-	-

Table 8. Round 2 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 2		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,4,6-Trichlorophenol	WG	T	36	ug/l	<0.53	<0.56	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	1.2	-	-	-
SVOC	2,4-Dichlorophenol	WG	T	36	ug/l	<0.63	<0.66	ND	ND	ND	ND	ND	0	0.00	0	0	77	-	-	-	0	0	4.6	-	-	-
SVOC	2,4-Dimethylphenol	WG	T	36	ug/l	<0.91	<0.96	ND	ND	ND	ND	ND	0	0.00	0	0	380	-	-	-	0	0	36	-	-	-
SVOC	2,4-Dinitrophenol	WG	T	36	ug/l	<2.4	<2.5	ND	ND	ND	ND	ND	0	0.00	0	0	69	-	-	-	0	0	3.9	-	-	-
SVOC	2,4-Dinitrotoluene	WG	T	36	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	0	0	1.1	-	-	-	36	100	0.24	-	-	-
SVOC	2,6-Dinitrotoluene	WG	T	36	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	36	100	0.049	-	-	-
SVOC	2-Chloronaphthalene	WG	T	36	ug/l	<0.61	<0.64	ND	ND	ND	ND	ND	0	0.00	0	0	1000	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	36	ug/l	<0.74	<0.78	ND	ND	ND	ND	ND	0	0.00	0	0	81	-	-	-	0	0	9.1	-	-	-
SVOC	2-Methylnaphthalene	WG	T	36	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.6	-	-	-
SVOC	2-Methylphenol	WG	T	36	ug/l	<1.3	<1.4	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	36	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	19	-	-	-
SVOC	2-Nitrophenol	WG	T	36	ug/l	<0.59	<0.62	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	36	ug/l	<0.88	34.0	ND	ND	ND	ND	ND	1	2.78	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	36	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	36	100	0.21	-	-	-	36	100	0.13	-	-	-
SVOC	3-Nitroaniline	WG	T	36	ug/l	<0.82	<0.86	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	36	ug/l	<2	<2.1	ND	ND	ND	ND	ND	0	0.00	0	0	13	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	36	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	36	ug/l	<0.76	<0.8	ND	ND	ND	ND	ND	0	0.00	0	0	3000	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	36	ug/l	<0.73	<0.77	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	4	11	0.37	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WG	T	36	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	36	ug/l	<0.48	<0.5	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.8	-	-	-
SVOC	4-Nitrophenol	WG	T	36	ug/l	<4.7	<4.9	ND	ND	ND	ND	ND	0	0.00	0	0	60	-	-	-	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	36	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0.00	0	0	670	-	-	-	0	0	53	-	-	-
SVOC	Acenaphthylene	WG	T	36	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	36	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Anthracene	WG	T	36	ug/l	<0.57	<0.6	ND	ND	ND	ND	ND	0	0.00	0	0	2100	-	-	-	0	0	180	-	-	-
SVOC	Atrazine	WG	T	36	ug/l	<0.77	<0.81	ND	ND	ND	ND	ND	0	0.00	0	0	3	0	0	3	36	100	0.3	-	-	-
SVOC	Benzaldehyde	WG	T	36	ug/l	<0.86	<0.9	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Benzo[a]anthracene	WG	T	36	ug/l	<0.55	<0.58	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	36	ug/l	<0.16	<0.17	ND	ND	ND	ND	ND	0	0.00	36	100	0.05	0	0	0.2	36	100	0.0034	-	-	-
SVOC	Benzo[b]fluoranthene	WG	T	36	ug/l	<0.44	<0.46	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	36	100	0.034	-	-	-
SVOC	Benzo[g,h,i]perylene	WG	T	36	ug/l	<0.75	<0.79	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	36	ug/l	<0.18	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	0	0	0.34	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WG	T	36	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	5.9	-	-	-
SVOC	Bis(2-chloroethyl)ether	WG	T	36	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0.00	0	0	0.3	-	-	-	36	100	0.014	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	36	ug/l	<0.72	2.4	ND	ND	ND	ND	0.585	2	5.56	0	0	6	0	0	6	0	0	5.6	-	-	-
SVOC	Butyl benzyl phthalate	WG	T	36	ug/l	<0.6	<0.63	ND	ND	ND	ND	ND	0	0.00	0	0	1500	-	-	-	0	0	16	-	-	-
SVOC	Caprolactam	WG	T	36	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	990	-	-	-
SVOC	Carbazole	WG	T	36	ug/l	<0.85	<0.89	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	36	ug/l	<0.67	<0.7	ND	ND	ND	ND	ND	0	0.00	0	0	50	-	-	-	0	0	3.4	-	-	-

Table 8. Round 2 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 2		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Dibenz(a,h)anthracene	WG	T	36	ug/l	<0.09	<0.095	ND	ND	ND	ND	ND	0	0.00	0	0	0.05	-	-	-	36	100	0.0034	-	-	-
SVOC	Dibenzofuran	WG	T	36	ug/l	<0.85	<0.89	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	0.79	-	-	-
SVOC	Diethyl phthalate	WG	T	36	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0.00	0	0	17000	-	-	-	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	36	ug/l	<0.98	<1	ND	ND	ND	ND	ND	0	0.00	0	0	3E+05	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	36	ug/l	<0.82	1.3	ND	ND	ND	ND	1.125	3	8.33	0	0	2000	-	-	-	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	36	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	20	-	-	-
SVOC	Fluoranthene	WG	T	36	ug/l	<0.72	<0.76	ND	ND	ND	ND	ND	0	0.00	0	0	130	-	-	-	0	0	80	-	-	-
SVOC	Fluorene	WG	T	36	ug/l	<0.8	<0.84	ND	ND	ND	ND	ND	0	0.00	0	0	1100	-	-	-	0	0	29	-	-	-
SVOC	Hexachlorobenzene	WG	T	36	ug/l	<0.47	<0.49	ND	ND	ND	ND	ND	0	0.00	36	100	0.2	0	0	1	36	100	0.0098	-	-	-
SVOC	Hexachlorobutadiene	WG	T	36	ug/l	<0.76	<0.8	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	36	100	0.14	-	-	-
SVOC	Hexachlorocyclopentadiene	WG	T	36	ug/l	<0.61	<0.64	ND	ND	ND	ND	ND	0	0.00	0	0	50	0	0	50	36	100	0.041	-	-	-
SVOC	Hexachloroethane	WG	T	36	ug/l	<0.09	<0.095	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	0.33	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	36	ug/l	<0.21	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	36	100	0.034	-	-	-
SVOC	Isophorone	WG	T	36	ug/l	<0.67	<0.7	ND	ND	ND	ND	ND	0	0.00	0	0	400	-	-	-	0	0	78	-	-	-
SVOC	Naphthalene	WG	T	36	ug/l	<0.8	<0.84	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	36	100	0.17	-	-	-
SVOC	Nitrobenzene	WG	T	36	ug/l	<0.49	<0.51	ND	ND	ND	ND	ND	0	0.00	0	0	17	-	-	-	36	100	0.14	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WG	T	36	ug/l	<0.83	<0.87	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	36	100	0.011	-	-	-
SVOC	N-Nitrosodiphenylamine	WG	T	36	ug/l	<0.74	<0.78	ND	ND	ND	ND	ND	0	0.00	0	0	33	-	-	-	0	0	12	-	-	-
SVOC	Pentachlorophenol	WG	T	36	ug/l	<2.2	<2.3	ND	ND	ND	ND	ND	0	0.00	36	100	1	36	100	1	36	100	0.041	-	-	-
SVOC	Phenanthrene	WG	T	36	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	36	ug/l	<0.41	1.6	ND	ND	ND	ND	ND	1	2.78	0	0	300	-	-	-	0	0	580	-	-	-
SVOC	Pyrene	WG	T	36	ug/l	<0.83	<0.87	ND	ND	ND	ND	ND	0	0.00	0	0	830	-	-	-	0	0	12	-	-	-
VOC	1,1,1-Trichloroethane	WG	T	36	ug/l	<0.28	3.2	ND	ND	ND	ND	ND	1	2.78	0	0	200	0	0	200	0	0	800	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WG	T	36	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	2	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	36	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	5500	-	-	-
VOC	1,1,2-Trichloroethane	WG	T	36	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0.00	0	0	3	-	-	-	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	36	ug/l	<0.24	0.95	ND	ND	ND	ND	ND	1	2.78	0	0	4	-	-	-	0	0	2.8	-	-	-
VOC	1,1-Dichloroethene	WG	T	36	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0.00	0	0	7	-	-	-	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	36	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0.00	0	0	0.7	-	-	-	0	0	0.7	-	-	-
VOC	1,2,4-Trichlorobenzene	WG	T	36	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0.00	0	0	70	-	-	-	0	0	0.4	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WG	T	36	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0.00	0	0	0.2	0	0	0.2	36	100	0.00033	-	-	-
VOC	1,2-Dichlorobenzene	WG	T	36	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	600	0	0	600	0	0	30	-	-	-
VOC	1,2-Dichloroethane	WG	T	36	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	5	0	0	0.17	-	-	-
VOC	1,2-Dichloropropane	WG	T	36	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.44	-	-	-

Table 8. Round 2 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 2		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	1,3-Dichlorobenzene	WG	T	36	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	600	-	-	-	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	36	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	75	0	0	75	0	0	0.48	-	-	-
VOC	2-Butanone (MEK)	WG	T	36	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	560	-	-	-
VOC	2-Hexanone	WG	T	36	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.8	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	36	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	630	-	-	-
VOC	Acetone	WG	T	36	ug/l	<1.1	3.2	ND	ND	ND	ND	ND	1	2.78	-	-	-	-	-	-	0	0	1400	-	-	-
VOC	Benzene	WG	T	36	ug/l	<0.09	0.15	ND	ND	ND	ND	ND	1	2.78	0	0	5	0	0	5	0	0	0.46	-	-	-
VOC	Bromoform	WG	T	36	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	80	0	0	80	0	0	3.3	-	-	-
VOC	Bromomethane	WG	T	36	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	10	-	-	-	0	0	0.75	-	-	-
VOC	Carbon disulfide	WG	T	36	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	81	-	-	-
VOC	Carbon tetrachloride	WG	T	36	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	3	0	0	5	0	0	0.46	-	-	-
VOC	Chlorobenzene	WG	T	36	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	100	0	0	100	0	0	7.8	-	-	-
VOC	Chlorobromomethane	WG	T	36	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	8.3	-	-	-
VOC	Chlorodibromomethane	WG	T	36	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	80	0	0	0.87	-	-	-
VOC	Chloroethane	WG	T	36	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	2100	-	-	-
VOC	Chloroform	WG	T	36	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	70	0	0	80	0	0	0.22	-	-	-
VOC	Chloromethane	WG	T	36	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	19	-	-	-
VOC	cis-1,2-Dichloroethene	WG	T	36	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	70	-	-	-	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	36	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0.00	0	0	4	-	-	-	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	36	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	1300	-	-	-
VOC	Dichlorobromomethane	WG	T	36	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0.00	0	0	10	0	0	80	0	0	0.13	-	-	-
VOC	Dichlorodifluoromethane	WG	T	36	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0.00	0	0	1000	-	-	-	0	0	20	-	-	-
VOC	Ethylbenzene	WG	T	36	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0.00	0	0	700	0	0	700	0	0	1.5	-	-	-
VOC	Ethylene Dibromide	WG	T	36	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	36	100	0.004	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	36	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	36	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	2000	-	-	-
VOC	Methyl tert-butyl ether	WG	T	36	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	14	-	-	-
VOC	Methylcyclohexane	WG	T	36	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	36	ug/l	<0.21	1.8	ND	ND	ND	ND	0.21	2	5.56	0	0	5	0	0	5	0	0	11	-	-	-
VOC	m-Xylene & p-Xylene	WG	T	36	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	36	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0.00	0	0	10000	-	-	-	0	0	19	-	-	-
VOC	Styrene	WG	T	36	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	100	0	0	100	0	0	120	-	-	-
VOC	Tetrachloroethene	WG	T	36	ug/l	<0.12	0.29	ND	ND	ND	ND	0.11	2	5.56	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Toluene	WG	T	36	ug/l	<0.25	0.66	ND	ND	ND	ND	0.2025	2	5.56	0	0	1000	0	0	1000	0	0	110	-	-	-
VOC	trans-1,2-Dichloroethene	WG	T	36	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	36	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	2	-	-	-	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	36	ug/l	<0.22	0.62	ND	ND	ND	ND	ND	1	2.78	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WG	T	36	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0.00	0	0	10000	-	-	-	0	0	520	-	-	-
VOC	Vinyl chloride	WG	T	36	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0.00	0	0	0.2	0	0	2	36	100	0.019	-	-	-

Table 9. Round 3 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	48	ug/l	26,700	1,350,000	353,265	271,500	237,228	204,700	815,250	48	100	-	-	-	-	-	-	-	-	-	42	88	212000
GENCHEM	Ammonia	WG	T	48	ug/l	<72	34,100	817.6208	ND	4,912	ND	636.95	11	23	-	-	-	-	-	-	-	-	-	11	23	72
GENCHEM	Chloride	WG	T	48	ug/l	<31	91,000	5,466	2,245	14,236	1,017	9,357	47	98	-	-	-	-	-	-	-	-	-	46	96	393
GENCHEM	Fluoride	WG	T	48	ug/l	<60	17,200	2,819	1,910	3,843	134.0	12,860	47	98	8	17	4000	8	17	4000	47	98	80	43	90	184
GENCHEM	Hardness as calcium carbonate	WG	T	48	ug/l	50,000	1,240,000	269,000	224,000	199,032	119,900	674,400	48	100	-	-	-	-	-	-	-	-	-	34	71	204000
GENCHEM	Nitrate Nitrite as N	WG	T	48	ug/l	<100	54,700	5,838	1,600	11,237	ND	30,380	42	88	7	15	10000	7	15	10000	-	-	-	42	88	100
GENCHEM	Orthophosphate as P	WG	T	40	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	0	0	48
GENCHEM	Sulfate	WG	T	48	ug/l	2,660	961,000	45,050	14,750	140,399	4,474	139,930	48	100	-	-	-	-	-	-	-	-	-	37	77	7000
GENCHEM	Total Dissolved Solids	WG	T	48	mg/l	116.0	1,950	457.2917	306.0	398.4565	207.1	1,386	48	100	-	-	-	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WG	T	48	mg/l	<1	220.0	34.5979	18.95	47.2731	1.1	141.8	47	98	-	-	-	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WG	DI	48	ug/l	<18.2	266.0	ND	ND	ND	ND	99.09	6	13	-	-	-	-	-	-	0	0	2000	6	13	18.2
METALS	Antimony	WG	DI	48	ug/l	<0.62	<0.62	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0	0.78	0	0	0.62
METALS	Arsenic	WG	DI	48	ug/l	<0.64	38.1	1.7844	ND	5.7086	ND	7.745	12	25	1	2	10	1	2	10	48	100	0.052	8	17	0.86
METALS	Barium	WG	DI	48	ug/l	20.8	1,010	238.7	215.0	191.4319	39.975	550.35	48	100	1	2	1000	0	0	2000	5	10	380	43	90	71.1
METALS	Beryllium	WG	DI	48	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0	2.5	0	0	0.24
METALS	Cadmium	WG	DI	48	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Calcium	WG	DI	48	ug/l	4,210	420,000	65,723	55,250	62,312	24,775	137,245	48	100	-	-	-	-	-	-	-	-	-	28	58	53500
METALS	Chromium	WG	DI	48	ug/l	<1.3	7.3	ND	ND	ND	ND	2.395	6	13	0	0	100	0	0	100	48	100	0.035	6	13	1.3
METALS	Cobalt	WG	DI	48	ug/l	<1.3	20.8	1.8375	ND	3.3492	ND	6.76	12	25	-	-	-	-	-	-	48	100	0.6	12	25	1.3
METALS	Copper	WG	DI	48	ug/l	<1.4	42.4	2.4708	ND	6.1583	ND	6.99	16	33	0	0	1300	0	0	1300	0	0	80	15	31	1.4
METALS	Cyanide, Free	WG	T	41	ug/l	<1.5	306.0	18.978	3.4	49.3719	ND	48.0	23	56	1	2	200	1	2	200	41	100	0.15	23	56	1.5
METALS	Cyanide, Total	WG	T	48	ug/l	<2	6,600	521.8979	98.75	1,128	ND	2,179	41	85	21	44	200	21	44	200	48	100	0.15	41	85	2
METALS	Iron	WG	DI	48	ug/l	<42.4	35,600	1,031	122.0	5,118	ND	1,350	32	67	-	-	-	-	-	-	3	6	1400	32	67	42.4
METALS	Lead	WG	DI	48	ug/l	<0.38	0.62	ND	ND	ND	ND	ND	2	4.2	0	0	15	0	0	15	0	0	15	2	4	0.38
METALS	Magnesium	WG	DI	48	ug/l	<63.6	48,300	16,016	15,800	7,435	4,500	24,335	47	98	-	-	-	-	-	-	-	-	-	38	79	13200
METALS	Manganese	WG	DI	48	ug/l	<2.5	1,100	41.325	ND	162.5368	ND	120.195	21	44	-	-	-	-	-	-	8	17	43	8	17	24.8
METALS	Mercury	WG	DI	48	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	48	100	0.063	0	0	0.17
METALS	Nickel	WG	DI	48	ug/l	<1.4	4.9	ND	ND	ND	ND	2.52	4	8.3	0	0	100	-	-	-	0	0	39	4	8	1.4
METALS	Potassium	WG	DI	48	ug/l	495.0	19,900	1,703	952.5	3,071	629.35	2,924	48	100	-	-	-	-	-	-	-	-	-	41	85	676
METALS	Selenium	WG	DI	48	ug/l	<0.73	8.9	0.8477	ND	1.7268	ND	1.6	9	19	0	0	50	0	0	50	0	0	10	9	19	0.73
METALS	Silver	WG	DI	48	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Sodium	WG	DI	48	ug/l	<69	601,000	67,706	31,750	106,689	3,999	220,100	47	98	-	-	-	-	-	-	-	-	-	44	92	4200
METALS	Thallium	WG	DI	48	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	48	100	0.02	0	0	0.26
METALS	Vanadium	WG	DI	48	ug/l	<1.9	75.7	ND	ND	ND	ND	11.47	5	10	-	-	-	-	-	-	3	6	8.6	5	10	1.9
METALS	Zinc	WG	DI	48	ug/l	<7	228.0	ND	ND	ND	ND	5.775	3	6.3	0	0	2000	-	-	-	0	0	600	2	4	7
SVOC	1,1'-Biphenyl	WG	T	39	ug/l	<0.63	<0.67	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	39	100	0.083	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	39	ug/l	<0.43	<0.46	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	39	100	0.17	-	-	-
SVOC	1,4-Dioxane	WG	T	39	ug/l	<3.1	<3.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	39	100	0.46	-	-	-

Table 9. Round 3 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	39	ug/l	<0.93	<0.99	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	39	ug/l	<0.69	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	24	-	-	-
SVOC	2,4,5-Trichlorophenol	WG	T	39	ug/l	<0.49	<0.52	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0	120	-	-	-
SVOC	2,4,6-Trichlorophenol	WG	T	39	ug/l	<0.53	<0.56	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	1.2	-	-	-
SVOC	2,4-Dichlorophenol	WG	T	39	ug/l	<0.63	<0.67	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0	4.6	-	-	-
SVOC	2,4-Dimethylphenol	WG	T	39	ug/l	<0.91	<0.97	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0	36	-	-	-
SVOC	2,4-Dinitrophenol	WG	T	39	ug/l	<2.4	<2.5	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0	3.9	-	-	-
SVOC	2,4-Dinitrotoluene	WG	T	39	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	39	100	0.24	-	-	-
SVOC	2,6-Dinitrotoluene	WG	T	39	ug/l	<0.88	<0.94	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	39	100	0.049	-	-	-
SVOC	2-Chloronaphthalene	WG	T	39	ug/l	<0.61	<0.65	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	39	ug/l	<0.74	<0.79	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0	9.1	-	-	-
SVOC	2-Methylnaphthalene	WG	T	39	ug/l	<0.88	<0.94	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.6	-	-	-
SVOC	2-Methylphenol	WG	T	39	ug/l	<1.3	<1.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	39	ug/l	<0.65	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	19	-	-	-
SVOC	2-Nitrophenol	WG	T	39	ug/l	<0.59	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	39	ug/l	<0.88	<0.94	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	39	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	39	100	0.21	-	-	-	39	100	0.13	-	-	-
SVOC	3-Nitroaniline	WG	T	39	ug/l	<0.82	<0.87	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	39	ug/l	<2	<2.1	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	39	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	39	ug/l	<0.76	<0.81	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	39	ug/l	<0.73	<0.78	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	17	44	0.37	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WG	T	39	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	39	ug/l	<0.48	<0.51	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
SVOC	4-Nitrophenol	WG	T	39	ug/l	<4.7	<4.9	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	39	ug/l	<0.88	<0.94	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0	53	-	-	-
SVOC	Acenaphthylene	WG	T	39	ug/l	<0.65	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	39	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Anthracene	WG	T	39	ug/l	<0.57	<0.61	ND	ND	ND	ND	ND	0	0	0	0	2100	-	-	-	0	0	180	-	-	-
SVOC	Atrazine	WG	T	39	ug/l	<0.77	<0.82	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	39	100	0.3	-	-	-
SVOC	Benzaldehyde	WG	T	39	ug/l	<0.86	<0.91	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Benzo[a]anthracene	WG	T	39	ug/l	<0.55	<0.59	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	39	ug/l	<0.16	<0.17	ND	ND	ND	ND	ND	0	0	39	100	0.05	0	0	0.2	39	100	0.0034	-	-	-
SVOC	Benzo[b]fluoranthene	WG	T	39	ug/l	<0.44	<0.47	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	39	100	0.034	-	-	-
SVOC	Benzo[g,h,i]perylene	WG	T	39	ug/l	<0.75	<0.8	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	39	ug/l	<0.18	<0.19	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	0	0	0.34	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WG	T	39	ug/l	<0.69	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5.9	-	-	-
SVOC	Bis(2-chloroethyl)ether	WG	T	39	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	39	100	0.014	-	-	-

Table 9. Round 3 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	39	ug/l	<0.72	1.6	ND	ND	ND	ND	ND	1	2.6	0	0	6	0	0	6	0	0	5.6	-	-	-
SVOC	Butyl benzyl phthalate	WG	T	39	ug/l	<0.6	<0.64	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0	16	-	-	-
SVOC	Caprolactam	WG	T	39	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	990	-	-	-
SVOC	Carbazole	WG	T	39	ug/l	<0.85	<0.9	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	39	ug/l	<0.67	<0.71	ND	ND	ND	ND	ND	0	0	0	0	50	-	-	-	0	0	3.4	-	-	-
SVOC	Dibenz(a,h)anthracene	WG	T	39	ug/l	<0.09	<0.096	ND	ND	ND	ND	ND	0	0	0	0	0.05	-	-	-	39	100	0.0034	-	-	-
SVOC	Dibenzofuran	WG	T	39	ug/l	<0.85	<0.9	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.79	-	-	-
SVOC	Diethyl phthalate	WG	T	39	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	39	ug/l	<0.98	<1	ND	ND	ND	ND	ND	0	0	0	0	3E+05	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	39	ug/l	<0.82	<0.87	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	39	ug/l	<0.69	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	20	-	-	-
SVOC	Fluoranthene	WG	T	39	ug/l	<0.72	<0.77	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	0	0	80	-	-	-
SVOC	Fluorene	WG	T	39	ug/l	<0.8	<0.85	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0	29	-	-	-
SVOC	Hexachlorobenzene	WG	T	39	ug/l	<0.47	<0.5	ND	ND	ND	ND	ND	0	0	39	100	0.2	0	0	1	39	100	0.0098	-	-	-
SVOC	Hexachlorobutadiene	WG	T	39	ug/l	<0.76	<0.81	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	39	100	0.14	-	-	-
SVOC	Hexachlorocyclopentadiene	WG	T	39	ug/l	<0.61	<0.65	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	39	100	0.041	-	-	-
SVOC	Hexachloroethane	WG	T	39	ug/l	<0.09	<0.096	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	0.33	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	39	ug/l	<0.21	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	39	100	0.034	-	-	-
SVOC	Isophorone	WG	T	39	ug/l	<0.67	<0.71	ND	ND	ND	ND	ND	0	0	0	0	400	-	-	-	0	0	78	-	-	-
SVOC	Naphthalene	WG	T	39	ug/l	<0.8	<0.85	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	39	100	0.17	-	-	-
SVOC	Nitrobenzene	WG	T	39	ug/l	<0.49	<0.52	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	39	100	0.14	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WG	T	39	ug/l	<0.83	<0.88	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	39	100	0.011	-	-	-
SVOC	N-Nitrosodiphenylamine	WG	T	39	ug/l	<0.74	<0.79	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0	12	-	-	-
SVOC	Pentachlorophenol	WG	T	39	ug/l	<2.2	<2.3	ND	ND	ND	ND	ND	0	0	39	100	1	39	100	1	39	100	0.041	-	-	-
SVOC	Phenanthrene	WG	T	39	ug/l	<0.65	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	39	ug/l	<0.41	<0.44	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0	580	-	-	-
SVOC	Pyrene	WG	T	39	ug/l	<0.83	<0.88	ND	ND	ND	ND	ND	0	0	0	0	830	-	-	-	0	0	12	-	-	-
VOC	1,1,1-Trichloroethane	WG	T	39	ug/l	<0.28	3.7	ND	ND	ND	ND	ND	1	2.6	0	0	200	0	0	200	0	0	800	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WG	T	39	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	39	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5500	-	-	-
VOC	1,1,2-Trichloroethane	WG	T	39	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	39	ug/l	<0.24	0.88	ND	ND	ND	ND	ND	1	2.6	0	0	4	-	-	-	0	0	2.8	-	-	-
VOC	1,1-Dichloroethene	WG	T	39	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	39	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	0	0	0.7	-	-	-
VOC	1,2,4-Trichlorobenzene	WG	T	39	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	0	0	0.4	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WG	T	39	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	39	100	0.00033	-	-	-
VOC	1,2-Dichlorobenzene	WG	T	39	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	600	0	0	600	0	0	30	-	-	-
VOC	1,2-Dichloroethane	WG	T	39	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	5	0	0	0.17	-	-	-

Table 9. Round 3 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	1,2-Dichloropropane	WG	T	39	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.44	-	-	-
VOC	1,3-Dichlorobenzene	WG	T	39	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	600	-	-	-	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	39	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0	0.48	-	-	-
VOC	2-Butanone (MEK)	WG	T	39	ug/l	<2.2	2.3	ND	ND	ND	ND	ND	1	2.6	-	-	-	-	-	-	0	0	560	-	-	-
VOC	2-Hexanone	WG	T	39	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	39	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	630	-	-	-
VOC	Acetone	WG	T	39	ug/l	<1.1	7.6	1.1256	ND	1.4242	ND	3.51	7	18	-	-	-	-	-	-	0	0	1400	-	-	-
VOC	Benzene	WG	T	39	ug/l	<0.09	0.16	ND	ND	ND	ND	ND	1	2.6	0	0	5	0	0	5	0	0	0.46	-	-	-
VOC	Bromoform	WG	T	39	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	80	0	0	80	0	0	3.3	-	-	-
VOC	Bromomethane	WG	T	39	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	10	-	-	-	0	0	0.75	-	-	-
VOC	Carbon disulfide	WG	T	39	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	81	-	-	-
VOC	Carbon tetrachloride	WG	T	39	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	5	0	0	0.46	-	-	-
VOC	Chlorobenzene	WG	T	39	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	7.8	-	-	-
VOC	Chlorobromomethane	WG	T	39	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	8.3	-	-	-
VOC	Chlorodibromomethane	WG	T	39	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0	0.87	-	-	-
VOC	Chloroethane	WG	T	39	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2100	-	-	-
VOC	Chloroform	WG	T	39	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	70	0	0	80	0	0	0.22	-	-	-
VOC	Chloromethane	WG	T	39	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	19	-	-	-
VOC	cis-1,2-Dichloroethene	WG	T	39	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	39	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	39	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1300	-	-	-
VOC	Dichlorobromomethane	WG	T	39	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10	0	0	80	0	0	0.13	-	-	-
VOC	Dichlorodifluoromethane	WG	T	39	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	0	0	20	-	-	-
VOC	Ethylbenzene	WG	T	39	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	700	0	0	700	0	0	1.5	-	-	-
VOC	Ethylene Dibromide	WG	T	39	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	39	100	0.004	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	39	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	39	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2000	-	-	-
VOC	Methyl tert-butyl ether	WG	T	39	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	14	-	-	-
VOC	Methylcyclohexane	WG	T	39	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	39	ug/l	<0.21	0.59	ND	ND	ND	ND	0.514	3	7.7	0	0	5	0	0	5	0	0	11	-	-	-
VOC	m-Xylene & p-Xylene	WG	T	39	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	39	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	19	-	-	-
VOC	Styrene	WG	T	39	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	120	-	-	-
VOC	Tetrachloroethene	WG	T	39	ug/l	<0.12	0.69	ND	ND	ND	ND	0.419	4	10	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Toluene	WG	T	39	ug/l	<0.25	0.32	ND	ND	ND	ND	ND	1	2.6	0	0	1000	0	0	1000	0	0	110	-	-	-
VOC	trans-1,2-Dichloroethene	WG	T	39	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	39	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	39	ug/l	<0.22	0.58	ND	ND	ND	ND	ND	1	2.6	0	0	5	-	-	-	-	-	-	-	-	-

Table 9. Round 3 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Trichlorofluoromethane	WG	T	39	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	520	-	-	-
VOC	Vinyl chloride	WG	T	39	ug/l	<0.06	<0.06	0.03	0.03	2.11E-17	0.03	0.03	0	0	0	0	0.2	0	0	2	39	100	0.019	-	-	-

Table 10. Round 4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	50	ug/l	55,300	1,570,000	331,376	242,500	301,804	172,550	1,007,300	50	100	-	-	-	-	-	-	-	-	-	36	72	214000
GENCHEM	Ammonia	WG	T	50	ug/l	<72	27,900	1,536	ND	5,839	ND	12,527	14	28	-	-	-	-	-	-	-	-	-	14	28	72
GENCHEM	Chloride	WG	T	50	ug/l	338.0	36,500	3,396	1,815	6,389	486.25	6,660	50	100	-	-	-	-	-	-	-	-	-	49	98	338
GENCHEM	Fluoride	WG	DI	50	ug/l	<60	55,300	3,575	1,420	8,798	122.7	7,761	49	98	8	16	4000	8	16	4000	49	98	80	47	94	120
GENCHEM	Fluoride	WG	T	50	ug/l	<60	52,900	3,488	1,280	8,430	155.15	7,778	49	98	7	14	4000	7	14	4000	49	98	80	49	98	120
GENCHEM	Hardness as calcium carbonate	WG	T	50	ug/l	56,000	1,100,000	224,660	192,000	168,254	111,600	468,800	50	100	-	-	-	-	-	-	-	-	-	23	46	198000
GENCHEM	Nitrate Nitrite as N	WG	T	50	ug/l	<100	62,800	3,783	988.5	9,943	ND	9,695	45	90	2	4	10000	2	4	10000	-	-	-	46	92	100
GENCHEM	Orthophosphate as P	WG	T	50	ug/l	<48	325.0	ND	ND	ND	ND	ND	1	2	-	-	-	-	-	-	-	-	-	1	2	48
GENCHEM	Sulfate	WG	T	50	ug/l	2,420	905,000	35,852	8,865	127,840	2,630	92,065	50	100	-	-	-	-	-	-	-	-	-	31	62	5660
GENCHEM	Total Dissolved Solids	WG	T	50	mg/l	97.0	2,440	436.12	287.5	507.5889	169.75	1,685	50	100	-	-	-	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WG	T	50	mg/l	<1	453.0	32.136	5.4	73.9457	n.d.	160.7	46	92	-	-	-	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WG	T	50	ug/l	<18.2	6,950	275.714	38.7	1,000	ND	929.55	34	68	-	-	-	-	-	-	1	2	2000	23	46	39.8
METALS	Aluminum	WG	DI	50	ug/l	<18.2	177.0	ND	ND	ND	ND	51.185	5	10	-	-	-	-	-	-	0	0	2000	3	6	39.8
METALS	Antimony	WG	T	50	ug/l	<0.62	4.4	ND	ND	ND	ND	1.047	5	10	0	0	6	0	0	6	5	10	0.78	5	10	0.62
METALS	Antimony	WG	DI	50	ug/l	<0.62	2.6	ND	ND	ND	ND	ND	2	4	0	0	6	0	0	6	2	4	0.78	2	4	0.62
METALS	Arsenic	WG	T	50	ug/l	<0.64	80.2	4.1628	ND	15.5924	ND	11.85	14	28	4	8	10	4	8	10	50	100	0.052	11	22	0.84
METALS	Arsenic	WG	DI	50	ug/l	<0.64	92.6	4.539	ND	18.2176	ND	10.445	11	22	3	6	10	3	6	10	50	100	0.052	7	14	0.84
METALS	Barium	WG	DI	50	ug/l	20.1	888.0	195.006	157.5	146.8401	52.26	391.25	50	100	0	0	1000	0	0	2000	3	6	380	45	90	75
METALS	Barium	WG	T	50	ug/l	26.0	953.0	209.61	171.0	158.3607	63.85	444.7	50	100	0	0	1000	0	0	2000	3	6	380	47	94	75
METALS	Beryllium	WG	T	50	ug/l	<0.24	0.4	ND	ND	ND	ND	ND	1	2	0	0	4	0	0	4	0	0	2.5	1	2	0.24
METALS	Beryllium	WG	DI	50	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0	2.5	0	0	0.24
METALS	Cadmium	WG	DI	50	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Cadmium	WG	T	50	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Calcium	WG	DI	50	ug/l	3,550	416,000	56,964	49,050	57,720	24,760	78,500	50	100	-	-	-	-	-	-	-	-	-	11	22	57600
METALS	Calcium	WG	T	50	ug/l	3,730	407,000	59,476	49,900	57,407	26,725	105,385	50	100	-	-	-	-	-	-	-	-	-	15	30	57600
METALS	Chromium	WG	T	50	ug/l	<1.3	8.2	1.06	ND	1.2522	ND	3.11	8	16	0	0	100	0	0	100	50	100	0.035	8	16	1.3
METALS	Chromium	WG	DI	50	ug/l	<1.3	2.9	ND	ND	ND	ND	1.3925	3	6	0	0	100	0	0	100	50	100	0.035	3	6	1.3
METALS	Cobalt	WG	T	50	ug/l	<1.3	39.5	2.46	ND	6.6833	ND	5.93	16	32	-	-	-	-	-	-	50	100	0.6	14	28	1.3
METALS	Cobalt	WG	DI	50	ug/l	<1.3	37.5	2.071	ND	6.0485	ND	3.795	11	22	-	-	-	-	-	-	50	100	0.6	8	16	1.3
METALS	Copper	WG	T	50	ug/l	<1.4	59.5	3.594	ND	9.1866	ND	15.77	21	42	0	0	1300	0	0	1300	0	0	80	21	42	1.4
METALS	Copper	WG	DI	50	ug/l	<1.4	50.9	ND	ND	ND	ND	5.795	7	14	0	0	1300	0	0	1300	0	0	80	6	12	1.4
METALS	Cyanide, Free	WG	T	47	ug/l	<1.5	120.0	22.9436	4.8	35.579	ND	115.2	32	68	0	0	200	0	0	200	47	100	0.15	32	68	1.5
METALS	Cyanide, Free	WG	DI	47	ug/l	<1.5	66.2	13.0085	3.9	18.3704	ND	47.42	31	66	0	0	200	0	0	200	47	100	0.15	31	66	1.5
METALS	Cyanide, Total	WG	T	50	ug/l	<2	8,120	483.408	103.5	1,386	ND	1,212	39	78	18	36	200	18	36	200	50	100	0.15	38	76	2
METALS	Cyanide, Total	WG	DI	50	ug/l	<2	7,780	469.434	97.3	1,354	ND	1,192	37	74	17	34	200	17	34	200	50	100	0.15	37	74	2
METALS	Iron	WG	T	50	ug/l	<42.4	72,900	2,860	309.5	10,731	ND	11,700	44	88	-	-	-	-	-	-	9	18	1400	27	54	277
METALS	Iron	WG	DI	50	ug/l	<42.4	26,500	808.368	81.3	3,759	ND	2,083	30	60	-	-	-	-	-	-	4	8	1400	10	20	277
METALS	Lead	WG	T	50	ug/l	<0.38	14.0	ND	ND	ND	ND	1.575	6	12	0	0	15	0	0	15	0	0	15	6	12	0.38

Table 10. Round 4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WG	DI	50	ug/l	<0.38	1.8	ND	ND	ND	ND	0.721	4	8	0	0	15	0	0	15	0	0	15	3	6	0.38
METALS	Magnesium	WG	T	50	ug/l	65.6	56,500	15,677	15,650	8,110	7,078	20,210	50	100	-	-	-	-	-	-	-	-	-	32	64	12500
METALS	Magnesium	WG	DI	50	ug/l	<63.6	44,800	13,621	13,650	6,372	6,173	18,955	49	98	-	-	-	-	-	-	-	-	-	26	52	12500
METALS	Manganese	WG	T	50	ug/l	<2.5	1,270	72.244	2.55	222.438	ND	395.3	26	52	-	-	-	-	-	-	9	18	43	14	28	15.8
METALS	Manganese	WG	DI	50	ug/l	<2.5	1,030	36.58	ND	148.6948	ND	143.85	13	26	-	-	-	-	-	-	7	14	43	8	16	15.8
METALS	Mercury	WG	DI	50	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	50	100	0.063	0	0	0.17
METALS	Mercury	WG	T	50	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	50	100	0.063	0	0	0.17
METALS	Nickel	WG	T	50	ug/l	<1.4	10.2	1.56	ND	2.384	ND	8.305	8	16	0	0	100	-	-	-	0	0	39	8	16	1.4
METALS	Nickel	WG	DI	50	ug/l	<1.4	9.0	ND	ND	ND	ND	2.375	5	10	0	0	100	-	-	-	0	0	39	5	10	1.4
METALS	Potassium	WG	DI	50	ug/l	475.0	19,000	1,460	885.0	2,619	539.4	3,042	50	100	-	-	-	-	-	-	-	-	-	41	82	632
METALS	Potassium	WG	T	50	ug/l	476.0	19,100	1,586	926.5	2,651	567.5	3,320	50	100	-	-	-	-	-	-	-	-	-	44	88	632
METALS	Selenium	WG	DI	50	ug/l	<0.73	17.1	ND	ND	ND	ND	5.215	5	10	0	0	50	0	0	50	1	2	10	4	8	0.73
METALS	Selenium	WG	T	50	ug/l	<0.73	13.0	ND	ND	ND	ND	4.5705	5	10	0	0	50	0	0	50	1	2	10	5	10	0.73
METALS	Silver	WG	DI	50	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Silver	WG	T	50	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Sodium	WG	DI	50	ug/l	2,980	707,000	64,392	29,200	137,283	3,784	233,800	50	100	-	-	-	-	-	-	-	-	-	45	90	4180
METALS	Sodium	WG	T	50	ug/l	3,510	834,000	75,114	33,100	156,160	4,021	293,700	50	100	-	-	-	-	-	-	-	-	-	47	94	4180
METALS	Thallium	WG	DI	50	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	50	100	0.02	0	0	0.26
METALS	Thallium	WG	T	50	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	50	100	0.02	0	0	0.26
METALS	Vanadium	WG	T	50	ug/l	<1.9	457.0	18.292	ND	82.7295	ND	10.575	8	16	-	-	-	-	-	-	4	8	8.6	7	14	1.9
METALS	Vanadium	WG	DI	50	ug/l	<1.9	397.0	ND	ND	ND	ND	8.13	6	12	-	-	-	-	-	-	3	6	8.6	6	12	1.9
METALS	Zinc	WG	T	50	ug/l	<7	3,990	86.306	ND	563.3914	ND	24.72	10	20	1	2	2000	-	-	-	1	2	600	10	20	7
METALS	Zinc	WG	DI	50	ug/l	<7	1,220	ND	ND	ND	ND	ND	2	4	0	0	2000	-	-	-	1	2	600	2	4	7
SVOC	1,1'-Biphenyl	WG	T	41	ug/l	<0.63	<0.66	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	41	100	0.083	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	41	ug/l	<0.43	<0.45	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	41	100	0.17	-	-	-
SVOC	1,4-Dioxane	WG	T	41	ug/l	<3.1	<3.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	41	100	0.46	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	41	ug/l	<0.93	<0.97	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	41	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	24	-	-	-
SVOC	2,4,5-Trichlorophenol	WG	T	41	ug/l	<0.49	<0.51	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0	120	-	-	-
SVOC	2,4,6-Trichlorophenol	WG	T	41	ug/l	<0.53	<0.55	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	1.2	-	-	-
SVOC	2,4-Dichlorophenol	WG	T	41	ug/l	<0.63	<0.66	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0	4.6	-	-	-
SVOC	2,4-Dimethylphenol	WG	T	41	ug/l	<0.91	<0.95	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0	36	-	-	-
SVOC	2,4-Dinitrophenol	WG	T	41	ug/l	<2.4	<2.5	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0	3.9	-	-	-
SVOC	2,4-Dinitrotoluene	WG	T	41	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	41	100	0.24	-	-	-
SVOC	2,6-Dinitrotoluene	WG	T	41	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	41	100	0.049	-	-	-
SVOC	2-Chloronaphthalene	WG	T	41	ug/l	<0.61	<0.64	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	41	ug/l	<0.74	<0.77	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0	9.1	-	-	-
SVOC	2-Methylnaphthalene	WG	T	41	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.6	-	-	-

Table 10. Round 4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2-Methylphenol	WG	T	41	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	41	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	19	-	-	-
SVOC	2-Nitrophenol	WG	T	41	ug/l	<0.59	<0.62	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	41	ug/l	<0.88	42.0	ND	ND	ND	ND	ND	1	2	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	41	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	41	100	0.21	-	-	-	41	100	0.13	-	-	-
SVOC	3-Nitroaniline	WG	T	41	ug/l	<0.82	<0.86	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	41	ug/l	<2	<2.1	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	41	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	41	ug/l	<0.76	<0.79	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	41	ug/l	<0.73	<0.76	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	3	7	0.37	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WG	T	41	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	41	ug/l	<0.48	<0.5	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
SVOC	4-Nitrophenol	WG	T	41	ug/l	<4.7	<4.9	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	41	ug/l	<0.88	<0.92	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0	53	-	-	-
SVOC	Acenaphthylene	WG	T	41	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	41	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Anthracene	WG	T	41	ug/l	<0.57	<0.6	ND	ND	ND	ND	ND	0	0	0	0	2100	-	-	-	0	0	180	-	-	-
SVOC	Atrazine	WG	T	41	ug/l	<0.77	<0.81	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	41	100	0.3	-	-	-
SVOC	Benzaldehyde	WG	T	41	ug/l	<0.86	<0.9	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Benzo[a]anthracene	WG	T	41	ug/l	<0.55	<0.58	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	41	ug/l	<0.16	<0.17	ND	ND	ND	ND	ND	0	0	41	100	0.05	0	0	0.2	41	100	0.0034	-	-	-
SVOC	Benzo[b]fluoranthene	WG	T	41	ug/l	<0.44	<0.46	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	41	100	0.034	-	-	-
SVOC	Benzo[g,h,i]perylene	WG	T	41	ug/l	<0.75	<0.78	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	41	ug/l	<0.18	<0.19	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	0	0	0.34	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WG	T	41	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5.9	-	-	-
SVOC	Bis(2-chloroethyl)ether	WG	T	41	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	41	100	0.014	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	41	ug/l	<0.72	1.2	ND	ND	ND	ND	ND	1	2	0	0	6	0	0	6	0	0	5.6	-	-	-
SVOC	Butyl benzyl phthalate	WG	T	41	ug/l	<0.6	<0.63	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0	16	-	-	-
SVOC	Caprolactam	WG	T	41	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	990	-	-	-
SVOC	Carbazole	WG	T	41	ug/l	<0.85	<0.89	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	41	ug/l	<0.67	<0.7	ND	ND	ND	ND	ND	0	0	0	0	50	-	-	-	0	0	3.4	-	-	-
SVOC	Dibenz(a,h)anthracene	WG	T	41	ug/l	<0.09	<0.094	ND	ND	ND	ND	ND	0	0	0	0	0.05	-	-	-	41	100	0.0034	-	-	-
SVOC	Dibenzofuran	WG	T	41	ug/l	<0.85	<0.89	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.79	-	-	-
SVOC	Diethyl phthalate	WG	T	41	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	41	ug/l	<0.98	<1	ND	ND	ND	ND	ND	0	0	0	0	3E+05	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	41	ug/l	<0.82	<0.86	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	41	ug/l	<0.69	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	20	-	-	-
SVOC	Fluoranthene	WG	T	41	ug/l	<0.72	<0.75	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	0	0	80	-	-	-

Table 10. Round 4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Fluorene	WG	T	41	ug/l	<0.8	<0.84	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0	29	-	-	-
SVOC	Hexachlorobenzene	WG	T	41	ug/l	<0.47	<0.49	ND	ND	ND	ND	ND	0	0	41	100	0.2	0	0	1	41	100	0.0098	-	-	-
SVOC	Hexachlorobutadiene	WG	T	41	ug/l	<0.76	<0.79	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	41	100	0.14	-	-	-
SVOC	Hexachlorocyclopentadiene	WG	T	41	ug/l	<0.61	<0.64	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	41	100	0.041	-	-	-
SVOC	Hexachloroethane	WG	T	41	ug/l	<0.09	<0.094	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	0.33	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	41	ug/l	<0.21	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	41	100	0.034	-	-	-
SVOC	Isophorone	WG	T	41	ug/l	<0.67	<0.7	ND	ND	ND	ND	ND	0	0	0	0	400	-	-	-	0	0	78	-	-	-
SVOC	Naphthalene	WG	T	41	ug/l	<0.8	<0.84	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	41	100	0.17	-	-	-
SVOC	Nitrobenzene	WG	T	41	ug/l	<0.49	<0.51	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	41	100	0.14	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WG	T	41	ug/l	<0.83	<0.87	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	41	100	0.011	-	-	-
SVOC	N-Nitrosodiphenylamine	WG	T	41	ug/l	<0.74	<0.77	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0	12	-	-	-
SVOC	Pentachlorophenol	WG	T	41	ug/l	<2.2	<2.3	ND	ND	ND	ND	ND	0	0	41	100	1	41	100	1	41	100	0.041	-	-	-
SVOC	Phenanthrene	WG	T	41	ug/l	<0.65	<0.68	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	41	ug/l	<0.41	3.9	ND	ND	ND	ND	ND	1	2	0	0	300	-	-	-	0	0	580	-	-	-
SVOC	Pyrene	WG	T	41	ug/l	<0.83	<0.87	ND	ND	ND	ND	ND	0	0	0	0	830	-	-	-	0	0	12	-	-	-
VOC	1,1,1-Trichloroethane	WG	T	41	ug/l	<0.28	3.3	ND	ND	ND	ND	ND	1	2	0	0	200	0	0	200	0	0	800	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WG	T	41	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	41	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5500	-	-	-
VOC	1,1,2-Trichloroethane	WG	T	41	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	41	ug/l	<0.24	0.8	ND	ND	ND	ND	ND	1	2	0	0	4	-	-	-	0	0	2.8	-	-	-
VOC	1,1-Dichloroethene	WG	T	41	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	41	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	0	0	0.7	-	-	-
VOC	1,2,4-Trichlorobenzene	WG	T	41	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	0	0	0.4	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WG	T	41	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	41	100	0.00033	-	-	-
VOC	1,2-Dichlorobenzene	WG	T	41	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	600	0	0	600	0	0	30	-	-	-
VOC	1,2-Dichloroethane	WG	T	41	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	5	0	0	0.17	-	-	-
VOC	1,2-Dichloropropane	WG	T	41	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.44	-	-	-
VOC	1,3-Dichlorobenzene	WG	T	41	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	600	-	-	-	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	41	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0	0.48	-	-	-
VOC	2-Butanone (MEK)	WG	T	41	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	560	-	-	-
VOC	2-Hexanone	WG	T	41	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	41	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	630	-	-	-
VOC	Acetone	WG	T	41	ug/l	<1.1	13.0	ND	ND	ND	ND	ND	2	5	-	-	-	-	-	-	0	0	1400	-	-	-
VOC	Benzene	WG	T	41	ug/l	<0.09	0.17	ND	ND	ND	ND	ND	2	5	0	0	5	0	0	5	0	0	0.46	-	-	-
VOC	Bromoform	WG	T	41	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	80	0	0	80	0	0	3.3	-	-	-
VOC	Bromomethane	WG	T	41	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	10	-	-	-	0	0	0.75	-	-	-
VOC	Carbon disulfide	WG	T	41	ug/l	<0.22	0.37	ND	ND	ND	ND	ND	1	2	-	-	-	-	-	-	0	0	81	-	-	-
VOC	Carbon tetrachloride	WG	T	41	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	5	0	0	0.46	-	-	-

Table 10. Round 4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Chlorobenzene	WG	T	41	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	7.8	-	-	-
VOC	Chlorobromomethane	WG	T	41	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	8.3	-	-	-
VOC	Chlorodibromomethane	WG	T	41	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0	0.87	-	-	-
VOC	Chloroethane	WG	T	41	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2100	-	-	-
VOC	Chloroform	WG	T	41	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	70	0	0	80	0	0	0.22	-	-	-
VOC	Chloromethane	WG	T	41	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	19	-	-	-
VOC	cis-1,2-Dichloroethene	WG	T	41	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	41	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	41	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1300	-	-	-
VOC	Dichlorobromomethane	WG	T	41	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10	0	0	80	0	0	0.13	-	-	-
VOC	Dichlorodifluoromethane	WG	T	41	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	0	0	20	-	-	-
VOC	Ethylbenzene	WG	T	41	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	700	0	0	700	0	0	1.5	-	-	-
VOC	Ethylene Dibromide	WG	T	41	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	41	100	0.004	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	41	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	41	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2000	-	-	-
VOC	Methyl tert-butyl ether	WG	T	41	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	14	-	-	-
VOC	Methylcyclohexane	WG	T	41	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	41	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	11	-	-	-
VOC	m-Xylene & p-Xylene	WG	T	41	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	41	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	19	-	-	-
VOC	Styrene	WG	T	41	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	120	-	-	-
VOC	Tetrachloroethene	WG	T	41	ug/l	<0.12	0.54	ND	ND	ND	ND	0.14	3	7	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Toluene	WG	T	41	ug/l	<0.25	0.27	ND	ND	ND	ND	ND	1	2	0	0	1000	0	0	1000	0	0	110	-	-	-
VOC	trans-1,2-Dichloroethene	WG	T	41	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	41	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	41	ug/l	<0.22	0.72	ND	ND	ND	ND	ND	1	2	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WG	T	41	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	520	-	-	-
VOC	Vinyl chloride	WG	T	41	ug/l	<0.06	<0.06	0.03	0.03	2.11E-17	0.03	0.03	0	0	0	0	0.2	0	0	2	41	100	0.019	-	-	-

Table 11. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	52	ug/l	51,500	2,320,000	478,850	200,500	613,327	113,100	1,932,000	52	100.00	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WG	T	52	ug/l	<72	6,400	262.7019	92.05	885.9819	ND	509.45	30	57.69	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WG	T	52	ug/l	205.0	17,900	3,140	1,880	3,483	343.15	8,735	52	100.00	-	-	-	-	-	-	-	-	-
GENCHEM	Fluoride	WG	DI	13	ug/l	90.2	649.0	272.0923	193.0	180.0477	105.68	616.6	13	100.00	0	0	4000	0	0	4000	13	100	80
GENCHEM	Fluoride	WG	T	52	ug/l	<15	569.0	240.1577	199.0	136.2465	52.08	503.65	50	96.15	0	0	4000	0	0	4000	47	90	80
GENCHEM	Hardness as calcium carbonate	WG	T	52	ug/l	48,000	2,800,000	458,500	194,000	613,286	99,300	1,745,000	52	100.00	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WG	T	52	ug/l	<100	4,750	168.0962	ND	650.799	ND	213.85	13	25.00	0	0	10000	0	0	10000	-	-	-
GENCHEM	Orthophosphate as P	WG	T	49	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WG	T	52	ug/l	<127	96,400	9,912	5,250	14,557	838.1	29,860	51	98.08	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WG	T	52	mg/l	53.0	2,750	514.9808	217.5	654.2992	104.6	2,044	52	100.00	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WG	T	52	mg/l	5.0	1,180	124.3077	43.6	232.9161	9.185	526.75	52	100.00	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WG	T	13	ug/l	<18.2	6,370	1,152	664.0	1,704	ND	3,766	12	92.31	-	-	-	-	-	-	2	15	2000
METALS	Aluminum	WG	DI	52	ug/l	<18.2	902.0	75.6673	20.35	179.0528	ND	280.05	27	51.92	-	-	-	-	-	-	0	0	2000
METALS	Antimony	WG	T	13	ug/l	<0.62	10.0	1.2331	ND	2.6625	ND	4.96	4	30.77	1	8	6	1	8	6	3	23	0.78
METALS	Antimony	WG	DI	52	ug/l	<0.62	8.2	ND	ND	ND	ND	0.8645	5	9.62	1	2	6	1	2	6	4	8	0.78
METALS	Arsenic	WG	T	13	ug/l	<0.64	5.3	1.82	1.7	1.6996	ND	4.88	9	69.23	0	0	10	0	0	10	13	100	0.052
METALS	Arsenic	WG	DI	52	ug/l	<0.64	8.3	1.3325	ND	1.6127	ND	4.135	23	44.23	0	0	10	0	0	10	52	100	0.052
METALS	Barium	WG	DI	52	ug/l	5.8	4,430	375.6923	116.0	792.2688	41.915	2,242	52	100.00	4	8	1000	4	8	2000	8	15	380
METALS	Barium	WG	T	13	ug/l	54.5	2,310	335.6154	144.0	605.7548	60.08	1,202	13	100.00	1	8	1000	1	8	2000	2	15	380
METALS	Beryllium	WG	T	13	ug/l	<0.24	0.38	ND	ND	ND	ND	0.224	1	7.69	0	0	4	0	0	4	0	0	2.5
METALS	Beryllium	WG	DI	52	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	4	0	0	2.5
METALS	Cadmium	WG	DI	52	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.92
METALS	Cadmium	WG	T	13	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.92
METALS	Calcium	WG	DI	52	ug/l	4,800	922,000	142,019	38,350	215,870	17,025	608,300	52	100.00	-	-	-	-	-	-	-	-	-
METALS	Calcium	WG	T	13	ug/l	29,100	602,000	116,662	43,700	175,020	32,040	474,800	13	100.00	-	-	-	-	-	-	-	-	-
METALS	Chromium	WG	T	13	ug/l	<1.3	20.4	3.8231	1.5	5.641	ND	13.38	7	53.85	0	0	100	0	0	100	13	100	0.035
METALS	Chromium	WG	DI	52	ug/l	<1.3	24.1	2.8029	ND	5.5046	ND	16.54	11	21.15	0	0	100	0	0	100	52	100	0.035
METALS	Cobalt	WG	T	13	ug/l	<1.3	4.4	ND	ND	ND	ND	2.15	1	7.69	-	-	-	-	-	-	13	100	0.6
METALS	Cobalt	WG	DI	52	ug/l	<1.3	2.7	ND	ND	ND	ND	ND	1	1.92	-	-	-	-	-	-	52	100	0.6
METALS	Copper	WG	T	13	ug/l	<1.4	13.2	4.5846	3.4	4.1555	ND	12.48	11	84.62	0	0	1300	0	0	1300	0	0	80
METALS	Copper	WG	DI	52	ug/l	<1.4	8.4	1.7308	ND	1.9348	ND	6.055	16	30.77	0	0	1300	0	0	1300	0	0	80
METALS	Cyanide, Free	WG	DI	4	ug/l	<1.5	<1.5	ND	ND	ND	ND	ND	0	0.00	0	0	200	0	0	200	4	100	0.15
METALS	Cyanide, Free	WG	T	7	ug/l	<1.5	<1.5	ND	ND	ND	ND	ND	0	0.00	0	0	200	0	0	200	7	100	0.15
METALS	Cyanide, Total	WG	DI	13	ug/l	<2	10.1	1.8385	ND	2.5316	ND	5.72	2	15.38	0	0	200	0	0	200	13	100	0.15
METALS	Cyanide, Total	WG	T	52	ug/l	<2	10.5	ND	ND	ND	ND	6.935	7	13.46	0	0	200	0	0	200	52	100	0.15
METALS	Iron	WG	T	13	ug/l	181.0	17,400	3,636	2,110	4,884	233.8	11,676	13	100.00	-	-	-	-	-	-	7	54	1400
METALS	Iron	WG	DI	52	ug/l	<42.4	4,350	501.8308	ND	989.8175	ND	2,503	20	38.46	-	-	-	-	-	-	8	15	1400
METALS	Lead	WG	T	13	ug/l	<0.38	7.7	2.1585	1.1	2.4043	ND	7.04	12	92.31	0	0	15	0	0	15	0	0	15

Table 11. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WG	DI	52	ug/l	<0.38	1.5	0.3152	ND	0.3362	ND	1.245	8	15.38	0	0	15	0	0	15	0	0	15
METALS	Magnesium	WG	T	13	ug/l	<63.6	26,200	13,071	14,100	8,951	ND	24,760	12	92.31	-	-	-	-	-	-	-	-	-
METALS	Magnesium	WG	DI	52	ug/l	<63.6	33,000	10,733	10,950	8,294	ND	22,900	40	76.92	-	-	-	-	-	-	-	-	-
METALS	Manganese	WG	T	13	ug/l	<2.5	391.0	153.7154	96.5	146.4453	ND	376.0	12	92.31	-	-	-	-	-	-	9	69	43
METALS	Manganese	WG	DI	52	ug/l	<2.5	1,540	113.0385	35.0	227.0561	ND	316.55	39	75.00	-	-	-	-	-	-	25	48	43
METALS	Mercury	WG	DI	52	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	52	100	0.063
METALS	Mercury	WG	T	13	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	13	100	0.063
METALS	Nickel	WG	T	13	ug/l	<1.4	7.6	1.7385	ND	1.8958	ND	4.66	6	46.15	0	0	100	-	-	-	0	0	39
METALS	Nickel	WG	DI	52	ug/l	<1.4	3.4	ND	ND	ND	ND	1.15	3	5.77	0	0	100	-	-	-	0	0	39
METALS	Potassium	WG	DI	52	ug/l	721.0	65,200	5,933	2,370	9,773	782.95	17,935	52	100.00	-	-	-	-	-	-	-	-	-
METALS	Potassium	WG	T	13	ug/l	802.0	16,200	4,944	2,360	4,950	920.8	13,380	13	100.00	-	-	-	-	-	-	-	-	-
METALS	Selenium	WG	DI	52	ug/l	<0.73	2.0	ND	ND	ND	ND	1.145	4	7.69	0	0	50	0	0	50	0	0	10
METALS	Selenium	WG	T	13	ug/l	<0.73	0.98	ND	ND	ND	ND	0.614	1	7.69	0	0	50	0	0	50	0	0	10
METALS	Silver	WG	DI	52	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	0	0	9.4
METALS	Silver	WG	T	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	0	0	9.4
METALS	Sodium	WG	DI	52	ug/l	3,400	102,000	17,192	10,450	19,880	3,755	49,360	52	100.00	-	-	-	-	-	-	-	-	-
METALS	Sodium	WG	T	13	ug/l	4,050	31,200	12,642	9,740	8,388	4,170	25,440	13	100.00	-	-	-	-	-	-	-	-	-
METALS	Thallium	WG	DI	52	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	52	100	0.02
METALS	Thallium	WG	T	13	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	13	100	0.02
METALS	Vanadium	WG	T	13	ug/l	<1.9	5.2	1.8385	ND	1.5538	ND	5.2	5	38.46	-	-	-	-	-	-	0	0	8.6
METALS	Vanadium	WG	DI	52	ug/l	<1.9	5.4	ND	ND	ND	ND	3.535	6	11.54	-	-	-	-	-	-	0	0	8.6
METALS	Zinc	WG	T	13	ug/l	<7	907.0	168.1385	11.6	316.0209	ND	824.8	10	76.92	0	0	2000	-	-	-	2	15	600
METALS	Zinc	WG	DI	52	ug/l	<7	176.0	ND	ND	ND	ND	16.81	7	13.46	0	0	2000	-	-	-	0	0	600
SVOC	1,1'-Biphenyl	WG	T	4	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	4	100	0.083
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	4	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0.00	0	0	0.97	-	-	-	4	100	0.17
SVOC	1,4-Dioxane	WG	T	4	ug/l	<3.1	<3.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	4	100	0.46
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	4	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0.00	0	0	1400	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	4	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	24
SVOC	2,4,5-Trichlorophenol	WG	T	4	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0.00	0	0	1800	-	-	-	0	0	120
SVOC	2,4,6-Trichlorophenol	WG	T	4	ug/l	<0.53	<0.53	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	1.2
SVOC	2,4-Dichlorophenol	WG	T	4	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0.00	0	0	77	-	-	-	0	0	4.6
SVOC	2,4-Dimethylphenol	WG	T	4	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0.00	0	0	380	-	-	-	0	0	36
SVOC	2,4-Dinitrophenol	WG	T	4	ug/l	<2.4	<2.4	ND	ND	ND	ND	ND	0	0.00	0	0	69	-	-	-	0	0	3.9
SVOC	2,4-Dinitrotoluene	WG	T	4	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	0	0	1.1	-	-	-	4	100	0.24
SVOC	2,6-Dinitrotoluene	WG	T	4	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	4	100	0.049
SVOC	2-Chloronaphthalene	WG	T	4	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0.00	0	0	1000	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	4	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0.00	0	0	81	-	-	-	0	0	9.1
SVOC	2-Methylnaphthalene	WG	T	4	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.6

Table 11. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2-Methylphenol	WG	T	4	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	4	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	19
SVOC	2-Nitrophenol	WG	T	4	ug/l	<0.59	<0.59	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	4	ug/l	<0.88	1.4	0.68	ND	0.48	ND	1.256	1	25.00	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	4	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	4	100	0.21	-	-	-	4	100	0.13
SVOC	3-Nitroaniline	WG	T	4	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	4	ug/l	<2	<2	ND	ND	ND	ND	ND	0	0.00	0	0	13	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	4	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	4	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0.00	0	0	3000	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	4	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	1	25	0.37
SVOC	4-Chlorophenyl phenyl ether	WG	T	4	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	4	ug/l	<0.48	<0.48	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.8
SVOC	4-Nitrophenol	WG	T	4	ug/l	<4.7	<4.7	ND	ND	ND	ND	ND	0	0.00	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	4	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0.00	0	0	670	-	-	-	0	0	53
SVOC	Acenaphthylene	WG	T	4	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	4	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	190
SVOC	Anthracene	WG	T	4	ug/l	<0.57	<0.57	ND	ND	ND	ND	ND	0	0.00	0	0	2100	-	-	-	0	0	180
SVOC	Atrazine	WG	T	4	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0.00	0	0	3	0	0	3	4	100	0.3
SVOC	Benzaldehyde	WG	T	4	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	190
SVOC	Benzo[a]anthracene	WG	T	4	ug/l	<0.55	<0.55	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	4	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0.00	4	100	0.05	0	0	0.2	4	100	0.003
SVOC	Benzo[b]fluoranthene	WG	T	4	ug/l	<0.44	<0.44	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	4	100	0.034
SVOC	Benzo[g,h,i]perylene	WG	T	4	ug/l	<0.75	<0.75	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	0	0	0.34
SVOC	Bis(2-chloroethoxy)methane	WG	T	4	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	5.9
SVOC	Bis(2-chloroethyl)ether	WG	T	4	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0.00	0	0	0.3	-	-	-	4	100	0.014
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	4	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0.00	0	0	6	0	0	6	0	0	5.6
SVOC	Butyl benzyl phthalate	WG	T	4	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0.00	0	0	1500	-	-	-	0	0	16
SVOC	Caprolactam	WG	T	4	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	990
SVOC	Carbazole	WG	T	4	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	4	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0.00	0	0	50	-	-	-	0	0	3.4
SVOC	Dibenz(a,h)anthracene	WG	T	4	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0.00	0	0	0.05	-	-	-	4	100	0.003
SVOC	Dibenzofuran	WG	T	4	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	0.79
SVOC	Diethyl phthalate	WG	T	4	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	0	0	17000	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	4	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0.00	0	0	270000	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	4	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0.00	0	0	2000	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	4	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	20
SVOC	Fluoranthene	WG	T	4	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0.00	0	0	130	-	-	-	0	0	80

Table 11. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Fluorene	WG	T	4	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0.00	0	0	1100	-	-	-	0	0	29
SVOC	Hexachlorobenzene	WG	T	4	ug/l	<0.47	<0.47	ND	ND	ND	ND	ND	0	0.00	4	100	0.2	0	0	1	4	100	0.01
SVOC	Hexachlorobutadiene	WG	T	4	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	4	100	0.14
SVOC	Hexachlorocyclopentadiene	WG	T	4	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0.00	0	0	50	0	0	50	4	100	0.041
SVOC	Hexachloroethane	WG	T	4	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	0.33
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	4	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	4	100	0.034
SVOC	Isophorone	WG	T	4	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0.00	0	0	400	-	-	-	0	0	78
SVOC	Naphthalene	WG	T	4	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	4	100	0.17
SVOC	Nitrobenzene	WG	T	4	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0.00	0	0	17	-	-	-	4	100	0.14
SVOC	N-Nitrosodi-n-propylamine	WG	T	4	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	4	100	0.011
SVOC	N-Nitrosodiphenylamine	WG	T	4	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0.00	0	0	33	-	-	-	0	0	12
SVOC	Pentachlorophenol	WG	T	4	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0.00	4	100	1	4	100	1	4	100	0.041
SVOC	Phenanthrene	WG	T	4	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	4	ug/l	<0.41	<0.41	ND	ND	ND	ND	ND	0	0.00	0	0	300	-	-	-	0	0	580
SVOC	Pyrene	WG	T	4	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0.00	0	0	830	-	-	-	0	0	12
VOC	1,1,1-Trichloroethane	WG	T	4	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0.00	0	0	200	0	0	200	0	0	800
VOC	1,1,2,2-Tetrachloroethane	WG	T	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	2	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	4	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	5500
VOC	1,1,2-Trichloroethane	WG	T	4	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0.00	0	0	3	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	4	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	4	-	-	-	0	0	2.8
VOC	1,1-Dichloroethene	WG	T	4	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0.00	0	0	7	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	4	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0.00	0	0	0.7	-	-	-	0	0	0.7
VOC	1,2,4-Trichlorobenzene	WG	T	4	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0.00	0	0	70	-	-	-	0	0	0.4
VOC	1,2-Dibromo-3-Chloropropane	WG	T	4	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0.00	0	0	0.2	0	0	0.2	4	100	3E-04
VOC	1,2-Dichlorobenzene	WG	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	600	0	0	600	0	0	30
VOC	1,2-Dichloroethane	WG	T	4	ug/l	<0.25	0.28	0.1675	ND	0.075	ND	0.2575	1	25.00	0	0	4	0	0	5	1	25	0.17
VOC	1,2-Dichloropropane	WG	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.44
VOC	1,3-Dichlorobenzene	WG	T	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	600	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	75	0	0	75	0	0	0.48
VOC	2-Butanone (MEK)	WG	T	4	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	560
VOC	2-Hexanone	WG	T	4	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.8
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	4	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	630
VOC	Acetone	WG	T	4	ug/l	<1.1	4.9	1.6375	ND	2.175	ND	4.2475	1	25.00	-	-	-	-	-	-	0	0	1400
VOC	Benzene	WG	T	4	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.46
VOC	Bromoform	WG	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	80	0	0	80	0	0	3.3
VOC	Bromomethane	WG	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	10	-	-	-	0	0	0.75
VOC	Carbon disulfide	WG	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	81
VOC	Carbon tetrachloride	WG	T	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	3	0	0	5	0	0	0.46

Table 11. Round 1-4 Groundwater in Monitoring Wells Screened in Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Chlorobenzene	WG	T	4	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	100	0	0	100	0	0	7.8
VOC	Chlorobromomethane	WG	T	4	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	8.3
VOC	Chlorodibromomethane	WG	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	80	0	0	0.87
VOC	Chloroethane	WG	T	4	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	2100
VOC	Chloroform	WG	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	70	0	0	80	0	0	0.22
VOC	Chloromethane	WG	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	19
VOC	cis-1,2-Dichloroethene	WG	T	4	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	70	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	4	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0.00	0	0	4	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	4	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	1300
VOC	Dichlorobromomethane	WG	T	4	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0.00	0	0	10	0	0	80	0	0	0.13
VOC	Dichlorodifluoromethane	WG	T	4	ug/l	<0.14	3.5	1.87	1.955	1.6866	ND	3.44	3	75.00	0	0	1000	-	-	-	0	0	20
VOC	Ethylbenzene	WG	T	4	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0.00	0	0	700	0	0	700	0	0	1.5
VOC	Ethylene Dibromide	WG	T	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	4	100	0.004	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	4	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	4	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	2000
VOC	Methyl tert-butyl ether	WG	T	4	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	14
VOC	Methylcyclohexane	WG	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	4	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	11
VOC	m-Xylene & p-Xylene	WG	T	4	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	4	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0.00	0	0	10000	-	-	-	0	0	19
VOC	Styrene	WG	T	4	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	100	0	0	100	0	0	120
VOC	Tetrachloroethene	WG	T	4	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	-	-	-
VOC	Toluene	WG	T	4	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0.00	0	0	1000	0	0	1000	0	0	110
VOC	trans-1,2-Dichloroethene	WG	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	2	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WG	T	4	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0.00	0	0	10000	-	-	-	0	0	520
VOC	Vinyl chloride	WG	T	4	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0.00	0	0	0.2	0	0	2	4	100	0.019

Table 12. Round 1 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	13	ug/l	112,000	2,320,000	641,538	200,000	797,000	115,600	2,044,000	13	100	-	-	-	-	-	-	-	-	-	6	46	200000
GENCHEM	Ammonia	WG	T	13	ug/l	<72	6,400	615.5077	95.7	1,743	ND	2,860	8	62	-	-	-	-	-	-	-	-	-	8	62	72
GENCHEM	Chloride	WG	T	13	ug/l	459.0	17,900	4,585	3,500	4,730	526.2	12,320	13	100	-	-	-	-	-	-	-	-	-	11	85	611
GENCHEM	Fluoride	WG	T	13	ug/l	<15	405.0	176.9385	147.0	146.5973	ND	401.4	11	85	0	0	4000	0	0	4000	8	62	80	8	62	91.7
GENCHEM	Hardness as calcium carbonate	WG	T	13	ug/l	102,000	2,220,000	617,231	194,000	769,928	105,600	1,968,000	13	100	-	-	-	-	-	-	-	-	-	4	31	206000
GENCHEM	Nitrate Nitrite as N	WG	T	13	ug/l	<100	<100	ND	ND	ND	ND	ND	0	0	0	0	10000	0	0	10000	-	-	-	0	0	100
GENCHEM	Orthophosphate as P	WG	T	13	ug/l	<42	<42	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	0	0	42
GENCHEM	Sulfate	WG	T	13	ug/l	797.0	96,400	15,591	5,260	26,201	814.4	60,580	13	100	-	-	-	-	-	-	-	-	-	6	46	6600
GENCHEM	Total Dissolved Solids	WG	T	13	mg/l	98.0	2,280	641.0	234.0	754.3251	105.2	1,980	13	100	-	-	-	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WG	T	13	mg/l	8.1	1,090	177.4923	34.7	316.9779	8.94	776.8	13	100	-	-	-	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WG	DI	13	ug/l	<18.2	168.0	53.5923	33.8	52.903	ND	149.4	8	62	-	-	-	-	-	-	0	0	2000	8	62	18.2
METALS	Antimony	WG	DI	13	ug/l	<0.62	0.87	0.3769	ND	0.1711	ND	0.72	2	15	0	0	6	0	0	6	1	8	0.78	1	8	0.62
METALS	Arsenic	WG	DI	13	ug/l	<0.64	8.3	1.73	ND	2.4906	ND	6.44	5	38	0	0	10	0	0	10	13	100	0.052	5	38	0.64
METALS	Barium	WG	DI	13	ug/l	42.7	4,430	555.5462	87.4	1,204	44.86	2,326	13	100	1	8	1000	1	8	2000	3	23	380	4	31	228
METALS	Beryllium	WG	DI	13	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0	2.5	0	0	0.24
METALS	Cadmium	WG	DI	13	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Calcium	WG	DI	13	ug/l	13,700	922,000	210,215	38,300	307,188	14,540	745,600	13	100	-	-	-	-	-	-	-	-	-	4	31	60300
METALS	Chromium	WG	DI	13	ug/l	<1.3	16.0	2.8962	ND	4.9331	ND	13.24	4	31	0	0	100	0	0	100	13	100	0.035	3	23	1.3
METALS	Cobalt	WG	DI	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	13	100	0.6	0	0	1.3
METALS	Copper	WG	DI	13	ug/l	<1.4	7.1	1.9385	ND	1.8728	ND	5.06	6	46	0	0	1300	0	0	1300	0	0	80	2	15	3.2
METALS	Cyanide, Total	WG	T	13	ug/l	<2	5.9	1.4615	ND	1.3678	ND	3.62	2	15	0	0	200	0	0	200	13	100	0.15	1	8	2.4
METALS	Iron	WG	DI	13	ug/l	<42.4	2,290	300.2154	ND	639.5845	ND	1,355	4	31	-	-	-	-	-	-	1	8	1400	4	31	42.4
METALS	Lead	WG	DI	13	ug/l	<0.38	1.3	0.3577	ND	0.3256	ND	0.892	4	31	0	0	15	0	0	15	0	0	15	4	31	0.38
METALS	Magnesium	WG	DI	13	ug/l	<63.6	24,100	8,737	7,470	8,177	ND	20,860	9	69	-	-	-	-	-	-	-	-	-	4	31	14100
METALS	Manganese	WG	DI	13	ug/l	<2.5	297.0	51.1462	21.6	79.8766	ND	170.52	9	69	-	-	-	-	-	-	5	38	43	9	69	2.5
METALS	Mercury	WG	DI	13	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	13	100	0.063	0	0	0.17
METALS	Nickel	WG	DI	13	ug/l	<1.4	<1.4	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	39	0	0	1.4
METALS	Potassium	WG	DI	13	ug/l	721.0	65,200	11,267	3,270	17,523	1,230	39,040	13	100	-	-	-	-	-	-	-	-	-	12	92	740
METALS	Selenium	WG	DI	13	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0	10	0	0	0.73
METALS	Silver	WG	DI	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Sodium	WG	DI	13	ug/l	3,700	102,000	25,602	17,500	27,763	3,820	71,340	13	100	-	-	-	-	-	-	-	-	-	9	69	8360
METALS	Thallium	WG	DI	13	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	13	100	0.02	0	0	0.26
METALS	Vanadium	WG	DI	13	ug/l	<1.9	5.4	1.6462	ND	1.4285	ND	4.38	3	23	-	-	-	-	-	-	0	0	8.6	3	23	1.9
METALS	Zinc	WG	DI	13	ug/l	<7	<7	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	0	0	600	0	0	7
SVOC	1,1'-Biphenyl	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100	0.083	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	1	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	1	100	0.17	-	-	-
SVOC	1,4-Dioxane	WG	T	1	ug/l	<3.1	<3.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100	0.46	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-	-	-	-

Table 12. Round 1 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	24	-	-	-
SVOC	2,4,5-Trichlorophenol	WG	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0	120	-	-	-
SVOC	2,4,6-Trichlorophenol	WG	T	1	ug/l	<0.53	<0.53	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	1.2	-	-	-
SVOC	2,4-Dichlorophenol	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0	4.6	-	-	-
SVOC	2,4-Dimethylphenol	WG	T	1	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0	36	-	-	-
SVOC	2,4-Dinitrophenol	WG	T	1	ug/l	<2.4	<2.4	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0	3.9	-	-	-
SVOC	2,4-Dinitrotoluene	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	1	100	0.24	-	-	-
SVOC	2,6-Dinitrotoluene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.049	-	-	-
SVOC	2-Chloronaphthalene	WG	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0	9.1	-	-	-
SVOC	2-Methylnaphthalene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.6	-	-	-
SVOC	2-Methylphenol	WG	T	1	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	19	-	-	-
SVOC	2-Nitrophenol	WG	T	1	ug/l	<0.59	<0.59	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	1	100	0.21	-	-	-	1	100	0.13	-	-	-
SVOC	3-Nitroaniline	WG	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	1	ug/l	<2	<2	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.37	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WG	T	1	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	1	ug/l	<0.48	<0.48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
SVOC	4-Nitrophenol	WG	T	1	ug/l	<4.7	<4.7	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0	53	-	-	-
SVOC	Acenaphthylene	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Anthracene	WG	T	1	ug/l	<0.57	<0.57	ND	ND	ND	ND	ND	0	0	0	0	2100	-	-	-	0	0	180	-	-	-
SVOC	Atrazine	WG	T	1	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	1	100	0.3	-	-	-
SVOC	Benzaldehyde	WG	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Benzo[a]anthracene	WG	T	1	ug/l	<0.55	<0.55	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	1	100	0.05	0	0	0.2	1	100	0.0034	-	-	-
SVOC	Benzo[b]fluoranthene	WG	T	1	ug/l	<0.44	<0.44	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.034	-	-	-
SVOC	Benzo[g,h,i]perylene	WG	T	1	ug/l	<0.75	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	0	0	0.34	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5.9	-	-	-
SVOC	Bis(2-chloroethyl)ether	WG	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	1	100	0.014	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0	5.6	-	-	-

Table 12. Round 1 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Butyl benzyl phthalate	WG	T	1	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0	16	-	-	-
SVOC	Caprolactam	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	990	-	-	-
SVOC	Carbazole	WG	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0	0	0	50	-	-	-	0	0	3.4	-	-	-
SVOC	Dibenz(a,h)anthracene	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	0.05	-	-	-	1	100	0.0034	-	-	-
SVOC	Dibenzofuran	WG	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.79	-	-	-
SVOC	Diethyl phthalate	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	1	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0	0	0	3E+05	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	20	-	-	-
SVOC	Fluoranthene	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	0	0	80	-	-	-
SVOC	Fluorene	WG	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0	29	-	-	-
SVOC	Hexachlorobenzene	WG	T	1	ug/l	<0.47	<0.47	ND	ND	ND	ND	ND	0	0	1	100	0.2	0	0	1	1	100	0.0098	-	-	-
SVOC	Hexachlorobutadiene	WG	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	1	100	0.14	-	-	-
SVOC	Hexachlorocyclopentadiene	WG	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	1	100	0.041	-	-	-
SVOC	Hexachloroethane	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	0.33	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.034	-	-	-
SVOC	Isophorone	WG	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0	0	0	400	-	-	-	0	0	78	-	-	-
SVOC	Naphthalene	WG	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	1	100	0.17	-	-	-
SVOC	Nitrobenzene	WG	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	1	100	0.14	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WG	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.011	-	-	-
SVOC	N-Nitrosodiphenylamine	WG	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0	12	-	-	-
SVOC	Pentachlorophenol	WG	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	1	100	1	1	100	1	1	100	0.041	-	-	-
SVOC	Phenanthrene	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	1	ug/l	<0.41	<0.41	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0	580	-	-	-
SVOC	Pyrene	WG	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0	0	0	830	-	-	-	0	0	12	-	-	-
VOC	1,1,1-Trichloroethane	WG	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	0	0	800	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5500	-	-	-
VOC	1,1,2-Trichloroethane	WG	T	1	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	0	0	2.8	-	-	-
VOC	1,1-Dichloroethene	WG	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	1	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	0	0	0.7	-	-	-
VOC	1,2,4-Trichlorobenzene	WG	T	1	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	0	0	0.4	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WG	T	1	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	1	100	0.00033	-	-	-
VOC	1,2-Dichlorobenzene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	600	0	0	600	0	0	30	-	-	-
VOC	1,2-Dichloroethane	WG	T	1	ug/l	0.28	0.28	0.28	0.28	-	0.28	0.28	1	100	0	0	4	0	0	5	1	100	0.17	-	-	-
VOC	1,2-Dichloropropane	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.44	-	-	-

Table 12. Round 1 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 1		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	1,3-Dichlorobenzene	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	600	-	-	-	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0	0.48	-	-	-
VOC	2-Butanone (MEK)	WG	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	560	-	-	-
VOC	2-Hexanone	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	630	-	-	-
VOC	Acetone	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1400	-	-	-
VOC	Benzene	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.46	-	-	-
VOC	Bromoform	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	80	0	0	80	0	0	3.3	-	-	-
VOC	Bromomethane	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	10	-	-	-	0	0	0.75	-	-	-
VOC	Carbon disulfide	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	81	-	-	-
VOC	Carbon tetrachloride	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	5	0	0	0.46	-	-	-
VOC	Chlorobenzene	WG	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	7.8	-	-	-
VOC	Chlorobromomethane	WG	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	8.3	-	-	-
VOC	Chlorodibromomethane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0	0.87	-	-	-
VOC	Chloroethane	WG	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2100	-	-	-
VOC	Chloroform	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	70	0	0	80	0	0	0.22	-	-	-
VOC	Chloromethane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	19	-	-	-
VOC	cis-1,2-Dichloroethene	WG	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1300	-	-	-
VOC	Dichlorobromomethane	WG	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10	0	0	80	0	0	0.13	-	-	-
VOC	Dichlorodifluoromethane	WG	T	1	ug/l	3.1	3.1	3.1	3.1	-	3.1	3.1	1	100	0	0	1000	-	-	-	0	0	20	-	-	-
VOC	Ethylbenzene	WG	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	700	0	0	700	0	0	1.5	-	-	-
VOC	Ethylene Dibromide	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	1	100	0.004	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2000	-	-	-
VOC	Methyl tert-butyl ether	WG	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	14	-	-	-
VOC	Methylcyclohexane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	11	-	-	-
VOC	m-Xylene & p-Xylene	WG	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	19	-	-	-
VOC	Styrene	WG	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	120	-	-	-
VOC	Tetrachloroethene	WG	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Toluene	WG	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	1000	0	0	1000	0	0	110	-	-	-
VOC	trans-1,2-Dichloroethene	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WG	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	520	-	-	-

Table 13. Round 2 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 2		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	13	ug/l	51,500	2,020,000	445,554	177,000	581,149	75,020	1,528,000	13	100	-	-	-	-	-	-	-	-	-	4	31	206000
GENCHEM	Ammonia	WG	T	13	ug/l	<72	1,060	166.2308	ND	282.0645	ND	617.8	6	46	-	-	-	-	-	-	-	-	-	6	46	72
GENCHEM	Chloride	WG	T	13	ug/l	205.0	8,600	2,613	2,030	2,259	454.0	6,566	13	100	-	-	-	-	-	-	-	-	-	11	85	799
GENCHEM	Fluoride	WG	T	13	ug/l	107.0	537.0	237.0769	194.0	128.3598	114.2	454.8	13	100	0	0	4000	0	0	4000	13	100	80	10	77	132
GENCHEM	Hardness as calcium carbonate	WG	T	13	ug/l	48,000	2,800,000	518,308	174,000	776,751	76,800	1,840,000	13	100	-	-	-	-	-	-	-	-	-	4	31	228000
GENCHEM	Nitrate Nitrite as N	WG	T	13	ug/l	<100	221.0	88.3077	ND	58.581	ND	200.0	5	38	0	0	10000	0	0	10000	-	-	-	5	38	100
GENCHEM	Orthophosphate as P	WG	T	13	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WG	T	13	ug/l	848.0	34,700	8,688	4,820	9,702	957.2	26,900	13	100	-	-	-	-	-	-	-	-	-	6	46	4980
GENCHEM	Total Dissolved Solids	WG	T	13	mg/l	53.0	2,750	516.1538	199.0	742.3198	68.0	1,748	13	100	-	-	-	-	-	-	-	-	-	6	46	202
GENCHEM	Total Suspended Solids	WG	T	13	mg/l	8.8	1,180	170.0462	50.8	313.5587	10.3	606.4	13	100	-	-	-	-	-	-	-	-	-	1	8	434
METALS	Aluminum	WG	DI	13	ug/l	<18.2	417.0	57.0615	20.5	112.2736	ND	235.8	7	54	-	-	-	-	-	-	0	0	2000	7	54	18.2
METALS	Antimony	WG	DI	13	ug/l	<0.62	0.86	ND	ND	ND	ND	0.53	1	7.7	0	0	6	0	0	6	1	8	0.78	1	8	0.62
METALS	Arsenic	WG	DI	13	ug/l	<0.64	4.0	1.4262	ND	1.3658	ND	3.7	6	46	0	0	10	0	0	10	13	100	0.052	6	46	1.2
METALS	Barium	WG	DI	13	ug/l	5.8	2,390	316.9846	111.0	634.4138	26.26	1,174	13	100	1	8	1000	1	8	2000	1	8	380	8	62	76.6
METALS	Beryllium	WG	DI	13	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0	2.5	0	0	0.24
METALS	Cadmium	WG	DI	13	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Calcium	WG	DI	13	ug/l	4,800	593,000	121,623	31,300	175,374	13,560	443,600	13	100	-	-	-	-	-	-	-	-	-	4	31	54900
METALS	Chromium	WG	DI	13	ug/l	<1.3	22.3	2.9692	ND	6.1604	ND	13.78	3	23	0	0	100	0	0	100	13	100	0.035	3	23	1.3
METALS	Cobalt	WG	DI	13	ug/l	<1.3	2.7	ND	ND	ND	ND	1.47	1	7.7	-	-	-	-	-	-	13	100	0.6	1	8	1.3
METALS	Copper	WG	DI	13	ug/l	<1.4	4.5	1.4385	ND	1.3029	ND	3.96	4	31	0	0	1300	0	0	1300	0	0	80	3	23	1.8
METALS	Cyanide, Total	WG	T	13	ug/l	<2	8.2	1.7308	ND	2.0451	ND	5.26	2	15	0	0	200	0	0	200	13	100	0.15	2	15	2
METALS	Iron	WG	DI	13	ug/l	<42.4	4,350	707.8462	ND	1,391	ND	3,204	3	23	-	-	-	-	-	-	3	23	1400	3	23	42.4
METALS	Lead	WG	DI	13	ug/l	<0.38	0.89	ND	ND	ND	ND	0.47	1	7.7	0	0	15	0	0	15	0	0	15	1	8	0.38
METALS	Magnesium	WG	DI	13	ug/l	<63.6	33,000	10,789	10,400	9,354	ND	26,100	11	85	-	-	-	-	-	-	-	-	-	4	31	13100
METALS	Manganese	WG	DI	13	ug/l	<2.5	1,540	170.9385	30.7	417.3398	ND	760.6	10	77	-	-	-	-	-	-	6	46	43	8	62	15.7
METALS	Mercury	WG	DI	13	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	13	100	0.063	0	0	0.17
METALS	Nickel	WG	DI	13	ug/l	<1.4	<1.4	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	39	0	0	1.4
METALS	Potassium	WG	DI	13	ug/l	767.0	13,500	3,755	2,500	3,493	1,033	9,300	13	100	-	-	-	-	-	-	-	-	-	13	100	737
METALS	Selenium	WG	DI	13	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0	10	0	0	0.73
METALS	Silver	WG	DI	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Sodium	WG	DI	13	ug/l	3,430	47,500	14,696	10,000	12,818	3,652	35,920	13	100	-	-	-	-	-	-	-	-	-	10	77	4380
METALS	Thallium	WG	DI	13	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	13	100	0.02	0	0	0.26
METALS	Vanadium	WG	DI	13	ug/l	<1.9	3.4	ND	ND	ND	ND	1.93	1	7.7	-	-	-	-	-	-	0	0	8.6	1	8	1.9
METALS	Zinc	WG	DI	13	ug/l	<7	7.6	ND	ND	ND	ND	5.14	1	7.7	0	0	2000	-	-	-	0	0	600	1	8	7
SVOC	1,1'-Biphenyl	WG	T	1	ug/l	<0.66	<0.66	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100	0.083	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	1	ug/l	<0.45	<0.45	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	1	100	0.17	-	-	-
SVOC	1,4-Dioxane	WG	T	1	ug/l	<3.3	<3.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100	0.46	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	1	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-	-	-	-

Table 13. Round 2 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 2		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	24	-	-	-
SVOC	2,4,5-Trichlorophenol	WG	T	1	ug/l	<0.52	<0.52	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0	120	-	-	-
SVOC	2,4,6-Trichlorophenol	WG	T	1	ug/l	<0.56	<0.56	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	1.2	-	-	-
SVOC	2,4-Dichlorophenol	WG	T	1	ug/l	<0.66	<0.66	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0	4.6	-	-	-
SVOC	2,4-Dimethylphenol	WG	T	1	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0	36	-	-	-
SVOC	2,4-Dinitrophenol	WG	T	1	ug/l	<2.5	<2.5	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0	3.9	-	-	-
SVOC	2,4-Dinitrotoluene	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	1	100	0.24	-	-	-
SVOC	2,6-Dinitrotoluene	WG	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.049	-	-	-
SVOC	2-Chloronaphthalene	WG	T	1	ug/l	<0.64	<0.64	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	1	ug/l	<0.78	<0.78	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0	9.1	-	-	-
SVOC	2-Methylnaphthalene	WG	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.6	-	-	-
SVOC	2-Methylphenol	WG	T	1	ug/l	<1.4	<1.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	19	-	-	-
SVOC	2-Nitrophenol	WG	T	1	ug/l	<0.62	<0.62	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	1	ug/l	1.4	1.4	1.4	1.4	-	1.4	1.4	1	100	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	1	100	0.21	-	-	-	1	100	0.13	-	-	-
SVOC	3-Nitroaniline	WG	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	1	ug/l	<2.1	<2.1	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	1	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100	0.37	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	1	ug/l	<0.51	<0.51	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
SVOC	4-Nitrophenol	WG	T	1	ug/l	<4.9	<4.9	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0	53	-	-	-
SVOC	Acenaphthylene	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Anthracene	WG	T	1	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0	0	0	2100	-	-	-	0	0	180	-	-	-
SVOC	Atrazine	WG	T	1	ug/l	<0.81	<0.81	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	1	100	0.3	-	-	-
SVOC	Benzaldehyde	WG	T	1	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Benzo[a]anthracene	WG	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	1	100	0.05	0	0	0.2	1	100	0.0034	-	-	-
SVOC	Benzo[b]fluoranthene	WG	T	1	ug/l	<0.46	<0.46	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.034	-	-	-
SVOC	Benzo[g,h,i]perylene	WG	T	1	ug/l	<0.79	<0.79	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	0	0	0.34	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WG	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5.9	-	-	-
SVOC	Bis(2-chloroethyl)ether	WG	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	1	100	0.014	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0	5.6	-	-	-

Table 13. Round 2 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 2		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Butyl benzyl phthalate	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0	16	-	-	-
SVOC	Caprolactam	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	990	-	-	-
SVOC	Carbazole	WG	T	1	ug/l	<0.9	<0.9	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	1	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	50	-	-	-	0	0	3.4	-	-	-
SVOC	Dibenz(a,h)anthracene	WG	T	1	ug/l	<0.095	<0.095	ND	ND	ND	ND	ND	0	0	0	0	0.05	-	-	-	1	100	0.0034	-	-	-
SVOC	Dibenzofuran	WG	T	1	ug/l	<0.9	<0.9	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.79	-	-	-
SVOC	Diethyl phthalate	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	3E+05	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	20	-	-	-
SVOC	Fluoranthene	WG	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	0	0	80	-	-	-
SVOC	Fluorene	WG	T	1	ug/l	<0.84	<0.84	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0	29	-	-	-
SVOC	Hexachlorobenzene	WG	T	1	ug/l	<0.5	<0.5	ND	ND	ND	ND	ND	0	0	1	100	0.2	0	0	1	1	100	0.0098	-	-	-
SVOC	Hexachlorobutadiene	WG	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	1	100	0.14	-	-	-
SVOC	Hexachlorocyclopentadiene	WG	T	1	ug/l	<0.64	<0.64	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	1	100	0.041	-	-	-
SVOC	Hexachloroethane	WG	T	1	ug/l	<0.095	<0.095	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	0.33	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.034	-	-	-
SVOC	Isophorone	WG	T	1	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	400	-	-	-	0	0	78	-	-	-
SVOC	Naphthalene	WG	T	1	ug/l	<0.84	<0.84	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	1	100	0.17	-	-	-
SVOC	Nitrobenzene	WG	T	1	ug/l	<0.52	<0.52	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	1	100	0.14	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.011	-	-	-
SVOC	N-Nitrosodiphenylamine	WG	T	1	ug/l	<0.78	<0.78	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0	12	-	-	-
SVOC	Pentachlorophenol	WG	T	1	ug/l	<2.3	<2.3	ND	ND	ND	ND	ND	0	0	1	100	1	1	100	1	1	100	0.041	-	-	-
SVOC	Phenanthrene	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	1	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0	580	-	-	-
SVOC	Pyrene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	830	-	-	-	0	0	12	-	-	-
VOC	1,1,1-Trichloroethane	WG	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	0	0	800	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5500	-	-	-
VOC	1,1,2-Trichloroethane	WG	T	1	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	0	0	2.8	-	-	-
VOC	1,1-Dichloroethene	WG	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	1	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	0	0	0.7	-	-	-
VOC	1,2,4-Trichlorobenzene	WG	T	1	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	0	0	0.4	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WG	T	1	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	1	100	0.00033	-	-	-
VOC	1,2-Dichlorobenzene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	600	0	0	600	0	0	30	-	-	-
VOC	1,2-Dichloroethane	WG	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	5	0	0	0.17	-	-	-
VOC	1,2-Dichloropropane	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.44	-	-	-

Table 13. Round 2 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 2		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	1,3-Dichlorobenzene	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	600	-	-	-	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0	0.48	-	-	-
VOC	2-Butanone (MEK)	WG	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	560	-	-	-
VOC	2-Hexanone	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	630	-	-	-
VOC	Acetone	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1400	-	-	-
VOC	Benzene	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.46	-	-	-
VOC	Bromoform	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	80	0	0	80	0	0	3.3	-	-	-
VOC	Bromomethane	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	10	-	-	-	0	0	0.75	-	-	-
VOC	Carbon disulfide	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	81	-	-	-
VOC	Carbon tetrachloride	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	5	0	0	0.46	-	-	-
VOC	Chlorobenzene	WG	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	7.8	-	-	-
VOC	Chlorobromomethane	WG	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	8.3	-	-	-
VOC	Chlorodibromomethane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0	0.87	-	-	-
VOC	Chloroethane	WG	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2100	-	-	-
VOC	Chloroform	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	70	0	0	80	0	0	0.22	-	-	-
VOC	Chloromethane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	19	-	-	-
VOC	cis-1,2-Dichloroethene	WG	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1300	-	-	-
VOC	Dichlorobromomethane	WG	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10	0	0	80	0	0	0.13	-	-	-
VOC	Dichlorodifluoromethane	WG	T	1	ug/l	3.5	3.5	3.5	3.5	-	3.5	3.5	1	100	0	0	1000	-	-	-	0	0	20	-	-	-
VOC	Ethylbenzene	WG	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	700	0	0	700	0	0	1.5	-	-	-
VOC	Ethylene Dibromide	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	1	100	0.004	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2000	-	-	-
VOC	Methyl tert-butyl ether	WG	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	14	-	-	-
VOC	Methylcyclohexane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	11	-	-	-
VOC	m-Xylene & p-Xylene	WG	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	19	-	-	-
VOC	Styrene	WG	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	120	-	-	-
VOC	Tetrachloroethene	WG	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Toluene	WG	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	1000	0	0	1000	0	0	110	-	-	-
VOC	trans-1,2-Dichloroethene	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WG	T	2	ug/l	<0.15	<0.15	0.0525	0.0525	0.0318	0.0323	0.0728	0	0	0	0	10000	-	-	-	0	0	520	-	-	-

Table 14. Round 3 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	13	ug/l	114,000	2,040,000	429,308	202,000	569,772	117,600	1,560,000	13	100.00	-	-	-	-	-	-	-	-	-	4	31	212000
GENCHEM	Ammonia	WG	T	13	ug/l	<72	521.0	160.5308	88.4	161.1615	ND	474.8	9	69.23	-	-	-	-	-	-	-	-	-	9	69	72
GENCHEM	Chloride	WG	T	13	ug/l	367.0	13,100	3,156	1,720	3,955	386.8	10,580	13	100.00	-	-	-	-	-	-	-	-	-	12	92	393
GENCHEM	Fluoride	WG	T	13	ug/l	135.0	524.0	274.0	242.0	123.9845	136.2	466.4	13	100.00	0	0	4000	0	0	4000	13	100	80	9	69	184
GENCHEM	Hardness as calcium carbonate	WG	T	13	ug/l	132,000	1,700,000	406,769	204,000	503,148	139,200	1,472,000	13	100.00	-	-	-	-	-	-	-	-	-	5	38	204000
GENCHEM	Nitrate Nitrite as N	WG	T	13	ug/l	<100	4,750	ND	ND	ND	ND	1,930	1	7.69	0	0	10000	0	0	10000	-	-	-	1	8	100
GENCHEM	Orthophosphate as P	WG	T	10	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	0	0	48
GENCHEM	Sulfate	WG	T	13	ug/l	<127	20,200	7,847	5,920	5,526	ND	17,140	12	92.31	-	-	-	-	-	-	-	-	-	5	38	7000
GENCHEM	Total Dissolved Solids	WG	T	13	mg/l	128.0	2,300	467.3077	208.0	627.3259	128.6	1,640	13	100.00	-	-	-	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WG	T	13	mg/l	23.0	493.0	93.8308	61.6	125.0486	23.12	285.4	13	100.00	-	-	-	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WG	DI	13	ug/l	<18.2	902.0	94.4308	ND	245.2345	ND	426.8	5	38.46	-	-	-	-	-	-	0	0	2000	5	38	18.2
METALS	Antimony	WG	DI	13	ug/l	<0.62	1.3	ND	ND	ND	ND	0.706	1	7.69	0	0	6	0	0	6	1	8	0.78	1	8	0.62
METALS	Arsenic	WG	DI	13	ug/l	<0.64	4.3	1.1023	ND	1.2191	ND	3.4	6	46.15	0	0	10	0	0	10	13	100	0.052	5	38	0.86
METALS	Barium	WG	DI	13	ug/l	41.2	2,540	332.8385	121.0	674.9507	41.98	1,305	13	100.00	1	8	1000	1	8	2000	2	15	380	9	69	71.1
METALS	Beryllium	WG	DI	13	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	4	0	0	2.5	0	0	0.24
METALS	Cadmium	WG	DI	13	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Calcium	WG	DI	13	ug/l	21,900	588,000	118,769	38,000	180,326	26,820	496,800	13	100.00	-	-	-	-	-	-	-	-	-	3	23	53500
METALS	Chromium	WG	DI	13	ug/l	<1.3	24.1	2.9654	ND	6.6108	ND	14.02	2	15.38	0	0	100	0	0	100	13	100	0.035	2	15	1.3
METALS	Cobalt	WG	DI	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	13	100	0.6	0	0	1.3
METALS	Copper	WG	DI	13	ug/l	<1.4	8.4	1.8538	ND	2.4165	ND	6.48	3	23.08	0	0	1300	0	0	1300	0	0	80	3	23	1.4
METALS	Cyanide, Free	WG	T	3	ug/l	<1.5	<1.5	ND	ND	ND	ND	ND	0	0.00	0	0	200	0	0	200	3	100	0.15	0	0	1.5
METALS	Cyanide, Total	WG	T	13	ug/l	<2	9.8	1.9	ND	2.5053	ND	6.26	2	15.38	0	0	200	0	0	200	13	100	0.15	2	15	2
METALS	Iron	WG	DI	13	ug/l	<42.4	3,430	581.4538	61.8	1,057	ND	2,428	7	53.85	-	-	-	-	-	-	3	23	1400	7	54	42.4
METALS	Lead	WG	DI	13	ug/l	<0.38	1.5	ND	ND	ND	ND	0.714	1	7.69	0	0	15	0	0	15	0	0	15	1	8	0.38
METALS	Magnesium	WG	DI	13	ug/l	<63.6	22,900	11,810	13,100	8,218	ND	22,060	10	76.92	-	-	-	-	-	-	-	-	-	6	46	13200
METALS	Manganese	WG	DI	13	ug/l	<2.5	424.0	116.6615	74.4	124.7667	ND	304.6	10	76.92	-	-	-	-	-	-	7	54	43	10	77	24.8
METALS	Mercury	WG	DI	13	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	13	100	0.063	0	0	0.17
METALS	Nickel	WG	DI	13	ug/l	<1.4	3.4	0.9846	ND	0.7766	ND	2.38	2	15.38	0	0	100	-	-	-	0	0	39	2	15	1.4
METALS	Potassium	WG	DI	13	ug/l	796.0	12,400	3,940	1,950	4,136	924.4	12,340	13	100.00	-	-	-	-	-	-	-	-	-	13	100	676
METALS	Selenium	WG	DI	13	ug/l	<0.73	2.0	0.5592	ND	0.4899	ND	1.52	2	15.38	0	0	50	0	0	50	0	0	10	2	15	0.73
METALS	Silver	WG	DI	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Sodium	WG	DI	13	ug/l	3,800	92,700	16,873	9,290	23,902	3,872	53,040	13	100.00	-	-	-	-	-	-	-	-	-	9	69	4200
METALS	Thallium	WG	DI	13	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	2	0	0	2	13	100	0.02	0	0	0.26
METALS	Vanadium	WG	DI	13	ug/l	<1.9	1.9	ND	ND	ND	ND	1.33	1	7.69	-	-	-	-	-	-	0	0	8.6	0	0	1.9
METALS	Zinc	WG	DI	13	ug/l	<7	176.0	23.9615	ND	49.8358	ND	114.74	3	23.08	0	0	2000	-	-	-	0	0	600	3	23	7
SVOC	1,1'-Biphenyl	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	1	100	0.083	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	1	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0.00	0	0	0.97	-	-	-	1	100	0.17	-	-	-
SVOC	1,4-Dioxane	WG	T	1	ug/l	<3.1	<3.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	1	100	0.46	-	-	-

Table 14. Round 3 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0.00	0	0	1400	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	24	-	-	-
SVOC	2,4,5-Trichlorophenol	WG	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0.00	0	0	1800	-	-	-	0	0	120	-	-	-
SVOC	2,4,6-Trichlorophenol	WG	T	1	ug/l	<0.53	<0.53	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	1.2	-	-	-
SVOC	2,4-Dichlorophenol	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0.00	0	0	77	-	-	-	0	0	4.6	-	-	-
SVOC	2,4-Dimethylphenol	WG	T	1	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0.00	0	0	380	-	-	-	0	0	36	-	-	-
SVOC	2,4-Dinitrophenol	WG	T	1	ug/l	<2.4	<2.4	ND	ND	ND	ND	ND	0	0.00	0	0	69	-	-	-	0	0	3.9	-	-	-
SVOC	2,4-Dinitrotoluene	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	0	0	1.1	-	-	-	1	100	0.24	-	-	-
SVOC	2,6-Dinitrotoluene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	1	100	0.049	-	-	-
SVOC	2-Chloronaphthalene	WG	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0.00	0	0	1000	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0.00	0	0	81	-	-	-	0	0	9.1	-	-	-
SVOC	2-Methylnaphthalene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.6	-	-	-
SVOC	2-Methylphenol	WG	T	1	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	19	-	-	-
SVOC	2-Nitrophenol	WG	T	1	ug/l	<0.59	<0.59	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	1	100	0.21	-	-	-	1	100	0.13	-	-	-
SVOC	3-Nitroaniline	WG	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	1	ug/l	<2	<2	ND	ND	ND	ND	ND	0	0.00	0	0	13	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0.00	0	0	3000	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	0.37	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WG	T	1	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	1	ug/l	<0.48	<0.48	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.8	-	-	-
SVOC	4-Nitrophenol	WG	T	1	ug/l	<4.7	<4.7	ND	ND	ND	ND	ND	0	0.00	0	0	60	-	-	-	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0.00	0	0	670	-	-	-	0	0	53	-	-	-
SVOC	Acenaphthylene	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Anthracene	WG	T	1	ug/l	<0.57	<0.57	ND	ND	ND	ND	ND	0	0.00	0	0	2100	-	-	-	0	0	180	-	-	-
SVOC	Atrazine	WG	T	1	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0.00	0	0	3	0	0	3	1	100	0.3	-	-	-
SVOC	Benzaldehyde	WG	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Benzo[a]anthracene	WG	T	1	ug/l	<0.55	<0.55	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0.00	1	100	0.05	0	0	0.2	1	100	0.0034	-	-	-
SVOC	Benzo[b]fluoranthene	WG	T	1	ug/l	<0.44	<0.44	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	1	100	0.034	-	-	-
SVOC	Benzo[g,h,i]perylene	WG	T	1	ug/l	<0.75	<0.75	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	0	0	0.34	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	5.9	-	-	-
SVOC	Bis(2-chloroethyl)ether	WG	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0.00	0	0	0.3	-	-	-	1	100	0.014	-	-	-

Table 14. Round 3 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0.00	0	0	6	0	0	6	0	0	5.6	-	-	-
SVOC	Butyl benzyl phthalate	WG	T	1	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0.00	0	0	1500	-	-	-	0	0	16	-	-	-
SVOC	Caprolactam	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	990	-	-	-
SVOC	Carbazole	WG	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0.00	0	0	50	-	-	-	0	0	3.4	-	-	-
SVOC	Dibenz(a,h)anthracene	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0.00	0	0	0.05	-	-	-	1	100	0.0034	-	-	-
SVOC	Dibenzofuran	WG	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	0.79	-	-	-
SVOC	Diethyl phthalate	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0.00	0	0	17000	-	-	-	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	1	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0.00	0	0	3E+05	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0.00	0	0	2000	-	-	-	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	20	-	-	-
SVOC	Fluoranthene	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0.00	0	0	130	-	-	-	0	0	80	-	-	-
SVOC	Fluorene	WG	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0.00	0	0	1100	-	-	-	0	0	29	-	-	-
SVOC	Hexachlorobenzene	WG	T	1	ug/l	<0.47	<0.47	ND	ND	ND	ND	ND	0	0.00	1	100	0.2	0	0	1	1	100	0.0098	-	-	-
SVOC	Hexachlorobutadiene	WG	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	1	100	0.14	-	-	-
SVOC	Hexachlorocyclopentadiene	WG	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0.00	0	0	50	0	0	50	1	100	0.041	-	-	-
SVOC	Hexachloroethane	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	0.33	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	1	100	0.034	-	-	-
SVOC	Isophorone	WG	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0.00	0	0	400	-	-	-	0	0	78	-	-	-
SVOC	Naphthalene	WG	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	1	100	0.17	-	-	-
SVOC	Nitrobenzene	WG	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0.00	0	0	17	-	-	-	1	100	0.14	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WG	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0.00	0	0	0.5	-	-	-	1	100	0.011	-	-	-
SVOC	N-Nitrosodiphenylamine	WG	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0.00	0	0	33	-	-	-	0	0	12	-	-	-
SVOC	Pentachlorophenol	WG	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0.00	1	100	1	1	100	1	1	100	0.041	-	-	-
SVOC	Phenanthrene	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	1	ug/l	<0.41	<0.41	ND	ND	ND	ND	ND	0	0.00	0	0	300	-	-	-	0	0	580	-	-	-
SVOC	Pyrene	WG	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0.00	0	0	830	-	-	-	0	0	12	-	-	-
VOC	1,1,1-Trichloroethane	WG	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0.00	0	0	200	0	0	200	0	0	800	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	2	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	5500	-	-	-
VOC	1,1,2-Trichloroethane	WG	T	1	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0.00	0	0	3	-	-	-	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	4	-	-	-	0	0	2.8	-	-	-
VOC	1,1-Dichloroethene	WG	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0.00	0	0	7	-	-	-	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	1	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0.00	0	0	0.7	-	-	-	0	0	0.7	-	-	-
VOC	1,2,4-Trichlorobenzene	WG	T	1	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0.00	0	0	70	-	-	-	0	0	0.4	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WG	T	1	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0.00	0	0	0.2	0	0	0.2	1	100	0.00033	-	-	-
VOC	1,2-Dichlorobenzene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	600	0	0	600	0	0	30	-	-	-
VOC	1,2-Dichloroethane	WG	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	5	0	0	0.17	-	-	-

Table 14. Round 3 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	1,2-Dichloropropane	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.44	-	-	-
VOC	1,3-Dichlorobenzene	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	600	-	-	-	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	75	0	0	75	0	0	0.48	-	-	-
VOC	2-Butanone (MEK)	WG	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	560	-	-	-
VOC	2-Hexanone	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	3.8	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	630	-	-	-
VOC	Acetone	WG	T	1	ug/l	4.9	4.9	4.9	4.9	-	4.9	4.9	1	100.00	-	-	-	-	-	-	0	0	1400	-	-	-
VOC	Benzene	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	0.46	-	-	-
VOC	Bromoform	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	80	0	0	80	0	0	3.3	-	-	-
VOC	Bromomethane	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	10	-	-	-	0	0	0.75	-	-	-
VOC	Carbon disulfide	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	81	-	-	-
VOC	Carbon tetrachloride	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0.00	0	0	3	0	0	5	0	0	0.46	-	-	-
VOC	Chlorobenzene	WG	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0.00	0	0	100	0	0	100	0	0	7.8	-	-	-
VOC	Chlorobromomethane	WG	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	8.3	-	-	-
VOC	Chlorodibromomethane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	4	0	0	80	0	0	0.87	-	-	-
VOC	Chloroethane	WG	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	2100	-	-	-
VOC	Chloroform	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	70	0	0	80	0	0	0.22	-	-	-
VOC	Chloromethane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	19	-	-	-
VOC	cis-1,2-Dichloroethene	WG	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	0	0	70	-	-	-	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0.00	0	0	4	-	-	-	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	1300	-	-	-
VOC	Dichlorobromomethane	WG	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0.00	0	0	10	0	0	80	0	0	0.13	-	-	-
VOC	Dichlorodifluoromethane	WG	T	1	ug/l	0.81	0.81	0.81	0.81	-	0.81	0.81	1	100.00	0	0	1000	-	-	-	0	0	20	-	-	-
VOC	Ethylbenzene	WG	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0.00	0	0	700	0	0	700	0	0	1.5	-	-	-
VOC	Ethylene Dibromide	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	1	100	0.004	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	0	0	2000	-	-	-
VOC	Methyl tert-butyl ether	WG	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0.00	0	0	30	-	-	-	0	0	14	-	-	-
VOC	Methylcyclohexane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0.00	0	0	5	0	0	5	0	0	11	-	-	-
VOC	m-Xylene & p-Xylene	WG	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0.00	0	0	10000	-	-	-	0	0	19	-	-	-
VOC	Styrene	WG	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0.00	0	0	100	0	0	100	0	0	120	-	-	-
VOC	Tetrachloroethene	WG	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Toluene	WG	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0.00	0	0	1000	0	0	1000	0	0	110	-	-	-
VOC	trans-1,2-Dichloroethene	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0.00	0	0	100	-	-	-	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0.00	0	0	2	-	-	-	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0.00	0	0	5	-	-	-	-	-	-	-	-	-

Table 14. Round 3 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 3		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Trichlorofluoromethane	WG	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0.00	0	0	10000	-	-	-	0	0	520	-	-	-

Table 15. Round 4 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WG	T	13	ug/l	130,000	1,840,000	399,000	206,000	511,562	133,000	1,438,000	13	100	-	-	-	-	-	-	-	-	-	5	38	214000
GENCHEM	Ammonia	WG	T	13	ug/l	<72	394.0	108.5385	100.0	102.0618	ND	280.6	7	54	-	-	-	-	-	-	-	-	-	7	54	72
GENCHEM	Chloride	WG	T	13	ug/l	287.0	6,240	2,205	1,400	2,218	303.2	5,928	13	100	-	-	-	-	-	-	-	-	-	11	85	338
GENCHEM	Fluoride	WG	DI	13	ug/l	90.2	649.0	272.0923	193.0	180.0477	105.68	616.6	13	100	0	0	4000	0	0	4000	13	100	80	11	85	120
GENCHEM	Fluoride	WG	T	13	ug/l	138.0	569.0	272.6154	204.0	137.2295	138.6	519.8	13	100	0	0	4000	0	0	4000	13	100	80	13	100	120
GENCHEM	Hardness as calcium carbonate	WG	T	13	ug/l	72,000	1,120,000	291,692	196,000	291,557	103,200	862,000	13	100	-	-	-	-	-	-	-	-	-	6	46	198000
GENCHEM	Nitrate Nitrite as N	WG	T	13	ug/l	<100	369.0	122.5385	109.0	94.4613	ND	272.4	7	54	0	0	10000	0	0	10000	-	-	-	7	54	100
GENCHEM	Orthophosphate as P	WG	T	13	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	0	0	48
GENCHEM	Sulfate	WG	T	13	ug/l	1,990	25,900	7,520	5,150	6,486	2,920	18,700	13	100	-	-	-	-	-	-	-	-	-	5	38	5660
GENCHEM	Total Dissolved Solids	WG	T	13	mg/l	138.0	1,850	435.4615	227.0	528.541	141.0	1,544	13	100	-	-	-	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WG	T	13	mg/l	5.0	272.0	55.8615	44.3	68.6926	11.3	152.78	13	100	-	-	-	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WG	T	13	ug/l	<18.2	6,370	1,152	664.0	1,704	ND	3,766	12	92	-	-	-	-	-	-	2	15	2000	12	92	39.8
METALS	Aluminum	WG	DI	13	ug/l	<18.2	897.0	97.5846	22.5	242.7051	ND	427.8	7	54	-	-	-	-	-	-	0	0	2000	3	23	39.8
METALS	Antimony	WG	T	13	ug/l	<0.62	10.0	1.2331	ND	2.6625	ND	4.96	4	31	1	8	6	1	8	6	3	23	0.78	4	31	0.62
METALS	Antimony	WG	DI	13	ug/l	<0.62	8.2	ND	ND	ND	ND	3.466	1	7.7	1	8	6	1	8	6	1	8	0.78	1	8	0.62
METALS	Arsenic	WG	T	13	ug/l	<0.64	5.3	1.82	1.7	1.6996	ND	4.88	9	69	0	0	10	0	0	10	13	100	0.052	7	54	0.84
METALS	Arsenic	WG	DI	13	ug/l	<0.64	3.7	1.0715	ND	1.0894	ND	3.16	6	46	0	0	10	0	0	10	13	100	0.052	6	46	0.84
METALS	Barium	WG	DI	13	ug/l	45.5	2,120	297.4	122.0	559.0276	46.28	1,095	13	100	1	8	1000	1	8	2000	2	15	380	10	77	75
METALS	Barium	WG	T	13	ug/l	54.5	2,310	335.6154	144.0	605.7548	60.08	1,202	13	100	1	8	1000	1	8	2000	2	15	380	11	85	75
METALS	Beryllium	WG	T	13	ug/l	<0.24	0.38	ND	ND	ND	ND	0.224	1	7.7	0	0	4	0	0	4	0	0	2.5	1	8	0.24
METALS	Beryllium	WG	DI	13	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0	2.5	0	0	0.24
METALS	Cadmium	WG	DI	13	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Cadmium	WG	T	13	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92	0	0	0.71
METALS	Calcium	WG	DI	13	ug/l	29,000	627,000	117,469	39,400	183,534	30,680	493,200	13	100	-	-	-	-	-	-	-	-	-	3	23	57600
METALS	Calcium	WG	T	13	ug/l	29,100	602,000	116,662	43,700	175,020	32,040	474,800	13	100	-	-	-	-	-	-	-	-	-	3	23	57600
METALS	Chromium	WG	T	13	ug/l	<1.3	20.4	3.8231	1.5	5.641	ND	13.38	7	54	0	0	100	0	0	100	13	100	0.035	7	54	1.3
METALS	Chromium	WG	DI	13	ug/l	<1.3	17.2	2.3808	ND	4.7466	ND	10.84	2	15	0	0	100	0	0	100	13	100	0.035	2	15	1.3
METALS	Cobalt	WG	T	13	ug/l	<1.3	4.4	ND	ND	ND	ND	2.15	1	7.7	-	-	-	-	-	-	13	100	0.6	1	8	1.3
METALS	Cobalt	WG	DI	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	13	100	0.6	0	0	1.3
METALS	Copper	WG	T	13	ug/l	<1.4	13.2	4.5846	3.4	4.1555	ND	12.48	11	85	0	0	1300	0	0	1300	0	0	80	10	77	1.4
METALS	Copper	WG	DI	13	ug/l	<1.4	8.0	1.6923	ND	2.1697	ND	5.54	3	23	0	0	1300	0	0	1300	0	0	80	3	23	1.4
METALS	Cyanide, Free	WG	DI	4	ug/l	<1.5	<1.5	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	4	100	0.15	0	0	1.5
METALS	Cyanide, Free	WG	T	4	ug/l	<1.5	<1.5	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	4	100	0.15	0	0	1.5
METALS	Cyanide, Total	WG	DI	13	ug/l	<2	10.1	1.8385	ND	2.5316	ND	5.72	2	15	0	0	200	0	0	200	13	100	0.15	2	15	2
METALS	Cyanide, Total	WG	T	13	ug/l	<2	10.5	ND	ND	ND	ND	4.8	1	7.7	0	0	200	0	0	200	13	100	0.15	1	8	2
METALS	Iron	WG	T	13	ug/l	181.0	17,400	3,636	2,110	4,884	233.8	11,676	13	100	-	-	-	-	-	-	7	54	1400	11	85	277
METALS	Iron	WG	DI	13	ug/l	<42.4	2,580	417.8077	ND	774.1884	ND	1,872	6	46	-	-	-	-	-	-	1	8	1400	4	31	277
METALS	Lead	WG	T	13	ug/l	<0.38	7.7	2.1585	1.1	2.4043	ND	7.04	12	92	0	0	15	0	0	15	0	0	15	12	92	0.38

Table 15. Round 4 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WG	DI	13	ug/l	<0.38	1.5	0.3685	ND	0.4399	ND	1.32	2	15	0	0	15	0	0	15	0	0	15	2	15	0.38
METALS	Magnesium	WG	T	13	ug/l	<63.6	26,200	13,071	14,100	8,951	ND	24,760	12	92	-	-	-	-	-	-	-	-	-	7	54	12500
METALS	Magnesium	WG	DI	13	ug/l	<63.6	22,900	11,594	12,700	8,005	ND	22,060	10	77	-	-	-	-	-	-	-	-	-	7	54	12500
METALS	Manganese	WG	T	13	ug/l	<2.5	391.0	153.7154	96.5	146.4453	ND	376.0	12	92	-	-	-	-	-	-	9	69	43	10	77	15.8
METALS	Manganese	WG	DI	13	ug/l	<2.5	327.0	113.4077	46.0	123.252	ND	315.6	10	77	-	-	-	-	-	-	7	54	43	10	77	15.8
METALS	Mercury	WG	DI	13	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	13	100	0.063	0	0	0.17
METALS	Mercury	WG	T	13	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	13	100	0.063	0	0	0.17
METALS	Nickel	WG	T	13	ug/l	<1.4	7.6	1.7385	ND	1.8958	ND	4.66	6	46	0	0	100	-	-	-	0	0	39	6	46	1.4
METALS	Nickel	WG	DI	13	ug/l	<1.4	1.8	ND	ND	ND	ND	1.14	1	7.7	0	0	100	-	-	-	0	0	39	1	8	1.4
METALS	Potassium	WG	DI	13	ug/l	725.0	17,800	4,770	2,120	5,277	860.0	13,720	13	100	-	-	-	-	-	-	-	-	-	13	100	632
METALS	Potassium	WG	T	13	ug/l	802.0	16,200	4,944	2,360	4,950	920.8	13,380	13	100	-	-	-	-	-	-	-	-	-	13	100	632
METALS	Selenium	WG	DI	13	ug/l	<0.73	1.2	0.49	ND	0.2936	ND	1.14	2	15	0	0	50	0	0	50	0	0	10	2	15	0.73
METALS	Selenium	WG	T	13	ug/l	<0.73	0.98	ND	ND	ND	ND	0.614	1	7.7	0	0	50	0	0	50	0	0	10	1	8	0.73
METALS	Silver	WG	DI	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Silver	WG	T	13	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4	0	0	1.3
METALS	Sodium	WG	DI	13	ug/l	3,400	27,200	11,598	8,640	7,479	3,922	22,460	13	100	-	-	-	-	-	-	-	-	-	12	92	4180
METALS	Sodium	WG	T	13	ug/l	4,050	31,200	12,642	9,740	8,388	4,170	25,440	13	100	-	-	-	-	-	-	-	-	-	12	92	4180
METALS	Thallium	WG	DI	13	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	13	100	0.02	0	0	0.26
METALS	Thallium	WG	T	13	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	2	0	0	2	13	100	0.02	0	0	0.26
METALS	Vanadium	WG	T	13	ug/l	<1.9	5.2	1.8385	ND	1.5538	ND	5.2	5	38	-	-	-	-	-	-	0	0	8.6	4	31	1.9
METALS	Vanadium	WG	DI	13	ug/l	<1.9	3.9	ND	ND	ND	ND	2.13	1	7.7	-	-	-	-	-	-	0	0	8.6	1	8	1.9
METALS	Zinc	WG	T	13	ug/l	<7	907.0	168.1385	11.6	316.0209	ND	824.8	10	77	0	0	2000	-	-	-	2	15	600	10	77	7
METALS	Zinc	WG	DI	13	ug/l	<7	8.8	4.5231	ND	1.972	ND	8.2	3	23	0	0	2000	-	-	-	0	0	600	3	23	7
SVOC	1,1'-Biphenyl	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100	0.083	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WG	T	1	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	1	100	0.17	-	-	-
SVOC	1,4-Dioxane	WG	T	1	ug/l	<3.1	<3.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100	0.46	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WG	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	24	-	-	-
SVOC	2,4,5-Trichlorophenol	WG	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0	120	-	-	-
SVOC	2,4,6-Trichlorophenol	WG	T	1	ug/l	<0.53	<0.53	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	1.2	-	-	-
SVOC	2,4-Dichlorophenol	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0	4.6	-	-	-
SVOC	2,4-Dimethylphenol	WG	T	1	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0	36	-	-	-
SVOC	2,4-Dinitrophenol	WG	T	1	ug/l	<2.4	<2.4	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0	3.9	-	-	-
SVOC	2,4-Dinitrotoluene	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	1	100	0.24	-	-	-
SVOC	2,6-Dinitrotoluene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.049	-	-	-
SVOC	2-Chloronaphthalene	WG	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WG	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0	9.1	-	-	-
SVOC	2-Methylnaphthalene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.6	-	-	-

Table 15. Round 4 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2-Methylphenol	WG	T	1	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	19	-	-	-
SVOC	2-Nitrophenol	WG	T	1	ug/l	<0.59	<0.59	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	1	100	0.21	-	-	-	1	100	0.13	-	-	-
SVOC	3-Nitroaniline	WG	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WG	T	1	ug/l	<2	<2	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WG	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WG	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.37	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WG	T	1	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WG	T	1	ug/l	<0.48	<0.48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
SVOC	4-Nitrophenol	WG	T	1	ug/l	<4.7	<4.7	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-	-	-	-
SVOC	Acenaphthene	WG	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0	53	-	-	-
SVOC	Acenaphthylene	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Anthracene	WG	T	1	ug/l	<0.57	<0.57	ND	ND	ND	ND	ND	0	0	0	0	2100	-	-	-	0	0	180	-	-	-
SVOC	Atrazine	WG	T	1	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	1	100	0.3	-	-	-
SVOC	Benzaldehyde	WG	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190	-	-	-
SVOC	Benzo[a]anthracene	WG	T	1	ug/l	<0.55	<0.55	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WG	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	1	100	0.05	0	0	0.2	1	100	0.0034	-	-	-
SVOC	Benzo[b]fluoranthene	WG	T	1	ug/l	<0.44	<0.44	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.034	-	-	-
SVOC	Benzo[g,h,i]perylene	WG	T	1	ug/l	<0.75	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	0	0	0.34	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5.9	-	-	-
SVOC	Bis(2-chloroethyl)ether	WG	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	1	100	0.014	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0	5.6	-	-	-
SVOC	Butyl benzyl phthalate	WG	T	1	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0	16	-	-	-
SVOC	Caprolactam	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	990	-	-	-
SVOC	Carbazole	WG	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WG	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0	0	0	50	-	-	-	0	0	3.4	-	-	-
SVOC	Dibenz(a,h)anthracene	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	0.05	-	-	-	1	100	0.0034	-	-	-
SVOC	Dibenzofuran	WG	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.79	-	-	-
SVOC	Diethyl phthalate	WG	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WG	T	1	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0	0	0	3E+05	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WG	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WG	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	20	-	-	-
SVOC	Fluoranthene	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	0	0	80	-	-	-

Table 15. Round 4 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Fluorene	WG	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0	29	-	-	-
SVOC	Hexachlorobenzene	WG	T	1	ug/l	<0.47	<0.47	ND	ND	ND	ND	ND	0	0	1	100	0.2	0	0	1	1	100	0.0098	-	-	-
SVOC	Hexachlorobutadiene	WG	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	1	100	0.14	-	-	-
SVOC	Hexachlorocyclopentadiene	WG	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	1	100	0.041	-	-	-
SVOC	Hexachloroethane	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	0.33	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WG	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.034	-	-	-
SVOC	Isophorone	WG	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0	0	0	400	-	-	-	0	0	78	-	-	-
SVOC	Naphthalene	WG	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	1	100	0.17	-	-	-
SVOC	Nitrobenzene	WG	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	1	100	0.14	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WG	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100	0.011	-	-	-
SVOC	N-Nitrosodiphenylamine	WG	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0	12	-	-	-
SVOC	Pentachlorophenol	WG	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	1	100	1	1	100	1	1	100	0.041	-	-	-
SVOC	Phenanthrene	WG	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WG	T	1	ug/l	<0.41	<0.41	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0	580	-	-	-
SVOC	Pyrene	WG	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0	0	0	830	-	-	-	0	0	12	-	-	-
VOC	1,1,1-Trichloroethane	WG	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	0	0	800	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WG	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5500	-	-	-
VOC	1,1,2-Trichloroethane	WG	T	1	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WG	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	0	0	2.8	-	-	-
VOC	1,1-Dichloroethene	WG	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WG	T	1	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	0	0	0.7	-	-	-
VOC	1,2,4-Trichlorobenzene	WG	T	1	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	0	0	0.4	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WG	T	1	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	1	100	0.00033	-	-	-
VOC	1,2-Dichlorobenzene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	600	0	0	600	0	0	30	-	-	-
VOC	1,2-Dichloroethane	WG	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	5	0	0	0.17	-	-	-
VOC	1,2-Dichloropropane	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.44	-	-	-
VOC	1,3-Dichlorobenzene	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	600	-	-	-	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0	0.48	-	-	-
VOC	2-Butanone (MEK)	WG	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	560	-	-	-
VOC	2-Hexanone	WG	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WG	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	630	-	-	-
VOC	Acetone	WG	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1400	-	-	-
VOC	Benzene	WG	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.46	-	-	-
VOC	Bromoform	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	80	0	0	80	0	0	3.3	-	-	-
VOC	Bromomethane	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	10	-	-	-	0	0	0.75	-	-	-
VOC	Carbon disulfide	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	81	-	-	-
VOC	Carbon tetrachloride	WG	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	5	0	0	0.46	-	-	-

Table 15. Round 4 Groundwater in Monitoring Wells Screened Below Upper Hydrogeologic Unit Analytical Results Statistical Summary
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL			CFMW-001 Round 4		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Chlorobenzene	WG	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	7.8	-	-	-
VOC	Chlorobromomethane	WG	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	8.3	-	-	-
VOC	Chlorodibromomethane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0	0.87	-	-	-
VOC	Chloroethane	WG	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2100	-	-	-
VOC	Chloroform	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	70	0	0	80	0	0	0.22	-	-	-
VOC	Chloromethane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	19	-	-	-
VOC	cis-1,2-Dichloroethene	WG	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WG	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-	-	-	-
VOC	Cyclohexane	WG	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1300	-	-	-
VOC	Dichlorobromomethane	WG	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10	0	0	80	0	0	0.13	-	-	-
VOC	Dichlorodifluoromethane	WG	T	1	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	0	0	20	-	-	-
VOC	Ethylbenzene	WG	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	700	0	0	700	0	0	1.5	-	-	-
VOC	Ethylene Dibromide	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	1	100	0.004	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WG	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WG	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2000	-	-	-
VOC	Methyl tert-butyl ether	WG	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	14	-	-	-
VOC	Methylcyclohexane	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WG	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	11	-	-	-
VOC	m-Xylene & p-Xylene	WG	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WG	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	19	-	-	-
VOC	Styrene	WG	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	120	-	-	-
VOC	Tetrachloroethene	WG	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Toluene	WG	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	1000	0	0	1000	0	0	110	-	-	-
VOC	trans-1,2-Dichloroethene	WG	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WG	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-	-	-	-
VOC	Trichloroethene	WG	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WG	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	520	-	-	-

Table 16. Comparison Table of Concentrations of Total and Dissolved Analytes in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Sample Date	Sample Designation	Sample Type	Antimony		Arsenic		Barium		Cyanide, Free		Cyanide, Total		Zinc		Fluoride	
				Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
CFMW-001	06/19/2017	CFMW-001-GW	N	0.62 U	0.62 U	1.9 J	0.84 J	94.1	75	2 U	2 U	1.5 U	1.5 U	7.7 J	7 U	159	120
CFMW-002	06/27/2017	CFMW-002-GW	N	0.62 U	0.62 U	0.84 J	0.81 J	199	184	**985**	**883**	119	47.9	7 U	7 U	**4930**	**5150 J+**
CFMW-003	06/27/2017	CFMW-003-GW	N	0.62 U	0.62 U	1.6 J	0.65 J	26	20.1	13.2	12	1.5 U	1.5 U	7 U	7 U	60 U	60 U
CFMW-003a	06/19/2017	CFMW-003a-GW	N	0.62 U	0.62 U	3.6	2.8	63.8	45.5	2 U	2 U	1.5 U	1.5 U	14.2 J	7 U	276	274
CFMW-007	06/19/2017	CFMW-007-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	218	170	2 U	2 U	1.5 U	1.5 U	7 U	7 U	152	126
CFMW-008	06/20/2017	CFMW-008-GW	N	1.2 J	0.62 U	1.9 J	0.64 U	505	434	2 U	2 U	1.5 U	1.5 U	**3990**	1220	527	431
CFMW-008a	06/28/2017	CFMW-008a-GW	N	1.3 J	0.91 J	0.64 U	0.64 U	953	888	2 U	2 U	1.5 UJ	1.5 UJ	24.5	15.8 J	304 J-	277 J+
CFMW-010	06/27/2017	CFMW-010-GW	N	0.62 U	0.62 U	2.9	2.5	141	126	**1190**	**1120**	117	56.8	7 U	7 U	**6810**	**6980 J+**
CFMW-011	06/28/2017	CFMW-DUP15-GW	FD	0.62 U	0.62 U	0.64 U	0.64 U	197	186	123	126	9.8 J	3.1 J-	7 U	7 U	297 J-	298 J+
CFMW-011	06/28/2017	CFMW-011-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	199	181	125	125	6.6 J	3.3 J-	7 U	7 U	289 J-	296 J+
CFMW-011a	06/29/2017	CFMW-011a-GW	N	0.62 U	0.62 U	2.1	1.3 J	83	57.9	2 U	2 U	NM	NM	8.3 J	7 U	197	170 J+
CFMW-012	06/23/2017	CFMW-012-GW	N	0.86 J	0.62 U	**80.2**	**92.6**	145	129	**5780**	**5860**	35.2	40.6	7 U	7 U	**30600**	**31900**
CFMW-012a	06/20/2017	CFMW-012a-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	85.7	79.3	2 U	2 U	NM	NM	7 U	7 U	139	90.2
CFMW-014	06/27/2017	CFMW-014-GW	N	0.62 U	0.62 U	2.2	2.1	169	158	**720**	**720**	111	27.4	7 U	7 U	3960	**4110 J+**
CFMW-015	06/27/2017	CFMW-015-GW	N	0.82 J	0.62 U	**77.7**	**92.1**	76.5	67	**8120**	**7780**	97.3	36.9	7 U	7 U	**52900**	**55300 J+**
CFMW-016	06/29/2017	CFMW-016-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	213	199	2 U	2 U	1.5 UJ	1.5 UJ	7 U	7 U	338	352 J+
CFMW-016a	06/26/2017	CFMW-016a-GW	N	4.4	2.6	0.64 U	0.64 U	141	97.1	2.1 J	2 U	1.5 U	1.5 U	7 U	7 U	293 J+	275
CFMW-017	06/26/2017	CFMW-017-GW	N	0.62 U	0.62 U	1.1 J	0.67 J	87.9	88.9	103	93.6	1.5 U	1.5 U	7 U	7 U	1160 J+	1220
CFMW-018	06/20/2017	CFMW-018-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	168	155	78	74.9 J-	3.3 J	3.7 J	7 U	7 U	451	475
CFMW-019	06/29/2017	CFMW-019-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	131	122	**1230**	**1250**	67.8 J-	44.5 J-	24.9	7 U	3720	3390 J+
CFMW-019a	06/26/2017	CFMW-019a-GW	N	1 J	0.62 U	1.8 J	1.3 J	54.5	46.8	2 U	2.8 J	NM	NM	7.9 J	7 U	179 J+	145
CFMW-020	06/26/2017	CFMW-020-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	193	199	2 J	2 U	1.5 U	1.5 U	18.4	7 U	489 J+	517
CFMW-021	06/26/2017	CFMW-021-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	110	109	**321**	**302**	18.9	7.5	7 U	7 U	1930 J+	1810
CFMW-022	06/26/2017	CFMW-022-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	171	170	13.3	11.8	1.5 U	1.5 U	7 U	7 U	573 J+	607
CFMW-023	06/27/2017	CFMW-023-GW	N	0.62 U	0.62 U	0.72 J	0.64 U	186	170	5.9 J	5.7 J	1.5 U	1.5 U	10.2 J	7 U	736	708 J+
CFMW-025a	06/22/2017	CFMW-025a-GW	N	0.62 U	0.62 U	5.3	1.6 J	232	122	2 U	2 U	NM	NM	45.5	7 U	413	422
CFMW-025b	06/22/2017	CFMW-025b-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	313	295	2 U	2 U	NM	NM	23.5	7 U	515	525
CFMW-026	06/22/2017	CFMW-026-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	272	266	2 U	2 U	1.5 U	1.5 U	7 U	7 U	1150	1260
CFMW-027	06/26/2017	CFMW-027-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	146	148	**560**	**520**	62	46.3	7 U	7 U	**5160**	**5190**
CFMW-028	06/26/2017	CFMW-028-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	181	177	**315**	**304**	10.7	10.5	7 U	7 U	3800 J+	3770
CFMW-028a	06/27/2017	CFMW-028a-GW	N	0.62 U	0.62 U	**10.2**	9.4	53.5	40.2	2 U	2 U	1.5 U	1.5 U	7 U	7 U	286	293 J+
CFMW-029	06/26/2017	CFMW-029-GW	N	0.62 U	0.62 U	0.66 J	0.64 U	147	141	128	116	19.7	5.4	7 U	7 U	2570 J+	2570
CFMW-031	06/21/2017	CFMW-DUP13-GW	FD	0.62 U	0.62 U	0.64 U	0.64 U	147	150	103	100	3.5 J	3.1 J	7 U	7 U	2770 J-	2900
CFMW-031	06/21/2017	CFMW-031-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	150	151	104	101	2.8 J	2.4 J	7 U	7 U	2800 J-	2900
CFMW-032	06/20/2017	CFMW-DUP12-GW	FD	0.62 U	0.62 U	0.64 U	0.64 U	158	145	**470**	**483 J-**	129 J	135 J	7 U	7 U	**8570**	**8400**
CFMW-032	06/20/2017	CFMW-032-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	156	146	**478**	**494 J-**	46.1 J	45.9 J	7 U	7 U	**8460**	**8420**
CFMW-032a	06/27/2017	CFMW-032a-GW	N	0.64 J	0.62 U	0.64 U	0.64 U	464	412	2 U	2 U	1.5 U	1.5 U	11.3 J	7 U	241	193 J+
CFMW-033	06/19/2017	CFMW-033-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	143	134	181	190	10.6	5.7	7 U	7 U	3250	3220
CFMW-034	06/19/2017	CFMW-034-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	176	157	**287**	**287**	24.9	6.7	7 U	7 U	**6590**	**6500**
CFMW-035	06/20/2017	CFMW-035-GW	N	0.62 U	0.62 U	**13.2**	**11.3**	745	702	53	51.4 J-	4.4 J-	4.6 J	47.3	7 U	209	190
CFMW-037	06/20/2017	CFMW-037-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	298	288	75.8	6 J-	2.1 J	1.5 U	7 U	7 U	1030	1100
CFMW-038	06/27/2017	CFMW-038-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	266	231	**298**	197	4.8 J	4.4 J	7 U	7 U	2810	2830 J+
CFMW-040	06/20/2017	CFMW-040-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	184	175	**385**	**391 J-**	40.4	45	7 U	7 U	2830	2560
CFMW-042	06/20/2017	CFMW-042-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	178	171	**395**	**391 J-**	27.6 J-	21.1	7 U	7 U	2780	2590

Table 16. Comparison Table of Concentrations of Total and Dissolved Analytes in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Sample Date	Sample Designation	Sample Type	Antimony		Arsenic		Barium		Cyanide, Free		Cyanide, Total		Zinc		Fluoride	
				Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
CFMW-043	06/21/2017	CFMW-043-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	171	169	**535**	**530**	120	66.2	7 U	7 U	2020 J-	2210
CFMW-044	06/21/2017	CFMW-044-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	125	147	69.5	89.4	4.5 J	2.8 J	15.9 J	7 U	1400 J-	1580
CFMW-044a	06/23/2017	CFMW-044a-GW	N	0.62 U	0.62 U	1.5 J	1.5 J	35.5	31	119	120	7.8	10.3	12.9 J	7 U	2250 J+	2350
CFMW-044b	06/23/2017	CFMW-044b-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	374	352	10.5	10.1	1.5 U	1.5 U	384	7.2 J	138 J+	116
CFMW-045	06/28/2017	CFMW-045-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	175	156	**450**	**428**	33.7 J-	14.4 J-	7 U	7 U	2150 J-	2370 J+
CFMW-045a	06/23/2017	CFMW-045a-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	127	124	63.2	67.3	1.6 J	2.4 J	7 U	7 U	3400 J+	3230
CFMW-047	06/21/2017	CFMW-047-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	209	201	119	120	10	4.1 J	7 U	7 U	1920	2100
CFMW-049	06/21/2017	CFMW-049-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	276	276	89.7	89.8	5.5	4.7 J	7 U	7 U	720 J-	815
CFMW-049a	06/21/2017	CFMW-049a-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	371	275	58.6	38.2	1.8 J	1.6 J	7 U	7 U	405 J-	444
CFMW-050	06/21/2017	CFMW-050-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	276	271	106	105	4.5 J	3.9 J	7 U	7 U	744 J-	808
CFMW-053	06/28/2017	CFMW-053-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	145	132	**239**	**238**	5.2 J-	3.3 J-	7 U	7 U	1610 J-	1740 J+
CFMW-053a	06/28/2017	CFMW-053a-GW	N	**10**	**8.2**	0.64 U	0.64 U	**2310**	**2120**	2 U	2 U	NM	NM	15.5 J	7.8 J	487 J-	595 J+
CFMW-054	06/21/2017	CFMW-054-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	148	145	**302**	**284**	40.3	19.1	7 U	7 U	1880	1910
CFMW-056	06/22/2017	CFMW-056-GW	N	0.62 U	0.62 U	0.74 J	0.64 U	144	135	2 U	2 U	NM	NM	907	7 U	194	180
CFMW-056a	06/22/2017	CFMW-056a-GW	N	0.62 U	0.62 U	1.9 J	0.99 J	186	170	2 U	2 U	1.5 U	1.5 U	11.6 J	7 U	569	649
CFMW-056b	06/22/2017	CFMW-056b-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	152	149	2 U	2 U	NM	NM	7 U	7 U	188	188
CFMW-057	06/28/2017	CFMW-057-GW	N	0.62 U	0.62 U	1.7 J	0.64 U	121	111	2 U	2 U	NM	NM	770	8.8 J	204 J-	209
CFMW-057a	06/28/2017	CFMW-057a-GW	N	1.6 J	0.62 U	0.64 J	0.64 U	98	89.7	2 U	2 U	NM	NM	7 U	7 U	322 J-	337 J+
CFMW-059	06/21/2017	CFMW-059-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	158	145	2 U	2 U	NM	NM	7 U	7 U	124	96
CFMW-059a	06/28/2017	CFMW-059a-GW	N	0.62 U	0.62 U	4.6	3.7	147	125	2 U	2 U	NM	NM	7 U	7 U	185 J-	157 J+
CFMW-061	06/23/2017	CFMW-061-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	232	226	2 U	2 U	1.5 U	1.5 U	7 U	7 U	601 J+	638
CFMW-064	06/23/2017	CFMW-DUP14-GW	FD	0.62 U	0.62 U	0.64 U	0.64 U	344	336	60.5	61.5	1.5 U	1.5 U	7 U	7 U	288 J+	312
CFMW-064	06/23/2017	CFMW-064-GW	N	0.62 U	0.62 U	0.64 U	0.64 U	345	339	60.1	62.6	1.5 U	1.5 U	7 U	7 U	302 J+	307

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Table 17. Comparison Table of Seasonal Variability for Cyanide and Fluoride in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Cyanide, Total				Fluoride				Water Level (ft-amsl)			
	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
CFMW-001	2.4 J	2 U	2 U	2 U	91.7	132	184	159	3075.25	3075.44	3075.41	3077.6
CFMW-002	2060 J	DRY	1370	985	18900	DRY	8900	4930	3065.28	3064.01	DRY	3077.33
CFMW-003	15.4	19.1	14	13.2	15 U	536 J-	60 U	60 U	3121.48	3122.83	3123.35	3126.1
CFMW-003a	2.1 J	2 U	2 U	2 U	312	337	373	276	2994.17	2996.23	2997.36	3001.89
CFMW-007	2.1 J	2 U	4.7 J	2 U	77 J	123	101	152	3067.85	3073	3071.27	3096.25
CFMW-008	2 U	2 U	2.2 J	2 U	777	456 J	427	527	3099.37	3116.79	3126.91	3163.12
CFMW-008a	2.2 J	2 U	2.8 J	2 U	180	179 J	160	304 J-	3131.41	3132.43	3133.02	3133.24
CFMW-010	7320 J	2120	1020	1190	30900	3190	17200	6810	3065.38	3064.26	3061.96	3078.96
CFMW-011	80.7	132	235	125	207	241 J	298 J+	297 J-	3064.99	3063.39	3060.18	3075
CFMW-011a	2 U	2 U	2 U	2 U	200	194 J-	246	197	3003.1	3003.78	3004.95	3011.6
CFMW-012	2280 J	972	2340	5780	12400	5750 J	12600 J+	30600	3066.78	3065.42	3062.17	3076.98
CFMW-012a	2 U	2 U	2 U	2 U	54.6 J	119	135	139	2997.42	2999.05	3000.11	3006.02
CFMW-014	2750 J	3360	3320	720	8300	17300 J-	13000	3960	3064.88	3063.34	3060.18	3075.13
CFMW-015	6240 J	3100	6600	8120	38400	16800 J-	4740	52900	3065.08	3064.01	3060.97	3075.48
CFMW-016	DRY	DRY	2.3 J	2 U	DRY	DRY	428	338	3068.89	3073.3	3072.66	3094.73
CFMW-016a	2.8 J	2 J	2.1 J	2.1 J	304	293 J-	358 J+	293 J+	3066.78	3073.32	3072.67	3094.62
CFMW-017	DRY	DRY	1880	103	DRY	DRY	13400	1160 J+	DRY	3073.55	3072.92	3094.44
CFMW-018	DRY	DRY	12.2	78	DRY	DRY	569	451	DRY	DRY	3086	3092.74
CFMW-019	961 J	791	1770	1230	2860	2890	2950	3720	3064.43	3062.7	3059.87	3073.25
CFMW-019a	2 U	2 U	2 U	2 U	361	182 J-	214 J+	179 J+	2997.48	2999.07	3000.11	3006.71
CFMW-020	2.9 J	2 U	2 U	2 J	281	301	516	489 J+	3066.69	3073.04	3072.36	3093.77
CFMW-021	400 J	1560	1020	321	1950	3120 J-	4500	1930 J+	3064.44	3062.78	3060.05	3073.26
CFMW-022	155	279	141	13.3	432	558 J-	971	573 J+	3064.74	3064.16	3062.06	3075.7
CFMW-023	2.7 J	2 U	7.6 J	5.9 J	395	452	647	736	3084.58	3092.47	3092.06	3093.67
CFMW-025a	2 U	2 U	2 U	2 U	399	334 J-	524	413	3055.65	3047.52	3048.53	3064.61
CFMW-025b	2 U	2 U	2 U	2 U	585	970 J-	828	515	3068.84	3069.73	3069.5	3073.76
CFMW-026	3.9 J	3.4 J	7.5 J	2 U	1650	1440 J-	2010	1150	3064.06	3061.84	3059.99	3071.71
CFMW-027	603	793	755	560	2390	1970 J-	2560 J+	5160	3064.25	3062.34	3059.51	3072.42
CFMW-028	104	195	283	315	3170 J+	3130 J-	4400	3800 J+	3064.24	3062.31	3059.52	3072.38
CFMW-028a	2 J	2.9 J	2 U	2 U	1020	557 J-	408	286	3064.35	3062.4	3059.68	3072.56
CFMW-029	366	186	258	128	3370 J+	4180 J	1810 J+	2570 J+	3064.44	3062.81	3060.11	3073.43
CFMW-031	233	690	520	104	2440	2100 J-	2700	2770 J-	3063.88	3061.68	3059.04	3071.05
CFMW-032	412 J-	152	238	478	5210 J-	2490	3060 J+	8570	3064.59	3062.48	3059.61	3073.51
CFMW-032a	2 U	2 U	3.9 J	2 U	49 J-	225 J	171	241	3003.59	3004.68	3005.01	3012.52
CFMW-033	478	483	515	181	2340	2040 J-	2620	3250	3063.76	3061.43	3058.79	3070.5
CFMW-034	327	255	275	287	4530 J-	60 U	3200	6590	3061.76	3056.33	3052.69	3070.44
CFMW-035	57.1	51.7	45.1	53	415	305	276	209	3063.36	3061.91	3059.28	3072.86
CFMW-037	66.7	40.7	37.5	75.8	1030 J-	1060 J	1530	1030	3035.16	3027.84	3023.62	3051.69
CFMW-038	260	286	110	298	2590	2400 J-	2830 J+	2810	3026.95	3024.26	3021.72	3031.3
CFMW-040	304	288	288	385	2650	2360	3090	2830	3036.55	3032.01	3028.53	3044.81
CFMW-042	402	DRY	DRY	395	2410	DRY	DRY	2780	3052.4	DRY	DRY	3063.57
CFMW-043	510	423	477	535	2280	2050 J-	2730	2020 J-	3061.92	3057.52	3054.21	3066.89
CFMW-044	430	220	233	69.5	2150	1670 J-	2050	1400 J-	3060.02	3056.41	DRY	3066.39

Table 17. Comparison Table of Seasonal Variability for Cyanide and Fluoride in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Cyanide, Total				Fluoride				Water Level (ft-amsl)			
	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
CFMW-044a	32.8	125	80.8	119	1720	2280	2720	2250 J+	3056.4	3052.88	3049.87	3062.87
CFMW-044b	5.9 J	8.2 J	9.8 J	10.5	153	142	176	138 J+	3044.03	3051.38	3039.81	3051.2
CFMW-045	365	392	381	450	2300	1920 J-	2550	2150 J-	3029.97	3025.2	3022.33	3039.2
CFMW-045a	56	34.8	52.9	63.2	2980	1650 J-	3520 J+	3400 J+	3024.37	3022.88	3020.73	3031.33
CFMW-047	120	145	171	119	2160	1960	2470	1920	3017.43	3017.72	3016.03	3022.96
CFMW-049	93.2	82.9	87.5	89.7	861	834	980 J+	720 J-	3017.79	3019.44	3018.19	3029.71
CFMW-049a	47.1	71.5	8 J	58.6	470 J-	433	439	405 J-	3017.69	3019.51	3018.34	3030.05
CFMW-050	51.7	51.6	72.4	106	811	809	945	744 J-	3017.34	3019.16	3017.99	3027.19
CFMW-053	363	386	DRY	239	1990	1870	DRY	1610 J-	3052.45	3038.58	3035.14	3063.43
CFMW-053a	2 U	2 U	2 U	2 U	15 U	537	428 J+	487 J-	3023.76	3021.97	3020.41	3028.56
CFMW-054	327	382	391	302	1920	1610	2070	1880	3038.9	3035.11	3031.32	3041.01
CFMW-056	2 U	2 U	2 U	2 U	138	107	242	194	3014.79	3015.92	3017.5	3026.29
CFMW-056a	2 U	3.3 J	2 U	2 U	405	400 J-	258	569	3021.12	3022.38	3023.73	3032.37
CFMW-056b	2 U	2 U	2 U	2 U	156	194	271	188	3067.5	3065.93	3065.96	3073.82
CFMW-057	2 U	2 U	2 U	2 U	66.6 J	127 J-	137	204 J-	3011.13	3012.65	3014.43	3023.44
CFMW-057a	2 U	2 U	2 U	2 U	15 U	180 J	425	322 J-	3016.22	3017.49	3018.95	3028.25
CFMW-059	2 U	2 U	2 U	2 U	59.5 J	114	120	124	3049	3048.6	3050.41	3056.43
CFMW-059a	2 U	2 U	2 U	2 U	147	198 J	233	185 J-	3046.13	3047.76	3050.28	3055.85
CFMW-061	7.7 J	4 J	2 U	2 U	780	669 J-	786	601 J+	3013.56	3015.03	3014.84	3018.87
CFMW-064	42.7	62.4	13.5	60.1	303	311 J-	344	288 J+	3014.74	3016.51	3016.43	3020.03

Green shading indicates minimum concentration across sampling rounds
Orange shading indicates maximum concentration across sampling rounds

Table 18. Slug Testing Methods, Inputs, and Hydraulic Conductivity Summary Table
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Well Name	Approximate Change in Head (ft)	Hydrogeologic Unit	Type of Test	Le Effective screen length (ft)	Ls Length of screen (ft)	Lw Length of water column (static water column height) (ft)	Rs Radius of screen (in)	Rb Radius of boring (in)	Rc Radius of casing (in)	r*t Radius of transducer (in)	Ts depth of transducer submerged (ft)	SWL Static Water Level (ft)	Depth to top of screen (ft)	TD Total Depth (ft)	H Aquifer Thickness (ft)	Ho Initial Change in Head (in)	Confined/ Unconfined	Well Screen	Method Used	Description of Response	Geoprobe or Aqtesolv	Geoprobe Software Hydraulic Conductivity (cm/sec)	Geoprobe Software Hydraulic Conductivity (m/sec)	Aqtesolv Software Hydraulic Conductivity (ft/day)	Geoprobe Software Hydraulic Conductivity (ft/day)	Geometric Mean Hydraulic Conductivity (ft/day)	RPD between tests at 1ft displacement (%)	RPD between tests at 2ft displacement (%)
CFMW-002	1.2	Upper Unit	Pneumatic	13	10	8.61	1	3.125	1	0.12	2.0	73.87	72.48	82.48	56.59	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.361E-02	1.361E-04		38.593		10.64	
CFMW-002	0.9	Upper Unit	Pneumatic	13	10	8.61	1	3.125	1	0.12	2.0	73.87	72.48	82.48	56.59	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.224E-02	1.224E-04		34.695	28.121		
CFMW-002	1.4	Upper Unit	Mechanic	13	10	8.61	1	3.125	1	0.12	4.6	73.87	72.48	82.48	56.59	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.539E-03	7.539E-05		21.370			2.24
CFMW-002	1.6	Upper Unit	Mechanic	13	10	8.61	1	3.125	1	0.12	4.6	73.87	72.48	82.48	56.59	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.710E-03	7.710E-05		21.854			
CFMW-003	1.0	Upper Unit	Pneumatic	13	10	34.38	1	3.125	1	0.12	3.0	19.8	44.18	54.18	39.83	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.245E-03	1.245E-05		3.530		0.14	
CFMW-003	1.0	Upper Unit	Pneumatic	13	10	34.38	1	3.125	1	0.12	3.0	19.8	44.18	54.18	39.83	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.243E-02	1.243E-04		3.525	3.133		
CFMW-003	2.1	Upper Unit	Pneumatic	13	10	34.38	1	3.125	1	0.12	3.0	19.8	44.18	54.18	39.83	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.020E-02	1.020E-04		2.892			7.72
CFMW-003	2.0	Upper Unit	Pneumatic	13	10	34.38	1	3.125	1	0.12	3.0	19.8	44.18	54.18	39.83	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	9.442E-04	9.442E-06		2.677			
CFMW-003a	1.3	Below Upper Unit	Pneumatic	15	10	57.1	1	3.125	1	0.12	3.0	145.92	193.02	203.02	307.84	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.603E-05	1.603E-07		0.045		23.53	
CFMW-003a	1.3	Below Upper Unit	Pneumatic	15	10	57.1	1	3.125	1	0.12	3.0	145.92	193.02	203.02	307.84	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.998E-05	1.998E-07		0.057	0.051		
CFMW-008a	2.0	Below Upper Unit	Mechanic	15	10	35.32	1	3.125	1	0.12	10.0	64.04	89.36	99.36	51.61	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv			0.00936				11.85
CFMW-008a	2.0	Below Upper Unit	Mechanic	15	10	35.32	1	3.125	1	0.12	9.5	64.04	89.36	99.36	51.61	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv			0.00832		0.009		
CFMW-010	1.1	Upper Unit	Pneumatic	13	10	14.61	1	3.125	1	0.12	3.0	72.24	76.85	86.85	55.13	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.406E-03	7.406E-05		20.994		14.72	
CFMW-010	1.1	Upper Unit	Pneumatic	13	10	14.61	1	3.125	1	0.12	3.0	72.24	76.85	86.85	55.13	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	8.583E-03	8.583E-05		24.331	20.296		
CFMW-010	2.0	Upper Unit	Pneumatic	13	10	14.61	1	3.125	1	0.12	3.0	72.24	76.85	86.85	55.13	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	6.425E-03	6.425E-05		18.212			0.16
CFMW-010	2.1	Upper Unit	Pneumatic	13	10	14.61	1	3.125	1	0.12	3.0	72.24	76.85	86.85	55.13	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	6.435E-03	6.435E-05		18.241			
CFMW-011	0.9	Upper Unit	Pneumatic	13	10	20.44	1	3.125	1	0.12	3.0	32.35	42.79	52.79	65.08	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	5.066E-02	5.066E-04		143.595		3.01	
CFMW-011	0.5	Upper Unit	Pneumatic	13	10	20.44	1	3.125	1	0.12	3.0	32.35	42.79	52.79	65.08	6	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	5.220E-02	5.220E-04		147.977	133.054		
CFMW-011	2.0	Upper Unit	Pneumatic	13	10	20.44	1	3.125	1	0.12	3.0	32.35	42.79	52.79	65.08	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	4.057E-02	4.057E-04		115.012			10.88
CFMW-011	2.0	Upper Unit	Pneumatic	13	10	20.44	1	3.125	1	0.12	3.0	32.35	42.79	52.79	65.08	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	4.524E-02	4.524E-04		128.242			
CFMW-011a	1.0	Below Upper Unit	Pneumatic	15	10	75.21	1	3.125	1	0.12	3.0	94.1	159.31	169.31	358.78	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.466E-03	2.466E-05		6.990		6.85	
CFMW-011a	1.0	Below Upper Unit	Pneumatic	15	10	75.21	1	3.125	1	0.12	3.0	94.1	159.31	169.31	358.78	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.641E-03	2.641E-05		7.486	7.359		
CFMW-011a	1.8	Below Upper Unit	Pneumatic	15	10	75.21	1	3.125	1	0.12	3.0	94.1	159.31	169.31	358.78	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.641E-03	2.641E-05		7.486			0.00
CFMW-011a	2.1	Below Upper Unit	Pneumatic	15	10	75.21	1	3.125	1	0.12	3.0	94.1	159.31	169.31	358.78	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.641E-03	2.641E-05		7.486			
CFMW-012a	1.1	Below Upper Unit	Pneumatic	15	10	74.42	1	3.125	1	0.12	3.0	138.99	203.41	213.41	263.48	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	3.588E-02	3.588E-04		101.693		9.33	
CFMW-012a	1.1	Below Upper Unit	Pneumatic	15	10	74.42	1	3.125	1	0.12	3.0	138.99	203.41	213.41	263.48	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	3.939E-02	3.939E-04		111.643	113.310		
CFMW-012a	2.1	Below Upper Unit	Pneumatic	15	10	74.42	1	3.125	1	0.12	3.0	138.99	203.41	213.41	263.48	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	4.340E-02	4.340E-04		123.014			4.13
CFMW-012a	1.9	Below Upper Unit	Pneumatic	15	10	74.42	1	3.125	1	0.12	3.0	138.99	203.41	213.41	263.48	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	4.164E-02	4.164E-04		118.031			
CFMW-016	0.1	Upper Unit	Mechanic	13	10	8.95	1	3.125	1	0.12	7.0	88.88	87.83	97.83	35.7	12	Unconfined	Partially penetrating		underdamped				K wasn't calculated because required displacement wasn't able to be achieved due to fast response during mechanical testing				
CFMW-016	0.1	Upper Unit	Mechanic	13	10	8.95	1	3.125	1	0.12	7.0	88.88	87.83	97.83	35.7	12	Unconfined	Partially penetrating		underdamped								
CFMW-016	0.1	Upper Unit	Mechanic	13	10	8.95	1	3.125	1	0.12	7.0	88.88	87.83	97.83	35.7	24	Unconfined	Partially penetrating		underdamped								
CFMW-016	0.1	Upper Unit	Mechanic	13	10	8.95	1	3.125	1	0.12	7.0	88.88	87.83	97.83	35.7	24	Unconfined	Partially penetrating		underdamped								
CFMW-016a	1.2	Upper Unit	Pneumatic	15	10	40.79	1	3.125	1	0.12	3.0	87.59	118.38	128.38	42.23	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.332E-03	4.332E-05		12.278		0.34	
CFMW-016a	1.1	Upper Unit	Pneumatic	15	10	40.79	1	3.125	1	0.12	3.0	87.59	118.38	128.38	42.23	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.317E-03	4.317E-05		12.236	13.066		
CFMW-016a	2.0	Upper Unit	Pneumatic	15	10	40.79	1	3.125	1	0.12	3.0	87.59	118.38	128.38	42.23	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.715E-03	4.715E-05		13.365			8.25
CFMW-016a	2.0	Upper Unit	Pneumatic	15	10	40.79	1	3.125	1	0.12	3.0	87.59	118.38	128.38	42.23	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	5.121E-03	5.121E-05		14.515			
CFMW-019a	1.0	Below Upper Unit	Pneumatic	15	10	87.99	1	3.125	1	0.12	3.0	135.02	213.01	223.01	117.45	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	1.330E-02	1.330E-04		37.689		3.30	
CFMW-019a	1.0	Below Upper Unit	Pneumatic	15	10	87.99	1	3.125	1	0.12	3.0	135.02	213.01	223.01	117.45	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	4.609E-03	4.609E-05		38.952	35.173		
CFMW-019a	1.9	Below Upper Unit	Pneumatic	15	10	87.99	1	3.125	1	0.12	3.0	135.02	213.01	223.01	117.45	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	1.143E-02	1.143E-04		32.409			0.74
CFMW-019a	1.9	Below Upper Unit	Pneumatic	15	10	87.99	1	3.125	1	0.12	3.0	135.02	213.01	223.01	117.45	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	1.135E-02	1.135E-04		32.170			
CFMW-022	1.1	Upper Unit	Pneumatic	13	10	17.88	1	3.125	1	0.12	3.0	65.42	73.3	83.3	49.09	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	7.131E-02	7.131E-04		202.149		6.14	
CFMW-022	1.1	Upper Unit	Pneumatic	13	10	17.88	1	3.125	1	0.12	3.0	65.42	73.3	83.3	49.09	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	7.583E-02	7.583E-04		214.964	200.901		
CFMW-022	1.9	Upper Unit	Pneumatic	13	10	17.88	1	3.125	1	0.12	3.0	65.42	73.3	83.3	49.09	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	6.709E-02	6.709E-04		192.477			1.18
CFMW-022	1.8	Upper Unit	Pneumatic	13	10	17.88	1	3.125	1	0.12	3.0	65.42	73.3	83.3	49.09	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	6.871E-02	6.871E-04		194.767			
CFMW-025a	1.1	Below Upper Unit	Pneumatic	15	10	56.88	1	3.125	1	0.12	3.0	41.4	88.28	98.28	511.309	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	5.503E-04	5.503E-06		1.568		7.78	
CFMW-025a	1.1	Below Upper Unit	Pneumatic	15	10	56.88	1	3.125	1	0.12	3.0	41.4	88.28	98.28	511.309	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	5.981E-04	5.981E-06		1.695	1.595		
CFMW-025a	2.1	Below Upper Unit	Pneumatic	15	10	56.88	1	3.125	1	0.12	3.0	41.4	88.28	98.28	511.309	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	5.067E-04	5.067E-06		1.436			16.54
CFMW-025a	2.0	Below Upper Unit	Pneumatic	15	10	56.88	1	3.125	1	0.12	3.0	41.4	88.28	98.28	511.309	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	5.979E-04	5.979E-06		1.695			
CFMW-026	0.9	Upper Unit	Pneumatic	13	10	13.35	1	3.125	1	0.12	3.0	34.06	37.41	47.41	59.16	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.051E-02	1.051E-04		29.798		4.48	
CFMW-026	1.0	Upper Unit	Pneumatic	13	10	13.35	1	3.125	1	0.12	3.0	34.06	37.41	47.41	59.16	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.099E-02	1.099E-04		31.164	28.063		
CFMW-026	2.1	Upper Unit	Pneumatic	13	10	13.35	1	3.125	1	0.12	3.0	34.06	37.41	47.41	59.16	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	9.067E-03	9.067E-05		25.702			1.10
CFMW-026	1.9	Upper Unit	Pneumatic	13	10	13.35	1	3.125	1	0.12	3.0	34.06	37.41	47.41	59.16	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.701E+01	7.701E-01		25.987			
CFMW-027	1.0	Upper Unit	Pneumatic	13	10	21.22	1	3.125	1	0.12	3.0	27.38	38.6	48.6	74.51	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	8.613E-02	8.613E-04		244.157		6.34	
CFMW-027	1.0	Upper Unit	Pneumatic	13	10	21.22	1	3.125	1	0.12	3.0	27.38	38.6	48.6	74.51	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	8.084E-02	8.084E-04		229.164	229.534		
CFMW-027	1.9	Upper Unit	Pneumatic	13	10	21.22	1	3.125	1	0.12	3.0	27.38	38.6	48.6	74.51	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	7.910E-02	7.910E-04		224.216			1.33
CFMW-027	1.9	Upper Unit	Pneumatic	13	10	21.22	1	3.125	1	0.12	3.0	27.38	38.6	48.6	74.51	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	7.806E-02	7.806E-04		221.263			
CFMW-028	1.1	Upper Unit	Pneumatic	13	10	24.19	1	3.125	1	0.12	3.0	38.2	52.39	62.39	85.508	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv	1.146E-04	1.146E-06	0.63960			17.26	
CFMW-028	1.1	Upper Unit	Pneumatic	13	10	24.19	1	3.125	1	0.12	3.0	38.2	52.39	62.39	85.508	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv	1.159E-04	1.159E-06	0.53800		0.555		
CFMW-028	2.0	Upper Unit	Pneumatic	13	10	24.19	1	3.125	1	0.12	3.0	38.2	52.39	62.39	85.508	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv	1.020E-04	1.020E-06	0.53990				5.50
CFMW-028	2.2	Upper Unit	Pneumatic	13	10	24.19	1	3.125	1	0.12	3.0	38.2	52.39	62.39	85.508	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv	1.044E-04	1.044E-06	0.51100				
CFMW-028a	1.0	Upper Unit	Pneumatic	15	10	84.28	1	3.125	1	0.12	3.0	38.03	112.31	122.31	85.714	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.992E-03	1.992E-05		5.646		27.55	
CFMW-028a	1.1	Upper Unit	Pneumatic	15	10	84.28	1	3.125	1	0.12	3.0	38.03	112.31	122.31	85.714	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.509E-03	1.509E-05		4.279	4.049		
CFMW-028a	2.0	Upper Unit	Pneumatic	15	10	84.28	1	3.125	1	0.12	3.0	38.03	112.31	122.31	85.714	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.138E-03	1.138E-05		3.227			6.65
CFMW-028a	2.0	Upper Unit	Pneumatic	15	10	84.28	1	3.125	1	0.12	3.0	38.03	112.31	122.31	85.714	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.217E-03	1.217E-05		3.449			
CFMW-029	0.9	Upper Unit	Pneumatic	13	10	15.31	1	3.125	1	0.12	3.0	62.85	68.16	78.16	68.87	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.185E-01	1.185E-03		335.870		6.64	
CFMW-029	1.1	Upper Unit	Pneumatic	13	10	15.31	1	3.125	1	0.12	3.0	62.85	68.16	78.16	68.87	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.266E-01	1.266E-03		358.928	304.277		
CFMW-029	2.0	Upper Unit	Pneumatic	13	10	15.31	1	3.125	1	0.12	3.0	62.85	68.16	78.16	68.87	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.056E-01	1.056E-03		299.449			23.09
CFMW-029	2.0	Upper Unit	Pneumatic	13	10	15.31	1	3.125	1	0.12	3.0	62.85	68.16	78.16	68.87	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	8.377E-02	8.377E-04		237.453			
CFMW-032	0.9	Upper Unit	Pneumatic	13	10	12.67	1	3.125	1	0.12	3.0	44.94	47.61	57.61	41.618	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.324E-03	1.324E-05		3.753		8.52	
CFMW-032	1.0	Upper Unit	Pneumatic	13	10	12.67	1	3.125	1	0.12	3.0	44.94	47.61	57.61	41.618	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.422E-03	1.422E-05		4.087	3.071		
CFMW-032	1.6	Upper Unit	Pneumatic	13	10	12.67	1	3.125	1	0.12	3.0	44.94	47.61	57.61	41.618	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	9.359E-04	9.359E-06		2.653			19.35
CFMW-032	1.9	Upper Unit	Pneumatic	13	10	12.67	1	3.125	1	0.12	3.0	44.94	47.61	57.61	41.618	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.709E-04	7.709E-06		2.185			
CFMW-032a	1.1	Below Upper Unit	Pneumatic	15	10	98.54	1	3.125	1	0.12	3.0	107.96	196.5	206.5	346.81	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv	3.516E-06	3.516E-08	0.01713			0.93	
CFMW-032a	1.1	Below Upper Unit	Pneumatic	15	10	98.54	1	3.125	1	0.12	3.0	107.96	196.5	206.5	346.81	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv	3.524E-06	3.524E-08	0.01729		0.017		
CFMW-033	1.0	Upper Unit	Pneumatic	13	10	21.87	1	3.125	1	0.12	3.0	41.75	53.62	63.62	83.11	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	1.340E-01	1.340E-03		379.719		16.80	
CFMW-033	1.1	Upper Unit	Pneumatic	13	10	21.87	1	3.125	1	0.12	3.0	41.75	53.62	63.62	83.11	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	1.132E-01	1.132E-03		320.855	325.532		
CFMW-033	1.8	Upper Unit	Pneumatic	13	10	21.87	1	3.125	1	0.12	3.0	41.75	53.62	63.62	83.11	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	1.104E-01	1.104E-03		312.905			6.04
CFMW-033	2.0	Upper Unit	Pneumatic	13	10	21.87	1	3.125	1	0.12	3.0	41.75	53.62	63.62	83.11	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	1.039E-01	1.039E-03		294.570			
CFMW-034	1.0	Upper Unit	Pneumatic	13	10	21.09	1	3.125	1	0.12	3.0	41.35	52.44	62.44	82.19	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.335E-02	1.335E-04		37.829		15.34	
CFMW-034	1.0	Upper Unit	Pneumatic	13	10	21.09	1	3.125	1	0.12	3.0	41.35	52.44	62.44	82.19	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.120E+02	1.120E+00		44.112	41.286		
CFMW-034	2.0	Upper Unit	Pneumatic	13	10	21.09	1	3.125	1	0.12	3.0	41.35	52.44	62.44	82.19	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.331E-02	1.331E-04		37.719			20.13
CFMW-034	2.0	Upper Unit	Pneumatic	13	10	21.09	1	3.125	1	0.12	3.0	41.35	52.44	62.44	82.19	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.628E-02	1.628E-04		46.162			
CFMW-035	0.8	Upper Unit	Pneumatic	13	10	29.94	1	3.125	1	0.12	3.0	40.48	60.42	70.42	39.03	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.688E-05	4.688E-07		0.133		1.49	
CFMW-035	0.9	Upper Unit	Pneumatic	13	10	29.94	1	3.125	1	0.12	3.0	40.48	60.42	70.42	39.03	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.755E-05	4.755E-07		0.135	0.126		
CFMW-035	1.8	Upper Unit	Pneumatic	13	10	29.94	1	3.125	1	0.12	3.0	40.48	60.42	70.42	39.03	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.455E-05	4.455E-07		0.126			11.76
CFMW-035	1.8	Upper Unit	Pneumatic	13	10	29.94	1	3.125	1	0.12	3.0	40.48	60.42	70.42	39.03	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	3.964E-05	3.964E-07		0.112			
CFMW-037	1.2	Upper Unit	Pneumatic	13	10	34.01	1	3.125	1	0.12	3.0	69.2	93.21	103.21	54.23	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.038E-04	2.038E-06		0.578		51.60	
CFMW-037	1.0	Upper Unit	Pneumatic	13	10	34.01	1	3.125	1	0.12	3.0	69.2	93.21	103.21	54.23	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	3.459E-04	3.459E-06		0.980	0.894		
CFMW-037	2.4	Upper Unit	Pneumatic	13	10	34.01	1	3.125	1	0.12	3.0	69.2	93.21	103.21	54.23	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	3.592E-04	3.592E-06		1.018			8.47
CFMW-037	2.2	Upper Unit	Pneumatic	13	10	34.01	1	3.125	1	0.12	3.0	69.2	93.21	103.21	54.23	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	3.910E-04	3.910E-06		1.108			
CFMW-038	1.1	Upper Unit	Mechanic	13	10	22.34	1	3.125	1	0.12	16.0	84.42	96.76	106.76	60.83	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	4.733E-02	4.733E-04		134.154		5.06	
CFMW-038	0.9	Upper Unit	Mechanic	13	10	22.34	1	3.125	1	0.12	16.0	84.42	96.76	106.76	60.83	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	4.499E-02	4.499E-04		127.537	114.398		
CFMW-038	2.2	Upper Unit	Mechanic	13	10	22.34	1	3.125	1	0.12	16.0	84.42	96.76	106.76	60.83	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	3.861E-02	3.861E-04		109.440			17.89
CFMW-038	1.8	Upper Unit	Mechanic	13	10	22.34	1	3.125	1	0.12	16.0	84.42	96.76	106.76	60.83	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	3.227E-02	3.227E-04		91.467			
CFMW-040	1.1	Upper Unit	Pneumatic	13	10	13.46	1	3.125	1	0.12	3.0	79.3	82.76	92.76	77.28	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.230E-04	7.230E-06		2.049		0.10	
CFMW-040	1.1	Upper Unit	Pneumatic	13	10	13.46	1	3.125	1	0.12	3.0	79.3	82.76	92.76	77.28	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.235E-04	7.235E-06		2.051	2.050		
CFMW-040	1.8	Upper Unit	Pneumatic	13	10	13.46	1	3.125	1	0.12	3.0	79.3	82.76	92.76	77.28	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.234E-04	7.234E-06		2.051			0.00

Table 18. Slug Testing Methods, Inputs, and Hydraulic Conductivity Summary Table
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Well Name	Approximate Change in Head (ft)	Hydrogeologic Unit	Type of Test	Le Effective screen length (ft)	Ls Length of screen (ft)	Lw Length of water column (static water column height) (ft)	Rs Radius of screen (in)	Rb Radius of boring (in)	Rc Radius of casing (in)	r*t Radius of transducer (in)	Ts depth of transducer submerged (ft)	SWL Static Water Level (ft)	Depth to top of screen (ft)	TD Total Depth (ft)	H Aquifer Thickness (ft)	Ho Initial Change in Head (in)	Confined/ Unconfined	Well Screen	Method Used	Description of Response	Geoprobe or Aqtesolv	Geoprobe Software Hydraulic Conductivity (cm/sec)	Geoprobe Software Hydraulic Conductivity (m/sec)	Aqtesolv Software Hydraulic Conductivity (ft/day)	Geoprobe Software Hydraulic Conductivity (ft/day)	Geometric Mean Hydraulic Conductivity (ft/day)	RPD between tests at 1ft displacement (%)	RPD between tests at 2ft displacement (%)
CFMW-040	2.1	Upper Unit	Pneumatic	13	10	13.46	1	3.125	1	0.12	3.0	79.3	82.76	92.76	77.28	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.234E-04	7.234E-06		2.051			0.00
CFMW-042	1.0	Upper Unit	Pneumatic	13	10	13.82	1	3.125	1	0.12	3.0	49.17	52.99	62.99	81.70	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.886E-02	1.886E-04		53.471		0.00	
CFMW-042	1.0	Upper Unit	Pneumatic	13	10	13.82	1	3.125	1	0.12	3.0	49.17	52.99	62.99	81.70	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.886E-02	1.886E-04		53.471	53.471		
CFMW-042	1.9	Upper Unit	Pneumatic	13	10	13.82	1	3.125	1	0.12	3.0	49.17	52.99	62.99	81.70	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.886E-02	1.886E-04		53.471			0.00
CFMW-042	2.0	Upper Unit	Pneumatic	13	10	13.82	1	3.125	1	0.12	3.0	49.17	52.99	62.99	81.70	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.886E-02	1.886E-04		53.471			
CFMW-043	0.9	Upper Unit	Pneumatic	13	10	18	1	3.125	1	0.12	3.0	44.01	52.01	62.01	81.64	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.977E-02	1.977E-04		56.028		0.00	
CFMW-043	1.0	Upper Unit	Pneumatic	13	10	18	1	3.125	1	0.12	3.0	44.01	52.01	62.01	81.64	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.977E-02	1.977E-04		56.028	56.028		
CFMW-043	2.1	Upper Unit	Pneumatic	13	10	18	1	3.125	1	0.12	3.0	44.01	52.01	62.01	81.64	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.977E-02	1.977E-04		56.028			0.00
CFMW-043	1.9	Upper Unit	Pneumatic	13	10	18	1	3.125	1	0.12	3.0	44.01	52.01	62.01	81.64	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.977E-02	1.977E-04		56.028			
CFMW-044a	1.0	Upper Unit	Pneumatic	15	10	65.23	1	3.125	1	0.12	3.0	47.71	102.94	112.94	77.67	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.464E-05	4.464E-07		0.127		40.76	
CFMW-044a	0.8	Upper Unit	Pneumatic	15	10	65.23	1	3.125	1	0.12	3.0	47.71	102.94	112.94	77.67	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.969E-05	2.969E-07		0.084	0.108		
CFMW-044a	1.9	Upper Unit	Pneumatic	15	10	65.23	1	3.125	1	0.12	3.0	47.71	102.94	112.94	77.67	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.209E-05	4.209E-07		0.119			11.56
CFMW-044a	1.8	Upper Unit	Pneumatic	15	10	65.23	1	3.125	1	0.12	3.0	47.71	102.94	112.94	77.67	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	3.732E-05	3.732E-07		0.106			
CFMW-045	1.0	Upper Unit	Pneumatic	13	10	22.13	1	3.125	1	0.12	3.0	76.95	89.08	99.08	79.09	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.530E-03	1.530E-05		4.336		1.33	
CFMW-045	0.9	Upper Unit	Pneumatic	13	10	22.13	1	3.125	1	0.12	3.0	76.95	89.08	99.08	79.09	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.550E-03	1.550E-05		4.394	5.677		
CFMW-045	2.0	Upper Unit	Pneumatic	13	10	22.13	1	3.125	1	0.12	3.0	76.95	89.08	99.08	79.09	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.570E-03	2.570E-05		7.285			2.71
CFMW-045	2.0	Upper Unit	Pneumatic	13	10	22.13	1	3.125	1	0.12	3.0	76.95	89.08	99.08	79.09	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.640E-03	2.640E-05		7.485			
CFMW-045a	1.1	Upper Unit	Mechanic	15	10	76.09	1	3.125	1	0.12	16.0	85.2	151.29	161.29	78.9	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv	4.810E-05	4.810E-07	0.16810			6.19	
CFMW-045a	1.1	Upper Unit	Mechanic	15	10	76.09	1	3.125	1	0.12	15.8	85.2	151.29	161.29	78.9	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv	5.397E-05	5.397E-07	0.15800		0.163		
CFMW-047	1.2	Upper Unit	Pneumatic	13	10	26.3	1	3.125	1	0.12	3.0	96.83	113.13	123.13	54.87	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	9.030E-04	9.030E-06		2.560		19.24	
CFMW-047	1.1	Upper Unit	Pneumatic	13	10	26.3	1	3.125	1	0.12	3.0	96.83	113.13	123.13	54.87	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.095E-03	1.095E-05		3.105	2.967		
CFMW-047	1.8	Upper Unit	Pneumatic	13	10	26.3	1	3.125	1	0.12	3.0	96.83	113.13	123.13	54.87	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	9.003E-04	9.003E-06		2.552			39.75
CFMW-047	1.9	Upper Unit	Pneumatic	13	10	26.3	1	3.125	1	0.12	3.0	96.83	113.13	123.13	54.87	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.347E-03	1.347E-05		3.818			
CFMW-049a	0.9	Upper Unit	Pneumatic	15	10	50	1	3.125	1	0.12	3.0	101.13	141.13	151.13	53.068	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	3.475E-04	3.475E-06		0.985		32.48	
CFMW-049a	1.1	Upper Unit	Pneumatic	15	10	50	1	3.125	1	0.12	3.0	101.13	141.13	151.13	53.068	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.822E-04	4.822E-06		1.367	1.016		
CFMW-049a	1.8	Upper Unit	Pneumatic	15	10	50	1	3.125	1	0.12	3.0	101.13	141.13	151.13	53.068	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.945E-04	2.945E-06		0.835			12.57
CFMW-049a	2.1	Upper Unit	Pneumatic	15	10	50	1	3.125	1	0.12	3.0	101.13	141.13	151.13	53.068	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	3.341E-04	3.341E-06		0.947			
CFMW-050	1.0	Upper Unit	Pneumatic	13	10	21.37	1	3.125	1	0.12	3.0	102.02	113.39	123.39	53.86	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	8.817E-03	8.817E-05		24.993		2.23	
CFMW-050	1.0	Upper Unit	Pneumatic	13	10	21.37	1	3.125	1	0.12	3.0	102.02	113.39	123.39	53.86	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	8.623E-03	8.623E-05		24.442	25.357		
CFMW-050	1.9	Upper Unit	Pneumatic	13	10	21.37	1	3.125	1	0.12	3.0	102.02	113.39	123.39	53.86	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	8.674E-03	8.674E-05		24.589			11.26
CFMW-050	2.1	Upper Unit	Pneumatic	13	10	21.37	1	3.125	1	0.12	3.0	102.02	113.39	123.39	53.86	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	9.710E-03	9.710E-05		27.524			
CFMW-053a	1.0	Below Upper Unit	Mechanic	13	10	76.74	1	3.125	1	0.12	3.0	85.81	152.55	162.55	516.585	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv			0.01385			7.24	
CFMW-053a	1.0	Below Upper Unit	Mechanic	13	10	76.74	1	3.125	1	0.12	3.0	85.81	152.55	162.55	516.585	12			Bouwer and Rice	overdamped	Aqtesolv			0.01489		0.014		
CFMW-054	1.0	Upper Unit	Pneumatic	13	10	15.44	1	3.125	1	0.12	3.3	71.95	77.39	87.39	75.76	121	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.724E-03	1.724E-05		4.886		3.56	
CFMW-054	1.1	Upper Unit	Pneumatic	13	10	15.44	1	3.125	1	0.12	3.3	71.95	77.39	87.39	75.76	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.786E-03	1.786E-05		5.063	4.937		
CFMW-054	2.0	Upper Unit	Pneumatic	13	10	15.44	1	3.125	1	0.12	3.3	71.95	77.39	87.39	75.76	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.734E-03	1.734E-05		4.915			0.59
CFMW-054	2.0	Upper Unit	Pneumatic	13	10	15.44	1	3.125	1	0.12	3.3	71.95	77.39	87.39	75.76	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.724E-03	1.724E-05		4.886			
CFMW-056a	1.0	Below Upper Unit	Mechanic	15	10	66.85	1	3.125	1	0.12	3.0	70.67	127.52	137.52	532.338	12			Bouwer and Rice	overdamped	Geoprobe	8.875E-06	8.875E-08		0.025		24.56	
CFMW-056a	1.0	Below Upper Unit	Mechanic	15	10	66.85	1	3.125	1	0.12	3.0	70.67	127.52	137.52	532.338	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.114E-05	1.114E-07		0.032	0.028		
CFMW-056b	0.9	Upper Unit	Pneumatic	13	10	23.63	1	3.125	1	0.12	3.0	28.97	42.6	52.6	44.63	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	5.499E-03	5.499E-05		15.588		2.46	
CFMW-056b	1.1	Upper Unit	Pneumatic	13	10	23.63	1	3.125	1	0.12	3.0	28.97	42.6	52.6	44.63	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	5.636E-03	5.636E-05		15.976	14.987		
CFMW-056b	2.0	Upper Unit	Pneumatic	13	10	23.63	1	3.125	1	0.12	3.0	28.97	42.6	52.6	44.63	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	5.075E-03	5.075E-05		14.385			2.13
CFMW-056b	2.1	Upper Unit	Pneumatic	13	10	23.63	1	3.125	1	0.12	3.0	28.97	42.6	52.6	44.63	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	4.968E-03	4.968E-05		14.082			
CFMW-057a	2.0	Below Upper Unit	Mechanic	15	10	71.66	1	3.125	1	0.12	11.5	68.75	130.41	140.41	584.146	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv			0.00684				186.22
CFMW-057a	2.0	Below Upper Unit	Mechanic	15	10	71.66	1	3.125	1	0.12	10.9	68.75	130.41	140.41	584.146	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Aqtesolv			0.00024		0.001		
CFMW-059	1.0	Upper Unit	Pneumatic	13	10	28.56	1	3.125	1	0.12	3.0	64.1	82.66	92.66	49.934	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.948E-03	1.948E-05		5.521		3.76	
CFMW-059	1.1	Upper Unit	Pneumatic	13	10	28.56	1	3.125	1	0.12	3.0	64.1	82.66	92.66	49.934	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.876E-03	1.876E-05		5.317	5.486		
CFMW-059	2.0	Upper Unit	Pneumatic	13	10	28.56	1	3.125	1	0.12	3.0	64.1	82.66	92.66	49.934	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.991E-03	1.991E-05		5.644			3.20
CFMW-059	2.0	Upper Unit	Pneumatic	13	10	28.56	1	3.125	1	0.12	3.0	64.1	82.66	92.66	49.934	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.928E-03	1.928E-05		5.466			
CFMW-059a	0.9	Below Upper Unit	Pneumatic	15	10	97.28	1	3.125	1	0.12	3.0	66.7	153.98	163.98	585.431	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.148E-03	1.148E-05		3.254		5.50	
CFMW-059a	1.0	Below Upper Unit	Pneumatic	15	10	97.28	1	3.125	1	0.12	3.0	66.7	153.98	163.98	585.431	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.213E-03	1.213E-05		3.438	2.808		
CFMW-059a	2.0	Below Upper Unit	Pneumatic	15	10	97.28	1	3.125	1	0.12	3.0	66.7	153.98	163.98	585.431	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	9.288E-04	9.288E-06		2.633			21.96
CFMW-059a	1.9	Below Upper Unit	Pneumatic	15	10	97.28	1	3.125	1	0.12	3.0	66.7	153.98	163.98	585.431	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	7.450E-04	7.450E-06		2.112			
CFMW-061	1.1	Upper Unit	Pneumatic	13	10	14.13	1	3.125	1	0.12	3.0	11.89	16.02	26.02	68.12	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	7.215E-02	7.215E-04		204.511		6.17	
CFMW-061	0.9	Upper Unit	Pneumatic	13	10	14.13	1	3.125	1	0.12	3.0	11.89	16.02	26.02	68.12	12	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	7.674E-02	7.674E-04		217.536	185.798		
CFMW-061	2.0	Upper Unit	Pneumatic	13	10	14.13	1	3.125	1	0.12	3.0	11.89	16.02	26.02	68.12	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	5.807E-02	5.807E-04		164.612			1.15
CFMW-061	1.8	Upper Unit	Pneumatic	13	10	14.13	1	3.125	1	0.12	3.0	11.89	16.02	26.02	68.12	24	Unconfined	Partially penetrating	Springer and Gelhar	underdamped	Geoprobe	5.741E-02	5.741E-04		162.726			
CFMW-064	0.9	Upper Unit	Pneumatic	13	10	20.32	1	3.125	1	0.12	3.0	12.6	22.92	32.92	66.98	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	2.077E-02	2.077E-04		58.867		16.80	
CFMW-064	1.0	Upper Unit	Pneumatic	13	10	20.32	1	3.125	1	0.12	3.0	12.6	22.92	32.92	66.98	12	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.755E-02	1.755E-04		49.743	52.149		
CFMW-064	1.9	Upper Unit	Pneumatic	13	10	20.32	1	3.125	1	0.12	3.0	12.6	22.92	32.92	66.98	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.795E-02	1.795E-04		50.873			2.44
CFMW-064	2.0	Upper Unit	Pneumatic	13	10	20.32	1	3.125	1	0.12	3.0	12.6	22.92	32.92	66.98	24	Unconfined	Partially penetrating	Bouwer and Rice	overdamped	Geoprobe	1.751E-02	1.751E-04		49.646			

Table 19. Summary of Field Parameters Measured during Surface Water Sampling
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Temperature				Conductivity				DO				pH				ORP				Turbidity			
	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
CFSWP-001	12.86	4.65	3.59	6.23	0.168	0.194	0.179	0.133	12.62	12.41	14.87	11.71	7.71	7.98	7.08	7.43	175	190	208	282.5	0.0	0.0	0.0	20.5
CFSWP-002	12.80	4.38	3.55	6.25	0.167	0.188	0.166	0.129	13.31	12.53	15.26	11.91	7.69	8.04	7.26	8.18	176	186	198	282.1	0.0	0.0	0.00	23.1
CFSWP-003	11.72	4.05	4.45	6.86	0.208	0.242	0.170	0.145	11.59	12.40	13.44	11.29	6.18	7.78	NA	8.22	-25	164	320	257.7	281	0.0	NA	20.9
CFSWP-004	10.66	6.74	5.07	6.9	0.520	0.478	0.207	0.145	9.88	6.33	14.9	11.00	6.75	7.52	NA	8.23	112	150	281	253.4	6.21	0.0	0.0	22.1
CFSWP-005	10.60	7.53	5.18	7.80	0.517	0.572	0.222	0.304	10.06	11.23	13.01	10.04	6.75	7.5	NA	7.87	192	213	236	231.6	0.0	0.0	0.0	14.3
CFSWP-006	12.36	4.15	2.22	6.24	0.165	0.183	0.160	0.127	9.12	13.40	17.57	12.12	7.53	8.23	NA	8.2	116	1.74	239	276.3	0.73	0.0	NA	28.2
CFSWP-007	12.49	4.26	2.28	6.28	0.166	0.189	0.16	0.127	13.03	12.98	17.36	12.18	7.46	8.02	NA	8.24	202	187	273	267.3	0.0	0.0	NA	25.0
CFSWP-008	12.36	3.82	3.95	6.27	0.166	0.196	0.170	0.129	11.65	13.03	16.23	11.81	7.31	8.05	7.14	7.92	197	184	188	281.6	0	0.0	1.34	25.5
CFSWP-009	11.66	DRY	4.05	11.99	0.326	DRY	0.317	0.333	16.06	DRY	12.24	8.78	8	DRY	7.79	7.86	96	DRY	159	172	0.3	DRY	0.0	0.0
CFSWP-010	12.58	DRY	1.86	16.86	0.296	DRY	0.171	0.323	12.09	DRY	10.44	7.64	8.06	DRY	NA	8.36	173	DRY	228	161	1.8	DRY	NA	4.79
CFSWP-011	12.26	DRY	4.87	17.37	0.298	DRY	0.310	0.327	13.53	DRY	12.53	7.88	7.94	DRY	7.94	8.3	162	DRY	137	182	0.8	DRY	83.5	0
CFSWP-012	11.95	DRY	4.23	16.81	0.296	DRY	0.316	0.287	13.49	DRY	12.18	9.01	7.88	DRY	7.46	8.39	166	DRY	162	152	1.5	DRY	0.0	6.46
CFSWP-013	11.82	3.02	3.12	15.87	0.295	0.321	0.290	0.320	15.18	8.67	10.56	8.71	7.81	7.72	NA	8.28	149	63	211	167	1.2	65.7	NA	0.3
CFSWP-014	18.83	4.1	4.17	12.32	0.208	0.379	0.351	0.322	15.48	14.39	10.94	10.68	7.35	8.14	NA	8.22	136	149	278	106	0	0	NA	0
CFSWP-015	18.45	2.57	4.79	12.86	0.311	0.333	0.356	0.328	19.02	16.05	10.07	10.48	7.38	7.48	NA	7.85	132	49	182	222	0	0	NA	7.52
CFSWP-016	17.71	3.85	4.99	14.73	0.31	0.385	0.351	0.337	16.83	17.53	9.95	8.95	7.44	8	NA	8.27	127	195	155	187	0.0	0.0	NA	0.0
CFSWP-017	10.77	3.79	4.3	6.31	0.274	0.195	0.171	0.129	11.86	13.58	19.28	12.04	7.28	7.69	NA	8.17	176	209	206	272.1	0	0	0.00	25.1
CFSWP-018	17.09	1.18	5.41	11.56	0.355	0.417	0.340	0.456	9.03	6.18	9.24	9.67	7.29	7.46	7.22	8.06	164	134	166	198.6	2.1	127	0.53	12.6
CFSWP-019	15.37	3.00	6.32	12.68	0.357	0.400	0.338	0.303	8.37	8.45	8.97	8.72	7.54	7.39	7.26	8.27	161	219	169	210.8	0.9	0.0	0.0	11.0
CFSWP-020	11.08	4.19	1.87	11.30	0.344	0.356	0.319	0.315	11.16	9.36	12.45	8.52	7.69	7.58	NA	8.03	157	221	277	219.6	0.3	19.1	NA	3.95
CFSWP-021	10.26	3.19	3.69	7.45	0.344	0.593	0.515	0.398	12.80	13.08	11.41	10.03	7.7	8.37	NA	7.64	163	147	292	250.8	0.1	0.0	NA	1.06
CFSWP-022	11.39	DRY	3.96	DRY	0.346	DRY	0.323	DRY	12.70	DRY	9.51	DRY	7.62	DRY	7.09	DRY	140	DRY	166	DRY	0.2	DRY	1.38	DRY
CFSWP-023	DRY	DRY	5.34	DRY	DRY	DRY	0.413	DRY	DRY	DRY	7.17	DRY	DRY	DRY	7.14	DRY	DRY	DRY	177	DRY	DRY	DRY	2.56	DRY
CFSWP-024	DRY	DRY	DRY	13.95	DRY	DRY	DRY	0.119	DRY	DRY	DRY	5.41	DRY	DRY	DRY	5.37	DRY	DRY	DRY	290.4	DRY	DRY	DRY	17.5
CFSWP-025	NA	2.61	4.83	12.30	NA	0.334	0.380	0.323	NA	14.51	9.67	9.85	NA	7.35	NA	8.28	NA	87	167	184	NA	0.0	NA	0.0

Table 20. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	88	ug/l	13,900	269,000	148,160	164,500	54,896	69,480	224,150	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	88	ug/l	<72	1,840	ND	ND	ND	ND	85.44	10	11	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	88	ug/l	227.0	3,100	1,422	1,590	848.7464	284.05	2,936	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Fluoride	WS	DI	23	ug/l	109.0	21,500	1,174	130.0	4,446	117.1	1,730	23	100	1	4	4000	1	4	4000	23	100.00	80
GENCHEM	Fluoride	WS	T	88	ug/l	33.5	22,400	602.3216	131.5	2,421	37.79	2,133	88	100	1	1	4000	1	1	4000	75	85.23	80
GENCHEM	Hardness as calcium carbonate	WS	T	88	ug/l	50,000	304,000	150,682	167,000	55,338	70,700	223,300	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	88	ug/l	<100	1,700	212.0682	106.5	385.0362	ND	1,451	46	52	0	0	10000	0	0	10000	-	-	-
GENCHEM	Orthophosphate as P	WS	T	71	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	88	ug/l	1,880	78,900	6,363	3,410	11,433	1,910	17,995	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfide	WS	T	23	ug/l	<579	<579	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	88	mg/l	62.0	336.0	160.9773	170.0	66.0087	74.0	291.8	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	88	mg/l	<1	413.0	24.4909	3.6	57.2414	ND	101.78	67	76	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	DI	23	ug/l	<18.2	4,780	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	1	4.35	2000
METALS	Aluminum	WS	T	88	ug/l	<13.5	8,630	368.3915	44.5	1,126	ND	1,299	74	84	-	-	-	-	-	-	2	2.27	2000
METALS	Antimony	WS	DI	23	ug/l	<0.62	7.2	ND	ND	ND	ND	ND	1	4	1	4	5.6	1	4	6	1	4.35	0.78
METALS	Antimony	WS	T	88	ug/l	<0.62	7.7	ND	ND	ND	ND	0.653	8	9	1	1	5.6	1	1	6	1	1.14	0.78
METALS	Arsenic	WS	DI	23	ug/l	<0.64	1.0	ND	ND	ND	ND	0.906	3	13	0	0	10	0	0	10	23	100.00	0.052
METALS	Arsenic	WS	T	88	ug/l	<0.64	3.7	ND	ND	ND	ND	1.1125	13	15	0	0	10	0	0	10	88	100.00	0.052
METALS	Barium	WS	DI	23	ug/l	26.4	270.0	99.5652	86.5	58.6305	63.61	242.6	23	100	0	0	1000	0	0	2000	0	0.00	380
METALS	Barium	WS	T	88	ug/l	43.4	424.0	126.5636	102.5	66.5438	69.07	259.75	88	100	0	0	1000	0	0	2000	1	1.14	380
METALS	Beryllium	WS	DI	23	ug/l	<0.24	0.51	ND	ND	ND	ND	ND	1	4	0	0	4	0	0	4	0	0.00	2.5
METALS	Beryllium	WS	T	88	ug/l	<0.24	0.71	ND	ND	ND	ND	ND	1	1	0	0	4	0	0	4	0	0.00	2.5
METALS	Cadmium	WS	DI	23	ug/l	<0.71	2.5	ND	ND	ND	ND	ND	1	4	0	0	5	0	0	5	1	4.35	0.92
METALS	Cadmium	WS	T	88	ug/l	<0.71	3.0	ND	ND	ND	ND	ND	1	1	0	0	5	0	0	5	1	1.14	0.92
METALS	Calcium	WS	DI	23	ug/l	7,020	54,100	35,697	39,800	15,709	18,200	52,030	23	100	-	-	-	-	-	-	-	-	-
METALS	Calcium	WS	T	88	ug/l	7,860	82,100	40,971	45,600	15,498	19,440	62,530	88	100	-	-	-	-	-	-	-	-	-
METALS	Chromium	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	23	100.00	0.035
METALS	Chromium	WS	T	88	ug/l	<1.3	37.7	ND	ND	ND	ND	3.155	12	14	0	0	100	0	0	100	88	100.00	0.035
METALS	Cobalt	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	23	100.00	0.6
METALS	Cobalt	WS	T	88	ug/l	<1.3	2.4	ND	ND	ND	ND	1.1075	5	6	-	-	-	-	-	-	88	100.00	0.6
METALS	Copper	WS	DI	23	ug/l	<1.4	26.4	ND	ND	ND	ND	2.9	3	13	0	0	1300	0	0	1300	0	0.00	80
METALS	Copper	WS	T	88	ug/l	<1.4	16.5	1.6102	ND	2.2216	ND	5.365	28	32	0	0	1300	0	0	1300	0	0.00	80
METALS	Cyanide, Free	WS	DI	7	ug/l	<1.5	42.2	8.2857	1.7	15.0962	ND	31.22	5	71	0	0	140	0	0	200	7	100.00	0.15
METALS	Cyanide, Free	WS	T	14	ug/l	<1.5	45.6	5.9964	1.425	11.7648	ND	21.81	7	50	0	0	140	0	0	200	14	100.00	0.15
METALS	Cyanide, Total	WS	DI	23	ug/l	<2	162.0	12.0739	ND	35.5998	ND	62.63	5	22	1	4	140	0	0	200	23	100.00	0.15
METALS	Cyanide, Total	WS	T	88	ug/l	<2	213.0	15.3534	ND	46.2003	ND	142.72	21	24	5	6	140	2	2	200	88	100.00	0.15
METALS	Iron	WS	DI	23	ug/l	<42.4	164.0	ND	ND	ND	ND	60.05	3	13	-	-	-	-	-	-	0	0.00	1400
METALS	Iron	WS	T	88	ug/l	<42.4	4,760	296.7307	46.0	658.1026	ND	1,168	45	51	-	-	-	-	-	-	4	4.55	1400

Table 20. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WS	DI	23	ug/l	<0.38	<0.38	ND	ND	ND	ND	ND	0	0	0	0	15	0	0	15	0	0.00	15
METALS	Lead	WS	T	88	ug/l	<0.38	7.6	0.4868	ND	0.9819	ND	1.525	22	25	0	0	15	0	0	15	0	0.00	15
METALS	Magnesium	WS	DI	23	ug/l	384.0	14,800	8,824	11,000	4,017	4,465	13,160	23	100	-	-	-	-	-	-	-	-	-
METALS	Magnesium	WS	T	88	ug/l	804.0	19,500	10,699	11,100	3,967	5,542	16,955	88	100	-	-	-	-	-	-	-	-	-
METALS	Manganese	WS	DI	23	ug/l	<2.5	31.8	5.2261	2.5	8.1144	ND	25.64	12	52	-	-	-	-	-	-	0	0.00	43
METALS	Manganese	WS	T	88	ug/l	<2.5	3,750	57.4773	6.0	399.126	ND	55.315	70	80	-	-	-	-	-	-	8	9.09	43
METALS	Mercury	WS	DI	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.05	0	0	2	23	100.00	0.063
METALS	Mercury	WS	T	88	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	88	100	0.05	0	0	2	88	100.00	0.063
METALS	Nickel	WS	DI	23	ug/l	<1.4	32.2	ND	ND	ND	ND	19.96	2	9	0	0	100	-	-	-	0	0.00	39
METALS	Nickel	WS	T	88	ug/l	<1.4	55.9	ND	ND	ND	ND	1.795	7	8	0	0	100	-	-	-	1	1.14	39
METALS	Potassium	WS	DI	23	ug/l	237.0	970.0	433.4348	419.0	190.8824	240.6	759.2	23	100	-	-	-	-	-	-	-	-	-
METALS	Potassium	WS	T	88	ug/l	242.0	1,250	558.2159	505.5	214.6647	309.7	1,046	88	100	-	-	-	-	-	-	-	-	-
METALS	Selenium	WS	DI	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Selenium	WS	T	88	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Silver	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Silver	WS	T	88	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Sodium	WS	DI	23	ug/l	562.0	23,500	3,824	2,020	5,408	570.4	13,910	23	100	-	-	-	-	-	-	-	-	-
METALS	Sodium	WS	T	88	ug/l	666.0	36,900	5,318	2,350	8,177	748.05	26,230	88	100	-	-	-	-	-	-	-	-	-
METALS	Thallium	WS	DI	23	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.24	0	0	2	23	100.00	0.02
METALS	Thallium	WS	T	88	ug/l	<0.26	0.27	ND	ND	ND	ND	ND	1	1	1	1	0.24	0	0	2	88	100.00	0.02
METALS	Vanadium	WS	DI	23	ug/l	<1.9	4.3	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	0	0.00	8.6
METALS	Vanadium	WS	T	88	ug/l	<1.9	18.0	1.3972	ND	1.9544	ND	2.165	15	17	-	-	-	-	-	-	1	1.14	8.6
METALS	Zinc	WS	DI	23	ug/l	<7	512.0	ND	ND	ND	ND	ND	1	4	0	0	2000	-	-	-	0	0.00	600
METALS	Zinc	WS	T	88	ug/l	<7	537.0	ND	ND	ND	ND	17.57	11	13	0	0	2000	-	-	-	0	0.00	600
OC_PEST	4,4'-DDD	WS	T	4	ug/l	<0.005	<0.006	ND	ND	ND	ND	ND	0	0	0	0	0.0031	-	-	-	0	0.00	0.032
OC_PEST	4,4'-DDE	WS	T	4	ug/l	<0.002	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0.00	0.046
OC_PEST	4,4'-DDT	WS	T	4	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0.00	0.23
OC_PEST	Aldrin	WS	T	4	ug/l	<0.003	<0.004	ND	ND	ND	ND	ND	0	0	4	100	0.00049	-	-	-	4	100.00	9E-04
OC_PEST	alpha-BHC	WS	T	4	ug/l	<0.006	<0.007	ND	ND	ND	ND	ND	0	0	0	0	0.026	-	-	-	0	0.00	0.007
OC_PEST	alpha-Chlordane	WS	T	4	ug/l	<0.002	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.008	-	-	-	-	-	-
OC_PEST	beta-BHC	WS	T	4	ug/l	<0.004	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.091	-	-	-	0	0.00	0.025
OC_PEST	delta-BHC	WS	T	4	ug/l	<0.005	<0.006	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	T	4	ug/l	<0.003	<0.004	ND	ND	ND	ND	ND	0	0	4	100	0.00052	-	-	-	3	75.00	0.002
OC_PEST	Endosulfan I	WS	T	4	ug/l	<0.002	<0.005	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan II	WS	T	4	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan sulfate	WS	T	4	ug/l	<0.005	<0.006	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endrin	WS	T	4	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.059	0	0	2	0	0.00	0.23
OC_PEST	Endrin aldehyde	WS	T	4	ug/l	<0.004	<0.008	ND	ND	ND	ND	ND	0	0	0	0	0.29	-	-	-	-	-	-

Table 20. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	Endrin ketone	WS	T	4	ug/l	<0.004	<0.008	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	T	4	ug/l	<0.004	<0.012	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	0	0.00	0.042
OC_PEST	gamma-Chlordane	WS	T	4	ug/l	<0.003	<0.005	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Heptachlor	WS	T	4	ug/l	<0.003	<0.004	ND	ND	ND	ND	ND	0	0	4	100	0.00079	0	0	0.4	4	100.00	0.001
OC_PEST	Heptachlor epoxide	WS	T	4	ug/l	<0.004	<0.005	ND	ND	ND	ND	ND	0	0	4	100	0.00039	0	0	0.2	4	100.00	0.001
OC_PEST	Methoxychlor	WS	T	4	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	40	0	0.00	3.7
OC_PEST	Toxaphene	WS	T	4	ug/l	<0.06	<0.11	ND	ND	ND	ND	ND	0	0	4	100	0.0028	0	0	3	0	0.00	0.071
PCB	Aroclor 1016	WS	T	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	0	0.00	0.14
PCB	Aroclor 1221	WS	T	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	4	100.00	0.005
PCB	Aroclor 1232	WS	T	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	4	100.00	0.005
PCB	Aroclor 1242	WS	T	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	4	100.00	0.008
PCB	Aroclor 1248	WS	T	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	4	100.00	0.008
PCB	Aroclor 1254	WS	T	4	ug/l	<0.084	<0.099	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	4	100.00	0.008
PCB	Aroclor 1260	WS	T	4	ug/l	<0.084	<0.099	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	4	100.00	0.008
PCB	Aroclor 1268	WS	T	4	ug/l	<0.084	<0.099	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	-	-	-
PCB	Aroclor-1262	WS	T	4	ug/l	<0.084	<0.099	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	T	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	0.00064	-	-	-	-	-	-
SVOC	1,1'-Biphenyl	WS	T	4	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	4	100.00	0.083
SVOC	1,2,4,5-Tetrachlorobenzene	WS	T	4	ug/l	<0.43	<0.47	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	4	100.00	0.17
SVOC	1,4-Dioxane	WS	T	4	ug/l	<3.1	<3.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	4	100.00	0.46
SVOC	2,2'-oxybis[1-chloropropane]	WS	T	4	ug/l	<0.93	<1	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	T	4	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	24
SVOC	2,4,5-Trichlorophenol	WS	T	4	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0.00	120
SVOC	2,4,6-Trichlorophenol	WS	T	4	ug/l	<0.53	<0.58	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0.00	1.2
SVOC	2,4-Dichlorophenol	WS	T	4	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0.00	4.6
SVOC	2,4-Dimethylphenol	WS	T	4	ug/l	<0.91	<0.99	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0.00	36
SVOC	2,4-Dinitrophenol	WS	T	4	ug/l	<2.4	<2.6	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0.00	3.9
SVOC	2,4-Dinitrotoluene	WS	T	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	4	100.00	0.24
SVOC	2,6-Dinitrotoluene	WS	T	4	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	4	100.00	0.049
SVOC	2-Chloronaphthalene	WS	T	4	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	T	4	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0.00	9.1
SVOC	2-Methylnaphthalene	WS	T	4	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.6
SVOC	2-Methylphenol	WS	T	4	ug/l	<1.3	<1.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	T	4	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	19
SVOC	2-Nitrophenol	WS	T	4	ug/l	<0.59	<0.64	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	T	4	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	T	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	4	100	0.21	-	-	-	4	100.00	0.13
SVOC	3-Nitroaniline	WS	T	4	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 20. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	4,6-Dinitro-2-methylphenol	WS	T	4	ug/l	<2	<2.2	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	T	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	T	4	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	T	4	ug/l	<0.73	<0.79	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	2	50.00	0.37
SVOC	4-Chlorophenyl phenyl ether	WS	T	4	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	T	4	ug/l	<0.48	<0.52	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.8
SVOC	4-Nitrophenol	WS	T	4	ug/l	<4.7	<5.1	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	T	4	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0.00	53
SVOC	Acenaphthylene	WS	T	4	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	T	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	190
SVOC	Anthracene	WS	T	4	ug/l	<0.57	<0.62	ND	ND	ND	ND	ND	0	0	0	0	8300	-	-	-	0	0.00	180
SVOC	Atrazine	WS	T	4	ug/l	<0.77	<0.84	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	4	100.00	0.3
SVOC	Benzaldehyde	WS	T	4	ug/l	<0.86	<0.93	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	19
SVOC	Benzo[a]anthracene	WS	T	4	ug/l	<0.55	3.0	0.9675	ND	1.355	ND	2.595	1	25	4	100	0.038	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	T	4	ug/l	<0.16	3.9	1.0375	ND	1.9083	ND	3.3278	1	25	4	100	0.038	1	25	0.2	4	100.00	0.003
SVOC	Benzo[b]fluoranthene	WS	T	4	ug/l	<0.44	10.0	2.6725	ND	4.885	ND	8.536	1	25	4	100	0.038	-	-	-	4	100.00	0.034
SVOC	Benzo[g,h,i]perylene	WS	T	4	ug/l	<0.75	3.9	1.27	ND	1.7534	ND	3.3765	1	25	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	T	4	ug/l	<0.18	<0.2	ND	ND	ND	ND	ND	0	0	4	100	0.038	-	-	-	0	0.00	0.34
SVOC	Bis(2-chloroethoxy)methane	WS	T	4	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	5.9
SVOC	Bis(2-chloroethyl)ether	WS	T	4	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	4	100.00	0.014
SVOC	Bis(2-ethylhexyl) phthalate	WS	T	4	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0.00	5.6
SVOC	Butyl benzyl phthalate	WS	T	4	ug/l	<0.6	<0.65	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0.00	16
SVOC	Caprolactam	WS	T	4	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	990
SVOC	Carbazole	WS	T	4	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	T	4	ug/l	<0.67	7.6	2.165	ND	3.6234	ND	6.5155	1	25	4	100	0.038	-	-	-	1	25.00	3.4
SVOC	Dibenz(a,h)anthracene	WS	T	4	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	4	100	0.038	-	-	-	4	100.00	0.003
SVOC	Dibenzofuran	WS	T	4	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.79
SVOC	Diethyl phthalate	WS	T	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WS	T	4	ug/l	<0.98	<1.1	ND	ND	ND	ND	ND	0	0	0	0	270000	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	T	4	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	T	4	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	20
SVOC	Fluoranthene	WS	T	4	ug/l	<0.72	9.3	2.6075	ND	4.4617	ND	7.9635	1	25	0	0	130	-	-	-	0	0.00	80
SVOC	Fluorene	WS	T	4	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0.00	29
SVOC	Hexachlorobenzene	WS	T	4	ug/l	<0.47	<0.51	ND	ND	ND	ND	ND	0	0	4	100	0.0028	0	0	1	4	100.00	0.01
SVOC	Hexachlorobutadiene	WS	T	4	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	4.4	-	-	-	4	100.00	0.14
SVOC	Hexachlorocyclopentadiene	WS	T	4	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	50	4	100.00	0.041
SVOC	Hexachloroethane	WS	T	4	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0.00	0.33
SVOC	Indeno[1,2,3-cd]pyrene	WS	T	4	ug/l	<0.21	3.1	0.86	ND	1.4933	ND	2.653	1	25	4	100	0.038	-	-	-	4	100.00	0.034

Table 20. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Isophorone	WS	T	4	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	0	0	350	-	-	-	0	0.00	78
SVOC	Naphthalene	WS	T	4	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	4	100.00	0.17
SVOC	Nitrobenzene	WS	T	4	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	4	100.00	0.14
SVOC	N-Nitrosodi-n-propylamine	WS	T	4	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	4	100	0.05	-	-	-	4	100.00	0.011
SVOC	N-Nitrosodiphenylamine	WS	T	4	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0.00	12
SVOC	Pentachlorophenol	WS	T	4	ug/l	<2.2	<2.4	ND	ND	ND	ND	ND	0	0	4	100	1	4	100	1	4	100.00	0.041
SVOC	Phenanthrene	WS	T	4	ug/l	<0.65	1.5	0.6325	ND	0.5785	ND	1.329	1	25	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WS	T	4	ug/l	<0.41	<0.45	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0.00	580
SVOC	Pyrene	WS	T	4	ug/l	<0.83	7.0	2.075	ND	3.2834	ND	6.0175	1	25	0	0	830	-	-	-	0	0.00	12
VOC	1,1,1-Trichloroethane	WS	T	4	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	0	0.00	800
VOC	1,1,2,2-Tetrachloroethane	WS	T	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	1.7	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	T	4	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	5500
VOC	1,1,2-Trichloroethane	WS	T	4	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	T	4	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2.8
VOC	1,1-Dichloroethene	WS	T	4	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	T	4	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.7
VOC	1,2,4-Trichlorobenzene	WS	T	4	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	35	-	-	-	0	0.00	0.4
VOC	1,2-Dibromo-3-Chloropropane	WS	T	4	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	4	100.00	3E-04
VOC	1,2-Dichlorobenzene	WS	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	420	0	0	600	0	0.00	30
VOC	1,2-Dichloroethane	WS	T	4	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	3.8	0	0	5	0	0.00	0.17
VOC	1,2-Dichloropropane	WS	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.44
VOC	1,3-Dichlorobenzene	WS	T	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	T	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0.00	0.48
VOC	2-Butanone (MEK)	WS	T	4	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	560
VOC	2-Hexanone	WS	T	4	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.8
VOC	4-Methyl-2-pentanone (MIBK)	WS	T	4	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	630
VOC	Acetone	WS	T	4	ug/l	<1.1	12.0	3.4125	ND	5.725	ND	10.2825	1	25	-	-	-	-	-	-	0	0.00	1400
VOC	Benzene	WS	T	4	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.46
VOC	Bromoform	WS	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	43	0	0	80	0	0.00	3.3
VOC	Bromomethane	WS	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	0	0.00	0.75
VOC	Carbon disulfide	WS	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	81
VOC	Carbon tetrachloride	WS	T	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	2.3	0	0	5	0	0.00	0.46
VOC	Chlorobenzene	WS	T	4	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0.00	7.8
VOC	Chlorobromomethane	WS	T	4	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	8.3
VOC	Chlorodibromomethane	WS	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0.00	0.87
VOC	Chloroethane	WS	T	4	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2100
VOC	Chloroform	WS	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	57	0	0	80	0	0.00	0.22
VOC	Chloromethane	WS	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0.00	19

Table 20. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	cis-1,2-Dichloroethene	WS	T	4	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	4	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	3.4	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	4	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	1300
VOC	Dichlorobromomethane	WS	T	4	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	5.5	0	0	80	0	0.00	0.13
VOC	Dichlorodifluoromethane	WS	T	4	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	20
VOC	Ethylbenzene	WS	T	4	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	530	0	0	700	0	0.00	1.5
VOC	Ethylene Dibromide	WS	T	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	4	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	4	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2000
VOC	Methyl tert-butyl ether	WS	T	4	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0.00	14
VOC	Methylcyclohexane	WS	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	4	ug/l	<0.21	0.9	0.3975	0.29	0.3755	ND	0.8355	2	50	0	0	5	0	0	5	0	0.00	11
VOC	m-Xylene & p-Xylene	WS	T	4	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WS	T	4	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0.00	19
VOC	Styrene	WS	T	4	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0.00	120
VOC	Tetrachloroethene	WS	T	4	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Toluene	WS	T	4	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	1000	0	0	1000	0	0.00	110
VOC	trans-1,2-Dichloroethene	WS	T	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	4	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0.00	520
VOC	Vinyl chloride	WS	T	4	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	0	0	0.25	0	0	2	4	100.00	0.019

Table 21. Round 1 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	22	ug/l	83,900	264,000	148,432	158,000	49,696	85,900	252,150	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	22	ug/l	<23	178.0	36.7864	ND	33.9923	ND	52.795	4	18	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	22	ug/l	335.0	3,060	1,621	1,745	926.6271	342.3	2,905	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Fluoride	WS	T	22	ug/l	33.5	2,570	331.0273	57.5	730.3816	33.9	2,451	22	100	0	0	4000	0	0	4000	9	41	80
GENCHEM	Hardness as calcium carbonate	WS	T	22	ug/l	84,000	222,000	148,909	164,000	43,353	86,000	216,100	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	22	ug/l	<100	1,680	235.3182	ND	476.182	ND	1,479	5	23	0	0	10000	0	0	10000	-	-	-
GENCHEM	Orthophosphate as P	WS	T	12	ug/l	<42	<42	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	22	ug/l	1,900	18,100	4,824	3,510	4,460	1,910	17,282	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	22	mg/l	91.0	315.0	163.7273	169.5	59.9247	95.0	306.05	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	22	mg/l	<1	413.0	33.1682	1.6	101.262	ND	249.48	17	77	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	T	22	ug/l	<13.5	937.0	103.0523	33.55	214.7063	15.375	503.05	21	95	-	-	-	-	-	-	0	0	2000
METALS	Antimony	WS	T	22	ug/l	<0.62	<0.76	ND	ND	ND	ND	ND	0	0	0	0	5.6	0	0	6	0	0	0.78
METALS	Arsenic	WS	T	22	ug/l	<0.64	1.2	0.4836	ND	0.2671	ND	0.9465	6	27	0	0	10	0	0	10	22	100	0.052
METALS	Barium	WS	T	22	ug/l	78.0	305.0	136.1727	103.5	68.1377	78.62	267.85	22	100	0	0	1000	0	0	2000	0	0	380
METALS	Beryllium	WS	T	22	ug/l	<0.24	<0.29	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0	2.5
METALS	Cadmium	WS	T	22	ug/l	<0.71	<0.72	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.92
METALS	Calcium	WS	T	22	ug/l	23,100	60,700	41,350	46,000	11,981	23,200	59,715	22	100	-	-	-	-	-	-	-	-	-
METALS	Chromium	WS	T	22	ug/l	<1.3	3.9	ND	ND	ND	ND	1.7475	2	9	0	0	100	0	0	100	22	100	0.035
METALS	Cobalt	WS	T	22	ug/l	<1.3	1.3	ND	ND	ND	ND	ND	1	5	-	-	-	-	-	-	22	100	0.6
METALS	Copper	WS	T	22	ug/l	<1.4	5.4	1.6045	ND	1.2838	ND	4.06	10	45	0	0	1300	0	0	1300	0	0	80
METALS	Cyanide, Total	WS	T	22	ug/l	<2	213.0	21.9909	ND	61.3262	ND	199.49	6	27	2	9	140	2	9	200	22	100	0.15
METALS	Iron	WS	T	22	ug/l	<42.4	827.0	103.2591	ND	178.932	ND	299.7	10	45	-	-	-	-	-	-	0	0	1400
METALS	Lead	WS	T	22	ug/l	<0.38	0.48	ND	ND	ND	ND	0.4005	2	9	0	0	15	0	0	15	0	0	15
METALS	Magnesium	WS	T	22	ug/l	6,010	18,200	11,411	10,900	3,912	6,031	17,720	22	100	-	-	-	-	-	-	-	-	-
METALS	Manganese	WS	T	22	ug/l	<2.5	57.1	9.35	6.0	12.1998	ND	21.6	15	68	-	-	-	-	-	-	1	5	43
METALS	Mercury	WS	T	22	ug/l	<0.14	<0.17	ND	ND	ND	ND	ND	0	0	22	100	0.05	0	0	2	22	100	0.063
METALS	Nickel	WS	T	22	ug/l	<1.4	<1.6	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	39
METALS	Potassium	WS	T	22	ug/l	306.0	1,120	559.4545	532.5	244.1474	311.3	1,015	22	100	-	-	-	-	-	-	-	-	-
METALS	Selenium	WS	T	22	ug/l	<0.73	<0.79	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0	10
METALS	Silver	WS	T	22	ug/l	<1.3	<1.5	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0	9.4
METALS	Sodium	WS	T	22	ug/l	951.0	36,900	6,065	2,605	10,070	961.6	34,925	22	100	-	-	-	-	-	-	-	-	-
METALS	Thallium	WS	T	22	ug/l	<0.26	<0.31	ND	ND	ND	ND	ND	0	0	0	0	0.24	0	0	2	22	100	0.02
METALS	Vanadium	WS	T	22	ug/l	<1.9	2.2	1.4727	ND	0.5885	ND	2.195	10	45	-	-	-	-	-	-	0	0	8.6
METALS	Zinc	WS	T	22	ug/l	<6.5	19.9	ND	ND	ND	ND	15.755	2	9	0	0	2000	-	-	-	0	0	600
OC_PEST	4,4'-DDD	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.0031	-	-	-	0	0	0.032
OC_PEST	4,4'-DDE	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0	0.046
OC_PEST	4,4'-DDT	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0	0.23
OC_PEST	Aldrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.00049	-	-	-	3	100	9E-04

Table 21. Round 1 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	alpha-BHC	WS	T	3	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	0.026	-	-	-	0	0	0.007
OC_PEST	alpha-Chlordane	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.008	-	-	-	-	-	-
OC_PEST	beta-BHC	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.091	-	-	-	0	0	0.025
OC_PEST	delta-BHC	WS	T	3	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.00052	-	-	-	3	100	0.002
OC_PEST	Endosulfan I	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan II	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan sulfate	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.059	0	0	2	0	0	0.23
OC_PEST	Endrin aldehyde	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.29	-	-	-	-	-	-
OC_PEST	Endrin ketone	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	0	0	0.042
OC_PEST	gamma-Chlordane	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Heptachlor	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.00079	0	0	0.4	3	100	0.001
OC_PEST	Heptachlor epoxide	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.00039	0	0	0.2	3	100	0.001
OC_PEST	Methoxychlor	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	40	0	0	3.7
OC_PEST	Toxaphene	WS	T	3	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	3	100	0.0028	0	0	3	0	0	0.071
PCB	Aroclor 1016	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	0	0	0.14
PCB	Aroclor 1221	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	3	100	0.005
PCB	Aroclor 1232	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	3	100	0.005
PCB	Aroclor 1242	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	3	100	0.008
PCB	Aroclor 1248	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	3	100	0.008
PCB	Aroclor 1254	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	3	100	0.008
PCB	Aroclor 1260	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	3	100	0.008
PCB	Aroclor 1268	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	-	-	-
PCB	Aroclor-1262	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	0.00064	-	-	-	-	-	-
SVOC	1,1'-Biphenyl	WS	T	3	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	3	100	0.083
SVOC	1,2,4,5-Tetrachlorobenzene	WS	T	3	ug/l	<0.43	<0.47	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	3	100	0.17
SVOC	1,4-Dioxane	WS	T	3	ug/l	<3.1	<3.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	3	100	0.46
SVOC	2,2'-oxybis[1-chloropropane]	WS	T	3	ug/l	<0.93	<1	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	24
SVOC	2,4,5-Trichlorophenol	WS	T	3	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0	120
SVOC	2,4,6-Trichlorophenol	WS	T	3	ug/l	<0.53	<0.58	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0	1.2
SVOC	2,4-Dichlorophenol	WS	T	3	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0	4.6
SVOC	2,4-Dimethylphenol	WS	T	3	ug/l	<0.91	<0.99	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0	36
SVOC	2,4-Dinitrophenol	WS	T	3	ug/l	<2.4	<2.6	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0	3.9
SVOC	2,4-Dinitrotoluene	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	3	100	0.24

Table 21. Round 1 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,6-Dinitrotoluene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	3	100	0.049
SVOC	2-Chloronaphthalene	WS	T	3	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	T	3	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0	9.1
SVOC	2-Methylnaphthalene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.6
SVOC	2-Methylphenol	WS	T	3	ug/l	<1.3	<1.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	19
SVOC	2-Nitrophenol	WS	T	3	ug/l	<0.59	<0.64	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	3	100	0.21	-	-	-	3	100	0.13
SVOC	3-Nitroaniline	WS	T	3	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WS	T	3	ug/l	<2	<2.2	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	T	3	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	T	3	ug/l	<0.73	<0.79	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	2	67	0.37
SVOC	4-Chlorophenyl phenyl ether	WS	T	3	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	T	3	ug/l	<0.48	<0.52	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8
SVOC	4-Nitrophenol	WS	T	3	ug/l	<4.7	<5.1	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0	53
SVOC	Acenaphthylene	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	190
SVOC	Anthracene	WS	T	3	ug/l	<0.57	<0.62	ND	ND	ND	ND	ND	0	0	0	0	8300	-	-	-	0	0	180
SVOC	Atrazine	WS	T	3	ug/l	<0.77	<0.84	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	3	100	0.3
SVOC	Benzaldehyde	WS	T	3	ug/l	<0.86	<0.93	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	19
SVOC	Benzo[a]anthracene	WS	T	3	ug/l	<0.55	<0.6	ND	ND	ND	ND	ND	0	0	3	100	0.038	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	T	3	ug/l	<0.16	<0.17	ND	ND	ND	ND	ND	0	0	3	100	0.038	0	0	0.2	3	100	0.003
SVOC	Benzo[b]fluoranthene	WS	T	3	ug/l	<0.44	<0.48	ND	ND	ND	ND	ND	0	0	3	100	0.038	-	-	-	3	100	0.034
SVOC	Benzo[g,h,i]perylene	WS	T	3	ug/l	<0.75	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	T	3	ug/l	<0.18	<0.2	ND	ND	ND	ND	ND	0	0	3	100	0.038	-	-	-	0	0	0.34
SVOC	Bis(2-chloroethoxy)methane	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5.9
SVOC	Bis(2-chloroethyl)ether	WS	T	3	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	3	100	0.014
SVOC	Bis(2-ethylhexyl) phthalate	WS	T	3	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0	5.6
SVOC	Butyl benzyl phthalate	WS	T	3	ug/l	<0.6	<0.65	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0	16
SVOC	Caprolactam	WS	T	3	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	990
SVOC	Carbazole	WS	T	3	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	T	3	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	3	100	0.038	-	-	-	0	0	3.4
SVOC	Dibenz(a,h)anthracene	WS	T	3	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	3	100	0.038	-	-	-	3	100	0.003
SVOC	Dibenzofuran	WS	T	3	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.79
SVOC	Diethyl phthalate	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-

Table 21. Round 1 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Dimethyl phthalate	WS	T	3	ug/l	<0.98	<1.1	ND	ND	ND	ND	ND	0	0	0	0	270000	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	T	3	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	20
SVOC	Fluoranthene	WS	T	3	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	0	0	80
SVOC	Fluorene	WS	T	3	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0	29
SVOC	Hexachlorobenzene	WS	T	3	ug/l	<0.47	<0.51	ND	ND	ND	ND	ND	0	0	3	100	0.0028	0	0	1	3	100	0.01
SVOC	Hexachlorobutadiene	WS	T	3	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	4.4	-	-	-	3	100	0.14
SVOC	Hexachlorocyclopentadiene	WS	T	3	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	50	3	100	0.041
SVOC	Hexachloroethane	WS	T	3	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0	0.33
SVOC	Indeno[1,2,3-cd]pyrene	WS	T	3	ug/l	<0.21	<0.23	ND	ND	ND	ND	ND	0	0	3	100	0.038	-	-	-	3	100	0.034
SVOC	Isophorone	WS	T	3	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	0	0	350	-	-	-	0	0	78
SVOC	Naphthalene	WS	T	3	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	3	100	0.17
SVOC	Nitrobenzene	WS	T	3	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	3	100	0.14
SVOC	N-Nitrosodi-n-propylamine	WS	T	3	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	3	100	0.05	-	-	-	3	100	0.011
SVOC	N-Nitrosodiphenylamine	WS	T	3	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0	12
SVOC	Pentachlorophenol	WS	T	3	ug/l	<2.2	<2.4	ND	ND	ND	ND	ND	0	0	3	100	1	3	100	1	3	100	0.041
SVOC	Phenanthrene	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WS	T	3	ug/l	<0.41	<0.45	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0	580
SVOC	Pyrene	WS	T	3	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	0	0	830	-	-	-	0	0	12
VOC	1,1,1-Trichloroethane	WS	T	3	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	0	0	800
VOC	1,1,2,2-Tetrachloroethane	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	1.7	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	T	3	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	5500
VOC	1,1,2-Trichloroethane	WS	T	3	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	T	3	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2.8
VOC	1,1-Dichloroethene	WS	T	3	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	T	3	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	0.7
VOC	1,2,4-Trichlorobenzene	WS	T	3	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	35	-	-	-	0	0	0.4
VOC	1,2-Dibromo-3-Chloropropane	WS	T	3	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	3	100	3E-04
VOC	1,2-Dichlorobenzene	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	420	0	0	600	0	0	30
VOC	1,2-Dichloroethane	WS	T	3	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	3.8	0	0	5	0	0	0.17
VOC	1,2-Dichloropropane	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.44
VOC	1,3-Dichlorobenzene	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0	0.48
VOC	2-Butanone (MEK)	WS	T	3	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	560
VOC	2-Hexanone	WS	T	3	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	3.8
VOC	4-Methyl-2-pentanone (MIBK)	WS	T	3	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	630
VOC	Acetone	WS	T	3	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1400
VOC	Benzene	WS	T	3	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0	0.46

Table 21. Round 1 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Bromoform	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	43	0	0	80	0	0	3.3
VOC	Bromomethane	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	0	0	0.75
VOC	Carbon disulfide	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	81
VOC	Carbon tetrachloride	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	2.3	0	0	5	0	0	0.46
VOC	Chlorobenzene	WS	T	3	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	7.8
VOC	Chlorobromomethane	WS	T	3	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	8.3
VOC	Chlorodibromomethane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0	0.87
VOC	Chloroethane	WS	T	3	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2100
VOC	Chloroform	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	57	0	0	80	0	0	0.22
VOC	Chloromethane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	19
VOC	cis-1,2-Dichloroethene	WS	T	3	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	3	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	3.4	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	3	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	1300
VOC	Dichlorobromomethane	WS	T	3	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	5.5	0	0	80	0	0	0.13
VOC	Dichlorodifluoromethane	WS	T	3	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	20
VOC	Ethylbenzene	WS	T	3	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	530	0	0	700	0	0	1.5
VOC	Ethylene Dibromide	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	3	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	3	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0	2000
VOC	Methyl tert-butyl ether	WS	T	3	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0	14
VOC	Methylcyclohexane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	3	ug/l	<0.21	0.9	0.4933	0.47	0.3955	ND	0.857	2	67	0	0	5	0	0	5	0	0	11
VOC	m-Xylene & p-Xylene	WS	T	3	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WS	T	3	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	19
VOC	Styrene	WS	T	3	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0	120
VOC	Tetrachloroethene	WS	T	3	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Toluene	WS	T	3	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	1000	0	0	1000	0	0	110
VOC	trans-1,2-Dichloroethene	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	3	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0	520
VOC	Vinyl chloride	WS	T	3	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	0	0	0.25	0	0	2	3	100	0.019

Table 22. Round 2 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	19	ug/l	87,500	269,000	159,126	183,000	59,594	87,440	232,100	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	19	ug/l	<72	<72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	19	ug/l	351.0	2,910	1,378	1,580	741.2583	359.1	2,370	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Fluoride	WS	T	19	ug/l	106.0	2,100	465.1579	189.0	579.427	106.0	1,839	19	100	0	0	4000	0	0	4000	19	100.00	80
GENCHEM	Hardness as calcium carbonate	WS	T	19	ug/l	90,000	304,000	178,211	196,000	67,800	90,000	264,400	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	19	ug/l	<100	1,620	219.9474	ND	450.4951	ND	1,368	4	21	0	0	10000	0	0	10000	-	-	-
GENCHEM	Orthophosphate as P	WS	T	19	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	19	ug/l	2,190	73,100	9,515	4,010	16,205	2,226	23,870	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	19	mg/l	69.0	309.0	172.0526	174.0	75.2392	79.8	286.5	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	19	mg/l	<1	153.0	26.0789	1.9	48.0043	ND	117.0	11	58	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	T	19	ug/l	<18.2	5,750	485.9105	44.4	1,332	ND	2,024	17	89	-	-	-	-	-	-	1	5.26	2000
METALS	Antimony	WS	T	19	ug/l	<0.62	<0.62	ND	ND	ND	ND	ND	0	0	0	0	5.6	0	0	6	0	0.00	0.78
METALS	Arsenic	WS	T	19	ug/l	<0.64	3.7	ND	ND	ND	ND	1.99	2	11	0	0	10	0	0	10	19	100.00	0.052
METALS	Barium	WS	T	19	ug/l	99.7	424.0	149.4579	118.0	78.5644	100.87	244.9	19	100	0	0	1000	0	0	2000	1	5.26	380
METALS	Beryllium	WS	T	19	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0.00	2.5
METALS	Cadmium	WS	T	19	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.92
METALS	Calcium	WS	T	19	ug/l	24,300	82,100	46,858	52,400	19,264	24,480	77,510	19	100	-	-	-	-	-	-	-	-	-
METALS	Chromium	WS	T	19	ug/l	<1.3	3.4	ND	ND	ND	ND	1.6	2	11	0	0	100	0	0	100	19	100.00	0.035
METALS	Cobalt	WS	T	19	ug/l	<1.3	2.4	0.8474	ND	0.5037	ND	2.04	3	16	-	-	-	-	-	-	19	100.00	0.6
METALS	Copper	WS	T	19	ug/l	<1.4	9.8	2.0105	ND	2.564	ND	6.56	6	32	0	0	1300	0	0	1300	0	0.00	80
METALS	Cyanide, Total	WS	T	19	ug/l	<2	192.0	24.2895	ND	57.3862	ND	179.4	6	32	2	11	140	0	0	200	19	100.00	0.15
METALS	Iron	WS	T	19	ug/l	<42.4	4,760	512.3789	ND	1,220	ND	3,095	8	42	-	-	-	-	-	-	2	10.53	1400
METALS	Lead	WS	T	19	ug/l	<0.38	4.5	0.7774	ND	1.1975	ND	3.06	5	26	0	0	15	0	0	15	0	0.00	15
METALS	Magnesium	WS	T	19	ug/l	6,750	19,500	12,256	13,600	4,416	6,750	18,060	19	100	-	-	-	-	-	-	-	-	-
METALS	Manganese	WS	T	19	ug/l	<2.5	3,750	223.2947	5.5	855.7305	ND	565.8	14	74	-	-	-	-	-	-	4	21.05	43
METALS	Mercury	WS	T	19	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	19	100	0.05	0	0	2	19	100.00	0.063
METALS	Nickel	WS	T	19	ug/l	<1.4	3.9	1.0	ND	0.8131	ND	2.46	3	16	0	0	100	-	-	-	0	0.00	39
METALS	Potassium	WS	T	19	ug/l	309.0	1,250	575.6842	484.0	272.9974	312.6	1,079	19	100	-	-	-	-	-	-	-	-	-
METALS	Selenium	WS	T	19	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Silver	WS	T	19	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Sodium	WS	T	19	ug/l	1,040	35,600	7,591	2,630	10,767	1,058	31,460	19	100	-	-	-	-	-	-	-	-	-
METALS	Thallium	WS	T	19	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.24	0	0	2	19	100.00	0.02
METALS	Vanadium	WS	T	19	ug/l	<1.9	3.9	ND	ND	ND	ND	2.1	2	11	-	-	-	-	-	-	0	0.00	8.6
METALS	Zinc	WS	T	19	ug/l	<7	19.2	5.9105	3.5	5.722	3.5	18.93	3	16	0	0	2000	-	-	-	0	0.00	600
METALS	Zinc	WS	T	24	ug/l	<7	<7	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	0	0.00	600
METALS	Cyanide, Total	WS	T	23	ug/l	<2	197.0	13.6609	ND	43.0212	ND	70.63	4	17	1	4	140	0	0	200	23	100.00	0.15
METALS	Iron	WS	T	23	ug/l	<42.4	1,210	303.9826	ND	405.5771	ND	1,068	10	43	-	-	-	-	-	-	0	0.00	1400
METALS	Iron	WS	DI	23	ug/l	<42.4	164.0	ND	ND	ND	ND	60.05	3	13	-	-	-	-	-	-	0	0.00	1400

Table 22. Round 2 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WS	T	23	ug/l	<0.38	7.6	0.6578	ND	1.5308	ND	0.961	9	39	0	0	15	0	0	15	0	0.00	15
METALS	Lead	WS	DI	23	ug/l	<0.38	<0.38	ND	ND	ND	ND	ND	0	0	0	0	15	0	0	15	0	0.00	15
METALS	Magnesium	WS	DI	23	ug/l	384.0	14,800	8,824	11,000	4,017	4,465	13,160	23	100	-	-	-	-	-	-	-	-	-
METALS	Magnesium	WS	T	23	ug/l	804.0	16,300	9,676	12,100	4,145	4,681	13,930	23	100	-	-	-	-	-	-	-	-	-
METALS	Manganese	WS	T	23	ug/l	<2.5	43.2	14.0609	8.1	13.2947	ND	36.92	20	87	-	-	-	-	-	-	1	4.35	43
METALS	Manganese	WS	DI	23	ug/l	<2.5	31.8	5.2261	2.5	8.1144	ND	25.64	12	52	-	-	-	-	-	-	0	0.00	43
METALS	Mercury	WS	DI	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.05	0	0	2	23	100.00	0.063
METALS	Mercury	WS	T	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.05	0	0	2	23	100.00	0.063
METALS	Nickel	WS	DI	23	ug/l	<1.4	32.2	ND	ND	ND	ND	19.96	2	9	0	0	100	-	-	-	0	0.00	39
METALS	Nickel	WS	T	23	ug/l	<1.4	55.9	ND	ND	ND	ND	1.96	2	9	0	0	100	-	-	-	1	4.35	39
METALS	Potassium	WS	DI	23	ug/l	237.0	970.0	433.4348	419.0	190.8824	240.6	759.2	23	100	-	-	-	-	-	-	-	-	-
METALS	Potassium	WS	T	23	ug/l	242.0	1,060	535.6522	480.0	186.9316	248.0	809.5	23	100	-	-	-	-	-	-	-	-	-
METALS	Selenium	WS	DI	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Selenium	WS	T	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Silver	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Silver	WS	T	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Sodium	WS	DI	23	ug/l	562.0	23,500	3,824	2,020	5,408	570.4	13,910	23	100	-	-	-	-	-	-	-	-	-
METALS	Sodium	WS	T	23	ug/l	666.0	25,800	4,300	2,220	6,134	678.5	17,450	23	100	-	-	-	-	-	-	-	-	-
METALS	Thallium	WS	T	23	ug/l	<0.26	0.27	ND	ND	ND	ND	ND	1	4	1	4	0.24	0	0	2	23	100.00	0.02
METALS	Thallium	WS	DI	23	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.24	0	0	2	23	100.00	0.02
METALS	Vanadium	WS	DI	23	ug/l	<1.9	4.3	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	0	0.00	8.6
METALS	Vanadium	WS	T	23	ug/l	<1.9	18.0	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	1	4.35	8.6
METALS	Zinc	WS	T	23	ug/l	<7	537.0	28.5739	ND	110.8994	ND	15.09	6	26	0	0	2000	-	-	-	0	0.00	600
METALS	Zinc	WS	DI	23	ug/l	<7	512.0	ND	ND	ND	ND	ND	1	4	0	0	2000	-	-	-	0	0.00	600
OC_PEST	4,4'-DDD	WS	T	1	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	0.0031	-	-	-	0	0.00	0.032
OC_PEST	4,4'-DDE	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0.00	0.046
OC_PEST	4,4'-DDT	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0.00	0.23
OC_PEST	Aldrin	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00049	-	-	-	1	100.00	9E-04
OC_PEST	alpha-BHC	WS	T	1	ug/l	<0.007	<0.007	ND	ND	ND	ND	ND	0	0	0	0	0.026	-	-	-	0	0.00	0.007
OC_PEST	alpha-Chlordane	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.008	-	-	-	-	-	-
OC_PEST	beta-BHC	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.091	-	-	-	0	0.00	0.025
OC_PEST	delta-BHC	WS	T	1	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00052	-	-	-	0	0.00	0.002
OC_PEST	Endosulfan I	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan II	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan sulfate	WS	T	1	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endrin	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.059	0	0	2	0	0.00	0.23
OC_PEST	Endrin aldehyde	WS	T	1	ug/l	<0.008	<0.008	ND	ND	ND	ND	ND	0	0	0	0	0.29	-	-	-	-	-	-

Table 22. Round 2 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	Endrin ketone	WS	T	1	ug/l	<0.008	<0.008	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	T	1	ug/l	<0.012	<0.012	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	0	0.00	0.042
OC_PEST	gamma-Chlordane	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Heptachlor	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00079	0	0	0.4	1	100.00	0.001
OC_PEST	Heptachlor epoxide	WS	T	1	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	1	100	0.00039	0	0	0.2	1	100.00	0.001
OC_PEST	Methoxychlor	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	40	0	0.00	3.7
OC_PEST	Toxaphene	WS	T	1	ug/l	<0.11	<0.11	ND	ND	ND	ND	ND	0	0	1	100	0.0028	0	0	3	0	0.00	0.071
PCB	Aroclor 1016	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	0	0.00	0.14
PCB	Aroclor 1221	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.005
PCB	Aroclor 1232	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.005
PCB	Aroclor 1242	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1248	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1254	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1260	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1268	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	-	-	-
PCB	Aroclor-1262	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	-	-	-
SVOC	1,1'-Biphenyl	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100.00	0.083
SVOC	1,2,4,5-Tetrachlorobenzene	WS	T	1	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	1	100.00	0.17
SVOC	1,4-Dioxane	WS	T	1	ug/l	<3.1	<3.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100.00	0.46
SVOC	2,2'-oxybis[1-chloropropane]	WS	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	24
SVOC	2,4,5-Trichlorophenol	WS	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0.00	120
SVOC	2,4,6-Trichlorophenol	WS	T	1	ug/l	<0.53	<0.53	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0.00	1.2
SVOC	2,4-Dichlorophenol	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0.00	4.6
SVOC	2,4-Dimethylphenol	WS	T	1	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0.00	36
SVOC	2,4-Dinitrophenol	WS	T	1	ug/l	<2.4	<2.4	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0.00	3.9
SVOC	2,4-Dinitrotoluene	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	1	100.00	0.24
SVOC	2,6-Dinitrotoluene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100.00	0.049
SVOC	2-Chloronaphthalene	WS	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0.00	9.1
SVOC	2-Methylnaphthalene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.6
SVOC	2-Methylphenol	WS	T	1	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	19
SVOC	2-Nitrophenol	WS	T	1	ug/l	<0.59	<0.59	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	1	100	0.21	-	-	-	1	100.00	0.13
SVOC	3-Nitroaniline	WS	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 22. Round 2 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	4,6-Dinitro-2-methylphenol	WS	T	1	ug/l	<2	<2	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.37
SVOC	4-Chlorophenyl phenyl ether	WS	T	1	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	T	1	ug/l	<0.48	<0.48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.8
SVOC	4-Nitrophenol	WS	T	1	ug/l	<4.7	<4.7	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0.00	53
SVOC	Acenaphthylene	WS	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	190
SVOC	Anthracene	WS	T	1	ug/l	<0.57	<0.57	ND	ND	ND	ND	ND	0	0	0	0	8300	-	-	-	0	0.00	180
SVOC	Atrazine	WS	T	1	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	1	100.00	0.3
SVOC	Benzaldehyde	WS	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	19
SVOC	Benzo[a]anthracene	WS	T	1	ug/l	3.0	3.0	3.0	3.0	-	3.0	3.0	1	100	1	100	0.038	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	T	1	ug/l	3.9	3.9	3.9	3.9	-	3.9	3.9	1	100	1	100	0.038	1	100	0.2	1	100.00	0.003
SVOC	Benzo[b]fluoranthene	WS	T	1	ug/l	10.0	10.0	10.0	10.0	-	10.0	10.0	1	100	1	100	0.038	-	-	-	1	100.00	0.034
SVOC	Benzo[g,h,i]perylene	WS	T	1	ug/l	3.9	3.9	3.9	3.9	-	3.9	3.9	1	100	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	1	100	0.038	-	-	-	0	0.00	0.34
SVOC	Bis(2-chloroethoxy)methane	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	5.9
SVOC	Bis(2-chloroethyl)ether	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	1	100.00	0.014
SVOC	Bis(2-ethylhexyl) phthalate	WS	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0.00	5.6
SVOC	Butyl benzyl phthalate	WS	T	1	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0.00	16
SVOC	Caprolactam	WS	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	990
SVOC	Carbazole	WS	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	T	1	ug/l	7.6	7.6	7.6	7.6	-	7.6	7.6	1	100	1	100	0.038	-	-	-	1	100.00	3.4
SVOC	Dibenz(a,h)anthracene	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	1	100	0.038	-	-	-	1	100.00	0.003
SVOC	Dibenzofuran	WS	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.79
SVOC	Diethyl phthalate	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WS	T	1	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0	0	0	270000	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	20
SVOC	Fluoranthene	WS	T	1	ug/l	9.3	9.3	9.3	9.3	-	9.3	9.3	1	100	0	0	130	-	-	-	0	0.00	80
SVOC	Fluorene	WS	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0.00	29
SVOC	Hexachlorobenzene	WS	T	1	ug/l	<0.47	<0.47	ND	ND	ND	ND	ND	0	0	1	100	0.0028	0	0	1	1	100.00	0.01
SVOC	Hexachlorobutadiene	WS	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	4.4	-	-	-	1	100.00	0.14
SVOC	Hexachlorocyclopentadiene	WS	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	50	1	100.00	0.041
SVOC	Hexachloroethane	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0.00	0.33
SVOC	Indeno[1,2,3-cd]pyrene	WS	T	1	ug/l	3.1	3.1	3.1	3.1	-	3.1	3.1	1	100	1	100	0.038	-	-	-	1	100.00	0.034

Table 22. Round 2 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Isophorone	WS	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0	0	0	350	-	-	-	0	0.00	78
SVOC	Naphthalene	WS	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	1	100.00	0.17
SVOC	Nitrobenzene	WS	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	1	100.00	0.14
SVOC	N-Nitrosodi-n-propylamine	WS	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0	1	100	0.05	-	-	-	1	100.00	0.011
SVOC	N-Nitrosodiphenylamine	WS	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0.00	12
SVOC	Pentachlorophenol	WS	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	1	100	1	1	100	1	1	100.00	0.041
SVOC	Phenanthrene	WS	T	1	ug/l	1.5	1.5	1.5	1.5	-	1.5	1.5	1	100	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WS	T	1	ug/l	<0.41	<0.41	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0.00	580
SVOC	Pyrene	WS	T	1	ug/l	7.0	7.0	7.0	7.0	-	7.0	7.0	1	100	0	0	830	-	-	-	0	0.00	12
VOC	1,1,1-Trichloroethane	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	0	0.00	800
VOC	1,1,2,2-Tetrachloroethane	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	1.7	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	5500
VOC	1,1,2-Trichloroethane	WS	T	1	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2.8
VOC	1,1-Dichloroethene	WS	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	T	1	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.7
VOC	1,2,4-Trichlorobenzene	WS	T	1	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	35	-	-	-	0	0.00	0.4
VOC	1,2-Dibromo-3-Chloropropane	WS	T	1	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	1	100.00	3E-04
VOC	1,2-Dichlorobenzene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	420	0	0	600	0	0.00	30
VOC	1,2-Dichloroethane	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	3.8	0	0	5	0	0.00	0.17
VOC	1,2-Dichloropropane	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.44
VOC	1,3-Dichlorobenzene	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0.00	0.48
VOC	2-Butanone (MEK)	WS	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	560
VOC	2-Hexanone	WS	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.8
VOC	4-Methyl-2-pentanone (MIBK)	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	630
VOC	Acetone	WS	T	1	ug/l	12.0	12.0	12.0	12.0	-	12.0	12.0	1	100	-	-	-	-	-	-	0	0.00	1400
VOC	Benzene	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.46
VOC	Bromoform	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	43	0	0	80	0	0.00	3.3
VOC	Bromomethane	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	0	0.00	0.75
VOC	Carbon disulfide	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	81
VOC	Carbon tetrachloride	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	2.3	0	0	5	0	0.00	0.46
VOC	Chlorobenzene	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0.00	7.8
VOC	Chlorobromomethane	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	8.3
VOC	Chlorodibromomethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0.00	0.87
VOC	Chloroethane	WS	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2100
VOC	Chloroform	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	57	0	0	80	0	0.00	0.22
VOC	Chloromethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0.00	19

Table 22. Round 2 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	cis-1,2-Dichloroethene	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	3.4	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	1300
VOC	Dichlorobromomethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	5.5	0	0	80	0	0.00	0.13
VOC	Dichlorodifluoromethane	WS	T	1	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	20
VOC	Ethylbenzene	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	530	0	0	700	0	0.00	1.5
VOC	Ethylene Dibromide	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2000
VOC	Methyl tert-butyl ether	WS	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0.00	14
VOC	Methylcyclohexane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	11
VOC	m-Xylene & p-Xylene	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0.00	19
VOC	Styrene	WS	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0.00	120
VOC	Tetrachloroethene	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Toluene	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	1000	0	0	1000	0	0.00	110
VOC	trans-1,2-Dichloroethene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0.00	520
VOC	Vinyl chloride	WS	T	2	ug/l	<0.06	<0.06	25.015	25.015	35.3341	2.5285	47.5015	1	50	1	50	0.25	1	50	2	2	100.00	0.019

Table 23. Round 3 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	24	ug/l	79,600	217,000	149,379	169,500	49,622	81,340	207,850	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	24	ug/l	<72	86.0	ND	ND	ND	ND	75.44	2	8	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	24	ug/l	320.0	3,100	1,556	1,525	967.1837	370.15	3,044	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Fluoride	WS	T	24	ug/l	84.2	2,600	373.9875	130.5	629.4292	87.095	1,896	24	100	0	0	4000	0	0	4000	24	100.00	80
GENCHEM	Hardness as calcium carbonate	WS	T	24	ug/l	82,000	224,000	147,500	163,000	49,267	84,000	204,000	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	24	ug/l	<100	273.0	136.0833	125.5	70.9972	ND	253.5	18	75	0	0	10000	0	0	10000	-	-	-
GENCHEM	Orthophosphate as P	WS	T	17	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	24	ug/l	2,160	78,900	7,496	3,995	15,365	2,233	12,180	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	24	ug/l	82,000	296,000	152,875	164,000	55,438	85,300	230,650	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	24	ug/l	<1000	82,800	14,613	6,150	22,591	ND	74,395	20	83	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	T	24	ug/l	<18.2	1,540	275.0375	106.0	435.2826	ND	1,360	20	83	-	-	-	-	-	-	0	0.00	2000
METALS	Antimony	WS	T	24	ug/l	<0.62	0.78	0.4183	ND	0.1748	ND	0.7295	7	29	0	0	5.6	0	0	6	0	0.00	0.78
METALS	Arsenic	WS	T	24	ug/l	<0.64	2.2	ND	ND	ND	ND	0.874	3	13	0	0	10	0	0	10	24	100.00	0.052
METALS	Barium	WS	T	24	ug/l	63.4	244.0	117.0958	100.65	57.1348	70.545	238.7	24	100	0	0	1000	0	0	2000	0	0.00	380
METALS	Beryllium	WS	T	24	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	4	0	0.00	2.5
METALS	Cadmium	WS	T	24	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.92
METALS	Calcium	WS	T	24	ug/l	21,700	63,300	39,533	44,100	13,436	22,180	55,770	24	100	-	-	-	-	-	-	-	-	-
METALS	Chromium	WS	T	24	ug/l	<1.3	37.7	2.8563	ND	7.6379	ND	8.21	7	29	0	0	100	0	0	100	24	100.00	0.035
METALS	Cobalt	WS	T	24	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	24	100.00	0.6
METALS	Copper	WS	T	24	ug/l	<1.4	3.8	1.2	ND	0.9089	ND	3.235	7	29	0	0	1300	0	0	1300	0	0.00	80
METALS	Cyanide, Free	WS	T	7	ug/l	<1.5	8.0	3.7714	0.75	3.8437	0.75	8.7	3	43	0	0	140	0	0	200	7	100.00	0.15
METALS	Cyanide, Total	WS	T	24	ug/l	<2	24.7	3.8167	ND	6.5206	ND	19.8	5	21	0	0	140	0	0	200	24	100.00	0.15
METALS	Iron	WS	T	24	ug/l	<42.4	1,640	296.4083	105.5	461.6047	ND	1,490	17	71	-	-	-	-	-	-	2	8.33	1400
METALS	Lead	WS	T	24	ug/l	<0.38	1.2	0.3313	ND	0.2989	ND	1.1145	6	25	0	0	15	0	0	15	0	0.00	15
METALS	Magnesium	WS	T	24	ug/l	6,060	14,000	9,794	10,350	3,076	6,162	13,900	24	100	-	-	-	-	-	-	-	-	-
METALS	Manganese	WS	T	24	ug/l	<2.5	52.0	11.9292	5.65	14.3909	ND	47.955	21	88	-	-	-	-	-	-	2	8.33	43
METALS	Mercury	WS	T	24	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	24	100	0.05	0	0	2	24	100.00	0.063
METALS	Nickel	WS	T	24	ug/l	<1.4	1.9	ND	ND	ND	ND	1.295	2	8	0	0	100	-	-	-	0	0.00	39
METALS	Potassium	WS	T	24	ug/l	367.0	1,100	564.875	532.5	165.2953	369.5	770.95	24	100	-	-	-	-	-	-	-	-	-
METALS	Selenium	WS	T	24	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Silver	WS	T	24	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Sodium	WS	T	24	ug/l	1,010	26,300	3,808	2,425	5,042	1,030	5,493	24	100	-	-	-	-	-	-	-	-	-
METALS	Thallium	WS	T	24	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.24	0	0	2	24	100.00	0.02
METALS	Vanadium	WS	T	24	ug/l	<1.9	6.9	ND	ND	ND	ND	1.7575	2	8	-	-	-	-	-	-	0	0.00	8.6
METALS	Zinc	WS	T	24	ug/l	<7	<7	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	0	0.00	600
METALS	Cyanide, Total	WS	T	23	ug/l	<2	197.0	13.6609	ND	43.0212	ND	70.63	4	17	1	4	140	0	0	200	23	100.00	0.15
METALS	Iron	WS	T	23	ug/l	<42.4	1,210	303.9826	ND	405.5771	ND	1,068	10	43	-	-	-	-	-	-	0	0.00	1400
METALS	Iron	WS	DI	23	ug/l	<42.4	164.0	ND	ND	ND	ND	60.05	3	13	-	-	-	-	-	-	0	0.00	1400

Table 23. Round 3 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WS	T	23	ug/l	<0.38	7.6	0.6578	ND	1.5308	ND	0.961	9	39	0	0	15	0	0	15	0	0.00	15
METALS	Lead	WS	DI	23	ug/l	<0.38	<0.38	ND	ND	ND	ND	ND	0	0	0	0	15	0	0	15	0	0.00	15
METALS	Magnesium	WS	DI	23	ug/l	384.0	14,800	8,824	11,000	4,017	4,465	13,160	23	100	-	-	-	-	-	-	-	-	-
METALS	Magnesium	WS	T	23	ug/l	804.0	16,300	9,676	12,100	4,145	4,681	13,930	23	100	-	-	-	-	-	-	-	-	-
METALS	Manganese	WS	T	23	ug/l	<2.5	43.2	14.0609	8.1	13.2947	ND	36.92	20	87	-	-	-	-	-	-	1	4.35	43
METALS	Manganese	WS	DI	23	ug/l	<2.5	31.8	5.2261	2.5	8.1144	ND	25.64	12	52	-	-	-	-	-	-	0	0.00	43
METALS	Mercury	WS	DI	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.05	0	0	2	23	100.00	0.063
METALS	Mercury	WS	T	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.05	0	0	2	23	100.00	0.063
METALS	Nickel	WS	DI	23	ug/l	<1.4	32.2	ND	ND	ND	ND	19.96	2	9	0	0	100	-	-	-	0	0.00	39
METALS	Nickel	WS	T	23	ug/l	<1.4	55.9	ND	ND	ND	ND	1.96	2	9	0	0	100	-	-	-	1	4.35	39
METALS	Potassium	WS	DI	23	ug/l	237.0	970.0	433.4348	419.0	190.8824	240.6	759.2	23	100	-	-	-	-	-	-	-	-	-
METALS	Potassium	WS	T	23	ug/l	242.0	1,060	535.6522	480.0	186.9316	248.0	809.5	23	100	-	-	-	-	-	-	-	-	-
METALS	Selenium	WS	DI	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Selenium	WS	T	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Silver	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Silver	WS	T	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Sodium	WS	DI	23	ug/l	562.0	23,500	3,824	2,020	5,408	570.4	13,910	23	100	-	-	-	-	-	-	-	-	-
METALS	Sodium	WS	T	23	ug/l	666.0	25,800	4,300	2,220	6,134	678.5	17,450	23	100	-	-	-	-	-	-	-	-	-
METALS	Thallium	WS	T	23	ug/l	<0.26	0.27	ND	ND	ND	ND	ND	1	4	1	4	0.24	0	0	2	23	100.00	0.02
METALS	Thallium	WS	DI	23	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.24	0	0	2	23	100.00	0.02
METALS	Vanadium	WS	DI	23	ug/l	<1.9	4.3	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	0	0.00	8.6
METALS	Vanadium	WS	T	23	ug/l	<1.9	18.0	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	1	4.35	8.6
METALS	Zinc	WS	T	23	ug/l	<7	537.0	28.5739	ND	110.8994	ND	15.09	6	26	0	0	2000	-	-	-	0	0.00	600
METALS	Zinc	WS	DI	23	ug/l	<7	512.0	ND	ND	ND	ND	ND	1	4	0	0	2000	-	-	-	0	0.00	600
OC_PEST	4,4'-DDD	WS	T	1	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	0.0031	-	-	-	0	0.00	0.032
OC_PEST	4,4'-DDE	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0.00	0.046
OC_PEST	4,4'-DDT	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0.00	0.23
OC_PEST	Aldrin	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00049	-	-	-	1	100.00	9E-04
OC_PEST	alpha-BHC	WS	T	1	ug/l	<0.007	<0.007	ND	ND	ND	ND	ND	0	0	0	0	0.026	-	-	-	0	0.00	0.007
OC_PEST	alpha-Chlordane	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.008	-	-	-	-	-	-
OC_PEST	beta-BHC	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.091	-	-	-	0	0.00	0.025
OC_PEST	delta-BHC	WS	T	1	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00052	-	-	-	0	0.00	0.002
OC_PEST	Endosulfan I	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan II	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan sulfate	WS	T	1	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endrin	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.059	0	0	2	0	0.00	0.23
OC_PEST	Endrin aldehyde	WS	T	1	ug/l	<0.008	<0.008	ND	ND	ND	ND	ND	0	0	0	0	0.29	-	-	-	-	-	-

Table 23. Round 3 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	Endrin ketone	WS	T	1	ug/l	<0.008	<0.008	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	T	1	ug/l	<0.012	<0.012	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	0	0.00	0.042
OC_PEST	gamma-Chlordane	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Heptachlor	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00079	0	0	0.4	1	100.00	0.001
OC_PEST	Heptachlor epoxide	WS	T	1	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	1	100	0.00039	0	0	0.2	1	100.00	0.001
OC_PEST	Methoxychlor	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	40	0	0.00	3.7
OC_PEST	Toxaphene	WS	T	1	ug/l	<0.11	<0.11	ND	ND	ND	ND	ND	0	0	1	100	0.0028	0	0	3	0	0.00	0.071
PCB	Aroclor 1016	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	0	0.00	0.14
PCB	Aroclor 1221	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.005
PCB	Aroclor 1232	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.005
PCB	Aroclor 1242	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1248	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1254	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1260	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1268	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	-	-	-
PCB	Aroclor-1262	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	-	-	-
SVOC	1,1'-Biphenyl	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100.00	0.083
SVOC	1,2,4,5-Tetrachlorobenzene	WS	T	1	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	1	100.00	0.17
SVOC	1,4-Dioxane	WS	T	1	ug/l	<3.1	<3.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100.00	0.46
SVOC	2,2'-oxybis[1-chloropropane]	WS	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	24
SVOC	2,4,5-Trichlorophenol	WS	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0.00	120
SVOC	2,4,6-Trichlorophenol	WS	T	1	ug/l	<0.53	<0.53	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0.00	1.2
SVOC	2,4-Dichlorophenol	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0.00	4.6
SVOC	2,4-Dimethylphenol	WS	T	1	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0.00	36
SVOC	2,4-Dinitrophenol	WS	T	1	ug/l	<2.4	<2.4	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0.00	3.9
SVOC	2,4-Dinitrotoluene	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	1	100.00	0.24
SVOC	2,6-Dinitrotoluene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100.00	0.049
SVOC	2-Chloronaphthalene	WS	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0.00	9.1
SVOC	2-Methylnaphthalene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.6
SVOC	2-Methylphenol	WS	T	1	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	19
SVOC	2-Nitrophenol	WS	T	1	ug/l	<0.59	<0.59	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	1	100	0.21	-	-	-	1	100.00	0.13
SVOC	3-Nitroaniline	WS	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 23. Round 3 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	4,6-Dinitro-2-methylphenol	WS	T	1	ug/l	<2	<2	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.37
SVOC	4-Chlorophenyl phenyl ether	WS	T	1	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	T	1	ug/l	<0.48	<0.48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.8
SVOC	4-Nitrophenol	WS	T	1	ug/l	<4.7	<4.7	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0.00	53
SVOC	Acenaphthylene	WS	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	190
SVOC	Anthracene	WS	T	1	ug/l	<0.57	<0.57	ND	ND	ND	ND	ND	0	0	0	0	8300	-	-	-	0	0.00	180
SVOC	Atrazine	WS	T	1	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	1	100.00	0.3
SVOC	Benzaldehyde	WS	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	19
SVOC	Benzo[a]anthracene	WS	T	1	ug/l	3.0	3.0	3.0	3.0	-	3.0	3.0	1	100	1	100	0.038	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	T	1	ug/l	3.9	3.9	3.9	3.9	-	3.9	3.9	1	100	1	100	0.038	1	100	0.2	1	100.00	0.003
SVOC	Benzo[b]fluoranthene	WS	T	1	ug/l	10.0	10.0	10.0	10.0	-	10.0	10.0	1	100	1	100	0.038	-	-	-	1	100.00	0.034
SVOC	Benzo[g,h,i]perylene	WS	T	1	ug/l	3.9	3.9	3.9	3.9	-	3.9	3.9	1	100	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	1	100	0.038	-	-	-	0	0.00	0.34
SVOC	Bis(2-chloroethoxy)methane	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	5.9
SVOC	Bis(2-chloroethyl)ether	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	1	100.00	0.014
SVOC	Bis(2-ethylhexyl) phthalate	WS	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0.00	5.6
SVOC	Butyl benzyl phthalate	WS	T	1	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0.00	16
SVOC	Caprolactam	WS	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	990
SVOC	Carbazole	WS	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	T	1	ug/l	7.6	7.6	7.6	7.6	-	7.6	7.6	1	100	1	100	0.038	-	-	-	1	100.00	3.4
SVOC	Dibenz(a,h)anthracene	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	1	100	0.038	-	-	-	1	100.00	0.003
SVOC	Dibenzofuran	WS	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.79
SVOC	Diethyl phthalate	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WS	T	1	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0	0	0	270000	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	20
SVOC	Fluoranthene	WS	T	1	ug/l	9.3	9.3	9.3	9.3	-	9.3	9.3	1	100	0	0	130	-	-	-	0	0.00	80
SVOC	Fluorene	WS	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0.00	29
SVOC	Hexachlorobenzene	WS	T	1	ug/l	<0.47	<0.47	ND	ND	ND	ND	ND	0	0	1	100	0.0028	0	0	1	1	100.00	0.01
SVOC	Hexachlorobutadiene	WS	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	4.4	-	-	-	1	100.00	0.14
SVOC	Hexachlorocyclopentadiene	WS	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	50	1	100.00	0.041
SVOC	Hexachloroethane	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0.00	0.33
SVOC	Indeno[1,2,3-cd]pyrene	WS	T	1	ug/l	3.1	3.1	3.1	3.1	-	3.1	3.1	1	100	1	100	0.038	-	-	-	1	100.00	0.034

Table 23. Round 3 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Isophorone	WS	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0	0	0	350	-	-	-	0	0.00	78
SVOC	Naphthalene	WS	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	1	100.00	0.17
SVOC	Nitrobenzene	WS	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	1	100.00	0.14
SVOC	N-Nitrosodi-n-propylamine	WS	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0	1	100	0.05	-	-	-	1	100.00	0.011
SVOC	N-Nitrosodiphenylamine	WS	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0.00	12
SVOC	Pentachlorophenol	WS	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	1	100	1	1	100	1	1	100.00	0.041
SVOC	Phenanthrene	WS	T	1	ug/l	1.5	1.5	1.5	1.5	-	1.5	1.5	1	100	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WS	T	1	ug/l	<0.41	<0.41	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0.00	580
SVOC	Pyrene	WS	T	1	ug/l	7.0	7.0	7.0	7.0	-	7.0	7.0	1	100	0	0	830	-	-	-	0	0.00	12
VOC	1,1,1-Trichloroethane	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	0	0.00	800
VOC	1,1,2,2-Tetrachloroethane	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	1.7	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	5500
VOC	1,1,2-Trichloroethane	WS	T	1	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2.8
VOC	1,1-Dichloroethene	WS	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	T	1	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.7
VOC	1,2,4-Trichlorobenzene	WS	T	1	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	35	-	-	-	0	0.00	0.4
VOC	1,2-Dibromo-3-Chloropropane	WS	T	1	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	1	100.00	3E-04
VOC	1,2-Dichlorobenzene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	420	0	0	600	0	0.00	30
VOC	1,2-Dichloroethane	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	3.8	0	0	5	0	0.00	0.17
VOC	1,2-Dichloropropane	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.44
VOC	1,3-Dichlorobenzene	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0.00	0.48
VOC	2-Butanone (MEK)	WS	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	560
VOC	2-Hexanone	WS	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.8
VOC	4-Methyl-2-pentanone (MIBK)	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	630
VOC	Acetone	WS	T	1	ug/l	12.0	12.0	12.0	12.0	-	12.0	12.0	1	100	-	-	-	-	-	-	0	0.00	1400
VOC	Benzene	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.46
VOC	Bromoform	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	43	0	0	80	0	0.00	3.3
VOC	Bromomethane	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	0	0.00	0.75
VOC	Carbon disulfide	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	81
VOC	Carbon tetrachloride	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	2.3	0	0	5	0	0.00	0.46
VOC	Chlorobenzene	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0.00	7.8
VOC	Chlorobromomethane	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	8.3
VOC	Chlorodibromomethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0.00	0.87
VOC	Chloroethane	WS	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2100
VOC	Chloroform	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	57	0	0	80	0	0.00	0.22
VOC	Chloromethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0.00	19

Table 23. Round 3 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	cis-1,2-Dichloroethene	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	3.4	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	1300
VOC	Dichlorobromomethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	5.5	0	0	80	0	0.00	0.13
VOC	Dichlorodifluoromethane	WS	T	1	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	20
VOC	Ethylbenzene	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	530	0	0	700	0	0.00	1.5
VOC	Ethylene Dibromide	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2000
VOC	Methyl tert-butyl ether	WS	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0.00	14
VOC	Methylcyclohexane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	11
VOC	m-Xylene & p-Xylene	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0.00	19
VOC	Styrene	WS	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0.00	120
VOC	Tetrachloroethene	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Toluene	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	1000	0	0	1000	0	0.00	110
VOC	trans-1,2-Dichloroethene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0.00	520
VOC	Vinyl chloride	WS	T	2	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	1	50	0.25	1	50	2	2	100.00	0.019

Table 24. Round 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	23	ug/l	13,900	233,000	137,570	175,000	62,105	69,000	199,100	23	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	23	ug/l	<72	1,840	122.7435	ND	375.0499	ND	122.27	4	17	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	23	ug/l	227.0	2,300	1,129	1,390	671.2694	241.2	1,759	23	100	-	-	-	-	-	-	-	-	-
GENCHEM	Fluoride	WS	DI	23	ug/l	109.0	21,500	1,174	130.0	4,446	117.1	1,730	23	100	1	4	4000	1	4	4000	23	100.00	80
GENCHEM	Fluoride	WS	T	23	ug/l	118.0	22,400	1,213	135.0	4,630	119.2	1,586	23	100	1	4	4000	1	4	4000	23	100.00	80
GENCHEM	Hardness as calcium carbonate	WS	T	23	ug/l	50,000	216,000	132,957	164,000	54,954	66,400	187,600	23	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	23	ug/l	<100	1,700	262.6087	127.0	434.6847	ND	1,428	19	83	0	0	10000	0	0	10000	-	-	-
GENCHEM	Orthophosphate as P	WS	T	23	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	23	ug/l	1,880	20,300	4,050	2,620	4,275	1,901	11,841	23	100	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfide	WS	T	23	ug/l	<579	<579	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	23	ug/l	62,000	336,000	157,652	191,000	75,904	71,100	249,300	23	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	23	ug/l	<1000	70,500	25,187	18,400	23,792	ND	61,900	19	83	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	T	23	ug/l	<18.2	8,630	622.5261	49.5	1,778	ND	987.9	16	70	-	-	-	-	-	-	1	4.35	2000
METALS	Aluminum	WS	DI	23	ug/l	<18.2	4,780	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	1	4.35	2000
METALS	Antimony	WS	DI	23	ug/l	<0.62	7.2	ND	ND	ND	ND	ND	1	4	1	4	5.6	1	4	6	1	4.35	0.78
METALS	Antimony	WS	T	23	ug/l	<0.62	7.7	ND	ND	ND	ND	ND	1	4	1	4	5.6	1	4	6	1	4.35	0.78
METALS	Arsenic	WS	DI	23	ug/l	<0.64	1.0	ND	ND	ND	ND	0.906	3	13	0	0	10	0	0	10	23	100.00	0.052
METALS	Arsenic	WS	T	23	ug/l	<0.64	2.4	ND	ND	ND	ND	0.815	2	9	0	0	10	0	0	10	23	100.00	0.052
METALS	Barium	WS	DI	23	ug/l	26.4	270.0	99.5652	86.5	58.6305	63.61	242.6	23	100	0	0	1000	0	0	2000	0	0.00	380
METALS	Barium	WS	T	23	ug/l	43.4	275.0	108.3391	88.8	60.22	62.86	248.7	23	100	0	0	1000	0	0	2000	0	0.00	380
METALS	Beryllium	WS	DI	23	ug/l	<0.24	0.51	ND	ND	ND	ND	ND	1	4	0	0	4	0	0	4	0	0.00	2.5
METALS	Beryllium	WS	T	23	ug/l	<0.24	0.71	ND	ND	ND	ND	ND	1	4	0	0	4	0	0	4	0	0.00	2.5
METALS	Cadmium	WS	DI	23	ug/l	<0.71	2.5	ND	ND	ND	ND	ND	1	4	0	0	5	0	0	5	1	4.35	0.92
METALS	Cadmium	WS	T	23	ug/l	<0.71	3.0	ND	ND	ND	ND	ND	1	4	0	0	5	0	0	5	1	4.35	0.92
METALS	Calcium	WS	DI	23	ug/l	7,020	54,100	35,697	39,800	15,709	18,200	52,030	23	100	-	-	-	-	-	-	-	-	-
METALS	Calcium	WS	T	23	ug/l	7,860	62,400	37,246	41,100	16,543	17,610	54,440	23	100	-	-	-	-	-	-	-	-	-
METALS	Chromium	WS	T	23	ug/l	<1.3	2.7	ND	ND	ND	ND	ND	1	4	0	0	100	0	0	100	23	100.00	0.035
METALS	Chromium	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	23	100.00	0.035
METALS	Cobalt	WS	T	23	ug/l	<1.3	1.6	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	23	100.00	0.6
METALS	Cobalt	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	23	100.00	0.6
METALS	Copper	WS	T	23	ug/l	<1.4	16.5	1.713	ND	3.3718	ND	4.96	5	22	0	0	1300	0	0	1300	0	0.00	80
METALS	Copper	WS	DI	23	ug/l	<1.4	26.4	ND	ND	ND	ND	2.9	3	13	0	0	1300	0	0	1300	0	0.00	80
METALS	Cyanide, Free	WS	DI	7	ug/l	<1.5	42.2	8.2857	1.7	15.0962	ND	31.22	5	71	0	0	140	0	0	200	7	100.00	0.15
METALS	Cyanide, Free	WS	T	7	ug/l	<1.5	45.6	8.2214	2.1	16.5397	ND	33.15	4	57	0	0	140	0	0	200	7	100.00	0.15
METALS	Cyanide, Total	WS	DI	23	ug/l	<2	162.0	12.0739	ND	35.5998	ND	62.63	5	22	1	4	140	0	0	200	23	100.00	0.15
METALS	Cyanide, Total	WS	T	23	ug/l	<2	197.0	13.6609	ND	43.0212	ND	70.63	4	17	1	4	140	0	0	200	23	100.00	0.15
METALS	Iron	WS	T	23	ug/l	<42.4	1,210	303.9826	ND	405.5771	ND	1,068	10	43	-	-	-	-	-	-	0	0.00	1400
METALS	Iron	WS	DI	23	ug/l	<42.4	164.0	ND	ND	ND	ND	60.05	3	13	-	-	-	-	-	-	0	0.00	1400

Table 24. Round 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WS	T	23	ug/l	<0.38	7.6	0.6578	ND	1.5308	ND	0.961	9	39	0	0	15	0	0	15	0	0.00	15
METALS	Lead	WS	DI	23	ug/l	<0.38	<0.38	ND	ND	ND	ND	ND	0	0	0	0	15	0	0	15	0	0.00	15
METALS	Magnesium	WS	DI	23	ug/l	384.0	14,800	8,824	11,000	4,017	4,465	13,160	23	100	-	-	-	-	-	-	-	-	-
METALS	Magnesium	WS	T	23	ug/l	804.0	16,300	9,676	12,100	4,145	4,681	13,930	23	100	-	-	-	-	-	-	-	-	-
METALS	Manganese	WS	T	23	ug/l	<2.5	43.2	14.0609	8.1	13.2947	ND	36.92	20	87	-	-	-	-	-	-	1	4.35	43
METALS	Manganese	WS	DI	23	ug/l	<2.5	31.8	5.2261	2.5	8.1144	ND	25.64	12	52	-	-	-	-	-	-	0	0.00	43
METALS	Mercury	WS	DI	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.05	0	0	2	23	100.00	0.063
METALS	Mercury	WS	T	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.05	0	0	2	23	100.00	0.063
METALS	Nickel	WS	DI	23	ug/l	<1.4	32.2	ND	ND	ND	ND	19.96	2	9	0	0	100	-	-	-	0	0.00	39
METALS	Nickel	WS	T	23	ug/l	<1.4	55.9	ND	ND	ND	ND	1.96	2	9	0	0	100	-	-	-	1	4.35	39
METALS	Potassium	WS	DI	23	ug/l	237.0	970.0	433.4348	419.0	190.8824	240.6	759.2	23	100	-	-	-	-	-	-	-	-	-
METALS	Potassium	WS	T	23	ug/l	242.0	1,060	535.6522	480.0	186.9316	248.0	809.5	23	100	-	-	-	-	-	-	-	-	-
METALS	Selenium	WS	DI	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Selenium	WS	T	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	50	0	0	50	0	0.00	10
METALS	Silver	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Silver	WS	T	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	0	0.00	9.4
METALS	Sodium	WS	DI	23	ug/l	562.0	23,500	3,824	2,020	5,408	570.4	13,910	23	100	-	-	-	-	-	-	-	-	-
METALS	Sodium	WS	T	23	ug/l	666.0	25,800	4,300	2,220	6,134	678.5	17,450	23	100	-	-	-	-	-	-	-	-	-
METALS	Thallium	WS	T	23	ug/l	<0.26	0.27	ND	ND	ND	ND	ND	1	4	1	4	0.24	0	0	2	23	100.00	0.02
METALS	Thallium	WS	DI	23	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.24	0	0	2	23	100.00	0.02
METALS	Vanadium	WS	DI	23	ug/l	<1.9	4.3	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	0	0.00	8.6
METALS	Vanadium	WS	T	23	ug/l	<1.9	18.0	ND	ND	ND	ND	ND	1	4	-	-	-	-	-	-	1	4.35	8.6
METALS	Zinc	WS	T	23	ug/l	<7	537.0	28.5739	ND	110.8994	ND	15.09	6	26	0	0	2000	-	-	-	0	0.00	600
METALS	Zinc	WS	DI	23	ug/l	<7	512.0	ND	ND	ND	ND	ND	1	4	0	0	2000	-	-	-	0	0.00	600
OC_PEST	4,4'-DDD	WS	T	1	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	0.0031	-	-	-	0	0.00	0.032
OC_PEST	4,4'-DDE	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0.00	0.046
OC_PEST	4,4'-DDT	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0022	-	-	-	0	0.00	0.23
OC_PEST	Aldrin	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00049	-	-	-	1	100.00	9E-04
OC_PEST	alpha-BHC	WS	T	1	ug/l	<0.007	<0.007	ND	ND	ND	ND	ND	0	0	0	0	0.026	-	-	-	0	0.00	0.007
OC_PEST	alpha-Chlordane	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.008	-	-	-	-	-	-
OC_PEST	beta-BHC	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.091	-	-	-	0	0.00	0.025
OC_PEST	delta-BHC	WS	T	1	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00052	-	-	-	0	0.00	0.002
OC_PEST	Endosulfan I	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan II	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endosulfan sulfate	WS	T	1	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	62	-	-	-	-	-	-
OC_PEST	Endrin	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.059	0	0	2	0	0.00	0.23
OC_PEST	Endrin aldehyde	WS	T	1	ug/l	<0.008	<0.008	ND	ND	ND	ND	ND	0	0	0	0	0.29	-	-	-	-	-	-

Table 24. Round 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	Endrin ketone	WS	T	1	ug/l	<0.008	<0.008	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	T	1	ug/l	<0.012	<0.012	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	0	0.00	0.042
OC_PEST	gamma-Chlordane	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
OC_PEST	Heptachlor	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	1	100	0.00079	0	0	0.4	1	100.00	0.001
OC_PEST	Heptachlor epoxide	WS	T	1	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	1	100	0.00039	0	0	0.2	1	100.00	0.001
OC_PEST	Methoxychlor	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	40	0	0.00	3.7
OC_PEST	Toxaphene	WS	T	1	ug/l	<0.11	<0.11	ND	ND	ND	ND	ND	0	0	1	100	0.0028	0	0	3	0	0.00	0.071
PCB	Aroclor 1016	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	0	0.00	0.14
PCB	Aroclor 1221	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.005
PCB	Aroclor 1232	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.005
PCB	Aroclor 1242	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1248	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1254	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1260	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	1	100.00	0.008
PCB	Aroclor 1268	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	-	-	-
PCB	Aroclor-1262	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	0.00064	-	-	-	-	-	-
SVOC	1,1'-Biphenyl	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100.00	0.083
SVOC	1,2,4,5-Tetrachlorobenzene	WS	T	1	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0	0	0	0.97	-	-	-	1	100.00	0.17
SVOC	1,4-Dioxane	WS	T	1	ug/l	<3.1	<3.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	1	100.00	0.46
SVOC	2,2'-oxybis[1-chloropropane]	WS	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	0	0	1400	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	24
SVOC	2,4,5-Trichlorophenol	WS	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	1800	-	-	-	0	0.00	120
SVOC	2,4,6-Trichlorophenol	WS	T	1	ug/l	<0.53	<0.53	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0.00	1.2
SVOC	2,4-Dichlorophenol	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	77	-	-	-	0	0.00	4.6
SVOC	2,4-Dimethylphenol	WS	T	1	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0	0	0	380	-	-	-	0	0.00	36
SVOC	2,4-Dinitrophenol	WS	T	1	ug/l	<2.4	<2.4	ND	ND	ND	ND	ND	0	0	0	0	69	-	-	-	0	0.00	3.9
SVOC	2,4-Dinitrotoluene	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	1	100.00	0.24
SVOC	2,6-Dinitrotoluene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	0.5	-	-	-	1	100.00	0.049
SVOC	2-Chloronaphthalene	WS	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	1000	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	0	0.00	9.1
SVOC	2-Methylnaphthalene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.6
SVOC	2-Methylphenol	WS	T	1	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	19
SVOC	2-Nitrophenol	WS	T	1	ug/l	<0.59	<0.59	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	1	100	0.21	-	-	-	1	100.00	0.13
SVOC	3-Nitroaniline	WS	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 24. Round 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	4,6-Dinitro-2-methylphenol	WS	T	1	ug/l	<2	<2	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	3000	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.37
SVOC	4-Chlorophenyl phenyl ether	WS	T	1	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	T	1	ug/l	<0.48	<0.48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.8
SVOC	4-Nitrophenol	WS	T	1	ug/l	<4.7	<4.7	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	670	-	-	-	0	0.00	53
SVOC	Acenaphthylene	WS	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	190
SVOC	Anthracene	WS	T	1	ug/l	<0.57	<0.57	ND	ND	ND	ND	ND	0	0	0	0	8300	-	-	-	0	0.00	180
SVOC	Atrazine	WS	T	1	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0	0	0	3	0	0	3	1	100.00	0.3
SVOC	Benzaldehyde	WS	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	19
SVOC	Benzo[a]anthracene	WS	T	1	ug/l	3.0	3.0	3.0	3.0	-	3.0	3.0	1	100	1	100	0.038	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	T	1	ug/l	3.9	3.9	3.9	3.9	-	3.9	3.9	1	100	1	100	0.038	1	100	0.2	1	100.00	0.003
SVOC	Benzo[b]fluoranthene	WS	T	1	ug/l	10.0	10.0	10.0	10.0	-	10.0	10.0	1	100	1	100	0.038	-	-	-	1	100.00	0.034
SVOC	Benzo[g,h,i]perylene	WS	T	1	ug/l	3.9	3.9	3.9	3.9	-	3.9	3.9	1	100	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	1	100	0.038	-	-	-	0	0.00	0.34
SVOC	Bis(2-chloroethoxy)methane	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	5.9
SVOC	Bis(2-chloroethyl)ether	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	0.3	-	-	-	1	100.00	0.014
SVOC	Bis(2-ethylhexyl) phthalate	WS	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	6	0	0	6	0	0.00	5.6
SVOC	Butyl benzyl phthalate	WS	T	1	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	0	0.00	16
SVOC	Caprolactam	WS	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	990
SVOC	Carbazole	WS	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	T	1	ug/l	7.6	7.6	7.6	7.6	-	7.6	7.6	1	100	1	100	0.038	-	-	-	1	100.00	3.4
SVOC	Dibenz(a,h)anthracene	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	1	100	0.038	-	-	-	1	100.00	0.003
SVOC	Dibenzofuran	WS	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.79
SVOC	Diethyl phthalate	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	17000	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WS	T	1	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0	0	0	270000	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	0	0	2000	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	20
SVOC	Fluoranthene	WS	T	1	ug/l	9.3	9.3	9.3	9.3	-	9.3	9.3	1	100	0	0	130	-	-	-	0	0.00	80
SVOC	Fluorene	WS	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	1100	-	-	-	0	0.00	29
SVOC	Hexachlorobenzene	WS	T	1	ug/l	<0.47	<0.47	ND	ND	ND	ND	ND	0	0	1	100	0.0028	0	0	1	1	100.00	0.01
SVOC	Hexachlorobutadiene	WS	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	4.4	-	-	-	1	100.00	0.14
SVOC	Hexachlorocyclopentadiene	WS	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	0	0	40	0	0	50	1	100.00	0.041
SVOC	Hexachloroethane	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	0	0.00	0.33
SVOC	Indeno[1,2,3-cd]pyrene	WS	T	1	ug/l	3.1	3.1	3.1	3.1	-	3.1	3.1	1	100	1	100	0.038	-	-	-	1	100.00	0.034

Table 24. Round 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Isophorone	WS	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0	0	0	350	-	-	-	0	0.00	78
SVOC	Naphthalene	WS	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	1	100.00	0.17
SVOC	Nitrobenzene	WS	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	0	0	17	-	-	-	1	100.00	0.14
SVOC	N-Nitrosodi-n-propylamine	WS	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0	1	100	0.05	-	-	-	1	100.00	0.011
SVOC	N-Nitrosodiphenylamine	WS	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	33	-	-	-	0	0.00	12
SVOC	Pentachlorophenol	WS	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	1	100	1	1	100	1	1	100.00	0.041
SVOC	Phenanthrene	WS	T	1	ug/l	1.5	1.5	1.5	1.5	-	1.5	1.5	1	100	-	-	-	-	-	-	-	-	-
SVOC	Phenol	WS	T	1	ug/l	<0.41	<0.41	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	0	0.00	580
SVOC	Pyrene	WS	T	1	ug/l	7.0	7.0	7.0	7.0	-	7.0	7.0	1	100	0	0	830	-	-	-	0	0.00	12
VOC	1,1,1-Trichloroethane	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	200	0	0	200	0	0.00	800
VOC	1,1,2,2-Tetrachloroethane	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	1.7	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	5500
VOC	1,1,2-Trichloroethane	WS	T	1	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2.8
VOC	1,1-Dichloroethene	WS	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	7	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	T	1	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	0.7
VOC	1,2,4-Trichlorobenzene	WS	T	1	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	35	-	-	-	0	0.00	0.4
VOC	1,2-Dibromo-3-Chloropropane	WS	T	1	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	0	0	0.2	0	0	0.2	1	100.00	3E-04
VOC	1,2-Dichlorobenzene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	420	0	0	600	0	0.00	30
VOC	1,2-Dichloroethane	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	3.8	0	0	5	0	0.00	0.17
VOC	1,2-Dichloropropane	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.44
VOC	1,3-Dichlorobenzene	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	75	0	0	75	0	0.00	0.48
VOC	2-Butanone (MEK)	WS	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	560
VOC	2-Hexanone	WS	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	3.8
VOC	4-Methyl-2-pentanone (MIBK)	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	630
VOC	Acetone	WS	T	1	ug/l	12.0	12.0	12.0	12.0	-	12.0	12.0	1	100	-	-	-	-	-	-	0	0.00	1400
VOC	Benzene	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	0.46
VOC	Bromoform	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	43	0	0	80	0	0.00	3.3
VOC	Bromomethane	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	0	0.00	0.75
VOC	Carbon disulfide	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	81
VOC	Carbon tetrachloride	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	2.3	0	0	5	0	0.00	0.46
VOC	Chlorobenzene	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0.00	7.8
VOC	Chlorobromomethane	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	8.3
VOC	Chlorodibromomethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	4	0	0	80	0	0.00	0.87
VOC	Chloroethane	WS	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2100
VOC	Chloroform	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	57	0	0	80	0	0.00	0.22
VOC	Chloromethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0.00	19

Table 24. Round 4 Surface Water Analytical Results Statistical Summary – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															DEQ 7 Human Health Standards			EPA Drinking MCL			EPA Tapwater RSL		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	cis-1,2-Dichloroethene	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	70	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	0	0	3.4	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	1300
VOC	Dichlorobromomethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	5.5	0	0	80	0	0.00	0.13
VOC	Dichlorodifluoromethane	WS	T	1	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	20
VOC	Ethylbenzene	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	530	0	0	700	0	0.00	1.5
VOC	Ethylene Dibromide	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	0	0.00	2000
VOC	Methyl tert-butyl ether	WS	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	0	0.00	14
VOC	Methylcyclohexane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	5	0	0.00	11
VOC	m-Xylene & p-Xylene	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	o-Xylene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0.00	19
VOC	Styrene	WS	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	100	0	0	100	0	0.00	120
VOC	Tetrachloroethene	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Toluene	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	1000	0	0	1000	0	0.00	110
VOC	trans-1,2-Dichloroethene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	5	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	0	0.00	520
VOC	Vinyl chloride	WS	T	2	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	1	50	0.25	1	50	2	2	100.00	0.019

Table 25. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	88	ug/l	13,900	269,000	148,160	164,500	54,896	69,480	224,150	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	88	ug/l	<72	1,840	ND	ND	ND	ND	85.44	10	11	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	N	88	ug/l	227.0	3,100	1,422	1,590	848.7464	284.05	2,936	88	100	0	0	120000	-	-	-	-	-	-
GENCHEM	Fluoride	WS	D	23	ug/l	109.0	21,500	1,174	130.0	4,446	117.1	1,730	23	100	17	74	120	-	-	-	-	-	-
GENCHEM	Fluoride	WS	N	88	ug/l	33.5	22,400	602.3216	131.5	2,421	37.79	2,133	88	100	56	64	120	-	-	-	-	-	-
GENCHEM	Hardness as calcium carbonate	WS	T	88	ug/l	50,000	304,000	150,682	167,000	55,338	70,700	223,300	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	88	ug/l	<100	1,700	212.0682	106.5	385.0362	ND	1,451	46	52	-	-	-	-	-	-	-	-	-
GENCHEM	Orthophosphate as P	WS	N	71	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	N	88	ug/l	1,880	78,900	6,363	3,410	11,433	1,910	17,995	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfide	WS	T	23	ug/l	<579	<579	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	88	mg/l	62.0	336.0	160.9773	170.0	66.0087	74.0	291.8	88	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	88	mg/l	<1	413.0	24.4909	3.6	57.2414	ND	101.78	67	76	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	D	23	ug/l	<18.2	4,780	ND	ND	ND	ND	ND	1	4	1	4	87	1	4	750	1	4.35	87
METALS	Aluminum	WS	T	88	ug/l	<13.5	8,630	368.3915	44.5	1,126	ND	1,299	74	84	32	36	87	10	11	750	32	36.36	87
METALS	Antimony	WS	D	23	ug/l	<0.62	7.2	ND	ND	ND	ND	ND	1	4	0	0	30	-	-	-	-	-	-
METALS	Antimony	WS	T	88	ug/l	<0.62	7.7	ND	ND	ND	ND	0.653	8	9	0	0	30	-	-	-	-	-	-
METALS	Arsenic	WS	D	23	ug/l	<0.64	1.0	ND	ND	ND	ND	0.906	3	13	0	0	3.1	0	0	340	0	0.00	150
METALS	Arsenic	WS	T	88	ug/l	<0.64	3.7	ND	ND	ND	ND	1.1125	13	15	1	1	3.1	0	0	340	0	0.00	150
METALS	Barium	WS	D	23	ug/l	26.4	270.0	99.5652	86.5	58.6305	63.61	242.6	23	100	23	100	4	-	-	-	-	-	-
METALS	Barium	WS	T	88	ug/l	43.4	424.0	126.5636	102.5	66.5438	69.07	259.75	88	100	88	100	4	-	-	-	-	-	-
METALS	Beryllium	WS	D	23	ug/l	<0.24	0.51	ND	ND	ND	ND	ND	1	4	0	0	0.66	-	-	-	-	-	-
METALS	Beryllium	WS	T	88	ug/l	<0.24	0.71	ND	ND	ND	ND	ND	1	1	1	1	0.66	-	-	-	-	-	-
METALS	Cadmium	WS	D	23	ug/l	<0.71	2.5	ND	ND	ND	ND	ND	1	4	23	100	0.09	1	4	0.52	23	100.00	0.238
METALS	Cadmium	WS	T	88	ug/l	<0.71	3.0	ND	ND	ND	ND	ND	1	1	88	100	0.09	1	1	0.52	88	100.00	0.238
METALS	Calcium	WS	D	23	ug/l	7,020	54,100	35,697	39,800	15,709	18,200	52,030	23	100	0	0	116000	-	-	-	-	-	-
METALS	Calcium	WS	T	88	ug/l	7,860	82,100	40,971	45,600	15,498	19,440	62,530	88	100	0	0	116000	-	-	-	-	-	-
METALS	Chromium	WS	D	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	85	-	-	-	0	0.00	74.7
METALS	Chromium	WS	T	88	ug/l	<1.3	37.7	ND	ND	ND	ND	3.155	12	14	0	0	85	-	-	-	0	0.00	74.7
METALS	Cobalt	WS	D	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	5.1	-	-	-	-	-	-
METALS	Cobalt	WS	T	88	ug/l	<1.3	2.4	ND	ND	ND	ND	1.1075	5	6	0	0	5.1	-	-	-	-	-	-
METALS	Copper	WS	D	23	ug/l	<1.4	26.4	ND	ND	ND	ND	2.9	3	13	23	100	0.23	1	4	3.79	1	4.35	8.038
METALS	Copper	WS	T	88	ug/l	<1.4	16.5	1.6102	ND	2.2216	ND	5.365	28	32	88	100	0.23	9	10	3.79	2	2.27	8.038
METALS	Cyanide, Free	WS	D	7	ug/l	<1.5	42.2	8.2857	1.7	15.0962	ND	31.22	5	71	3	43	5	1	14	22	3	42.86	5.2
METALS	Cyanide, Free	WS	T	14	ug/l	<1.5	45.6	5.9964	1.425	11.7648	ND	21.81	7	50	4	29	5	1	7	22	4	28.57	5.2
METALS	Cyanide, Total	WS	D	23	ug/l	<2	162.0	12.0739	ND	35.5998	ND	62.63	5	22	5	22	5	2	9	22	5	21.74	5.2
METALS	Cyanide, Total	WS	T	88	ug/l	<2	213.0	15.3534	ND	46.2003	ND	142.72	21	24	19	22	5	8	9	22	19	21.59	5.2
METALS	Iron	WS	D	23	ug/l	<42.4	164.0	ND	ND	ND	ND	60.05	3	13	1	4	158	-	-	-	0	0.00	1000
METALS	Iron	WS	T	88	ug/l	<42.4	4,760	296.7307	46.0	658.1026	ND	1,168	45	51	27	31	158	-	-	-	6	6.82	1000

Table 25. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WS	D	23	ug/l	<0.38	<0.38	ND	ND	ND	ND	ND	0	0	0	0	0.54	0	0	13.98	0	0.00	2.548
METALS	Lead	WS	T	88	ug/l	<0.38	7.6	0.4868	ND	0.9819	ND	1.525	22	25	15	17	0.54	0	0	13.98	3	3.41	2.548
METALS	Magnesium	WS	D	23	ug/l	384.0	14,800	8,824	11,000	4,017	4,465	13,160	23	100	0	0	82000	-	-	-	-	-	-
METALS	Magnesium	WS	T	88	ug/l	804.0	19,500	10,699	11,100	3,967	5,542	16,955	88	100	0	0	82000	-	-	-	-	-	-
METALS	Manganese	WS	D	23	ug/l	<2.5	31.8	5.2261	2.5	8.1144	ND	25.64	12	52	0	0	120	-	-	-	-	-	-
METALS	Manganese	WS	T	88	ug/l	<2.5	3,750	57.4773	6.0	399.126	ND	55.315	70	80	3	3	120	-	-	-	-	-	-
METALS	Mercury	WS	D	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.026	0	0	1.7	0	0.00	0.91
METALS	Mercury	WS	T	88	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	88	100	0.026	0	0	1.7	0	0.00	0.91
METALS	Nickel	WS	D	23	ug/l	<1.4	32.2	ND	ND	ND	ND	19.96	2	9	2	9	5	0	0	145	0	0.00	45.009
METALS	Nickel	WS	T	88	ug/l	<1.4	55.9	ND	ND	ND	ND	1.795	7	8	1	1	5	0	0	145	1	1.14	45.009
METALS	Potassium	WS	D	23	ug/l	237.0	970.0	433.4348	419.0	190.8824	240.6	759.2	23	100	0	0	53000	-	-	-	-	-	-
METALS	Potassium	WS	T	88	ug/l	242.0	1,250	558.2159	505.5	214.6647	309.7	1,046	88	100	0	0	53000	-	-	-	-	-	-
METALS	Selenium	WS	D	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	1	0	0	20	0	0.00	5
METALS	Selenium	WS	T	88	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	1	0	0	20	0	0.00	5
METALS	Silver	WS	D	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	23	100	0.067	23	100	0.374	-	-	-
METALS	Silver	WS	T	88	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	88	100	0.067	88	100	0.374	-	-	-
METALS	Sodium	WS	D	23	ug/l	562.0	23,500	3,824	2,020	5,408	570.4	13,910	23	100	0	0	680000	-	-	-	-	-	-
METALS	Sodium	WS	T	88	ug/l	666.0	36,900	5,318	2,350	8,177	748.05	26,230	88	100	0	0	680000	-	-	-	-	-	-
METALS	Thallium	WS	D	23	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.8	-	-	-	-	-	-
METALS	Thallium	WS	T	88	ug/l	<0.26	0.27	ND	ND	ND	ND	ND	1	1	0	0	0.8	-	-	-	-	-	-
METALS	Vanadium	WS	D	23	ug/l	<1.9	4.3	ND	ND	ND	ND	ND	1	4	0	0	20	-	-	-	-	-	-
METALS	Vanadium	WS	T	88	ug/l	<1.9	18.0	1.3972	ND	1.9544	ND	2.165	15	17	0	0	20	-	-	-	-	-	-
METALS	Zinc	WS	D	23	ug/l	<7	512.0	ND	ND	ND	ND	ND	1	4	1	4	30	1	4	37	1	4.35	103.361
METALS	Zinc	WS	T	88	ug/l	<7	537.0	ND	ND	ND	ND	17.57	11	13	1	1	30	1	1	37	1	1.14	103.361
OC_PEST	4,4'-DDD	WS	N	4	ug/l	<0.005	<0.006	ND	ND	ND	ND	ND	0	0	4	100	0.001	-	-	-	-	-	-
OC_PEST	4,4'-DDE	WS	N	4	ug/l	<0.002	<0.004	ND	ND	ND	ND	ND	0	0	3	75	0.001	-	-	-	-	-	-
OC_PEST	4,4'-DDT	WS	N	4	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	4	100	0.0005	0	0	0.5	4	100.00	0.001
OC_PEST	Aldrin	WS	N	4	ug/l	<0.003	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.004	0	0	1.5	0	0.00	1.5
OC_PEST	alpha-BHC	WS	N	4	ug/l	<0.006	<0.007	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	alpha-Chlordane	WS	N	4	ug/l	<0.002	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0043	-	-	-	0	0.00	0.004
OC_PEST	beta-BHC	WS	N	4	ug/l	<0.004	<0.005	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	delta-BHC	WS	N	4	ug/l	<0.005	<0.006	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	N	4	ug/l	<0.003	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.056	0	0	0.24	0	0.00	0.056
OC_PEST	Endosulfan I	WS	N	4	ug/l	<0.002	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.003	0	0	0.11	0	0.00	0.056
OC_PEST	Endosulfan II	WS	N	4	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.051	0	0	0.11	0	0.00	0.056
OC_PEST	Endosulfan sulfate	WS	N	4	ug/l	<0.005	<0.006	ND	ND	ND	ND	ND	0	0	0	0	0.051	-	-	-	-	-	-
OC_PEST	Endrin	WS	N	4	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0023	0	0	0.086	0	0.00	0.036
OC_PEST	Endrin aldehyde	WS	N	4	ug/l	<0.004	<0.008	ND	ND	ND	ND	ND	0	0	0	0	0.036	-	-	-	-	-	-

Table 25. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	Endrin ketone	WS	N	4	ug/l	<0.004	<0.008	ND	ND	ND	ND	ND	0	0	0	0	0.036	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	N	4	ug/l	<0.004	<0.012	ND	ND	ND	ND	ND	0	0	0	0	0.01	-	-	-	0	0.00	0.95
OC_PEST	gamma-Chlordane	WS	N	4	ug/l	<0.003	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.0043	-	-	-	0	0.00	0.004
OC_PEST	Heptachlor	WS	N	4	ug/l	<0.003	<0.004	ND	ND	ND	ND	ND	0	0	3	75	0.0019	0	0	0.26	0	0.00	0.004
OC_PEST	Heptachlor epoxide	WS	N	4	ug/l	<0.004	<0.005	ND	ND	ND	ND	ND	0	0	4	100	0.0019	0	0	0.26	0	0.00	0.004
OC_PEST	Methoxychlor	WS	N	4	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.019	-	-	-	0	0.00	0.03
OC_PEST	Toxaphene	WS	N	4	ug/l	<0.06	<0.11	ND	ND	ND	ND	ND	0	0	4	100	0.0002	0	0	0.73	4	100.00	0
PCB	Aroclor 1016	WS	N	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	7E-05	-	-	-	4	100.00	0.014
PCB	Aroclor 1221	WS	N	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	7E-05	-	-	-	4	100.00	0.014
PCB	Aroclor 1232	WS	N	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	7E-05	-	-	-	4	100.00	0.014
PCB	Aroclor 1242	WS	N	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	7E-05	-	-	-	4	100.00	0.014
PCB	Aroclor 1248	WS	N	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	7E-05	-	-	-	4	100.00	0.014
PCB	Aroclor 1254	WS	N	4	ug/l	<0.084	<0.099	ND	ND	ND	ND	ND	0	0	4	100	7E-05	-	-	-	4	100.00	0.014
PCB	Aroclor 1260	WS	N	4	ug/l	<0.084	<0.099	ND	ND	ND	ND	ND	0	0	4	100	7E-05	-	-	-	4	100.00	0.014
PCB	Aroclor 1268	WS	N	4	ug/l	<0.084	<0.099	ND	ND	ND	ND	ND	0	0	4	100	0.014	-	-	-	4	100.00	0.014
PCB	Aroclor-1262	WS	N	4	ug/l	<0.084	<0.099	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	N	4	ug/l	<0.098	<0.1	ND	ND	ND	ND	ND	0	0	4	100	7E-05	-	-	-	4	100.00	0.014
SVOC	1,1'-Biphenyl	WS	N	4	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WS	N	4	ug/l	<0.43	<0.47	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	1,4-Dioxane	WS	N	4	ug/l	<3.1	<3.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WS	N	4	ug/l	<0.93	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	N	4	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	0	0	1	-	-	-	-	-	-
SVOC	2,4,5-Trichlorophenol	WS	N	4	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4,6-Trichlorophenol	WS	N	4	ug/l	<0.53	<0.58	ND	ND	ND	ND	ND	0	0	0	0	4.9	-	-	-	-	-	-
SVOC	2,4-Dichlorophenol	WS	N	4	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	11	-	-	-	-	-	-
SVOC	2,4-Dimethylphenol	WS	N	4	ug/l	<0.91	<0.99	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4-Dinitrophenol	WS	N	4	ug/l	<2.4	<2.6	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4-Dinitrotoluene	WS	N	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	44	-	-	-	-	-	-
SVOC	2,6-Dinitrotoluene	WS	N	4	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	-	-	-
SVOC	2-Chloronaphthalene	WS	N	4	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	N	4	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	24	-	-	-	-	-	-
SVOC	2-Methylnaphthalene	WS	N	4	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	4.7	-	-	-	-	-	-
SVOC	2-Methylphenol	WS	N	4	ug/l	<1.3	<1.4	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	N	4	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitrophenol	WS	N	4	ug/l	<0.59	<0.64	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	N	4	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	N	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	4.5	-	-	-	-	-	-
SVOC	3-Nitroaniline	WS	N	4	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 25. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	4,6-Dinitro-2-methylphenol	WS	N	4	ug/l	<2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	N	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.5	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	N	4	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	N	4	ug/l	<0.73	<0.79	ND	ND	ND	ND	ND	0	0	0	0	232	-	-	-	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WS	N	4	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	N	4	ug/l	<0.48	<0.52	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitrophenol	WS	N	4	ug/l	<4.7	<5.1	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	N	4	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	5.8	-	-	-	-	-	-
SVOC	Acenaphthylene	WS	N	4	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	N	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Anthracene	WS	N	4	ug/l	<0.57	<0.62	ND	ND	ND	ND	ND	0	0	4	100	0.012	-	-	-	-	-	-
SVOC	Atrazine	WS	N	4	ug/l	<0.77	<0.84	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
SVOC	Benzaldehyde	WS	N	4	ug/l	<0.86	<0.93	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]anthracene	WS	N	4	ug/l	<0.55	3.0	0.9675	ND	1.355	ND	2.595	1	25	4	100	0.018	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	N	4	ug/l	<0.16	3.9	1.0375	ND	1.9083	ND	3.3278	1	25	4	100	0.014	-	-	-	-	-	-
SVOC	Benzo[b]fluoranthene	WS	N	4	ug/l	<0.44	10.0	2.6725	ND	4.885	ND	8.536	1	25	-	-	-	-	-	-	-	-	-
SVOC	Benzo[g,h,i]perylene	WS	N	4	ug/l	<0.75	3.9	1.27	ND	1.7534	ND	3.3765	1	25	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	N	4	ug/l	<0.18	<0.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WS	N	4	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-chloroethyl)ether	WS	N	4	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WS	N	4	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	Butyl benzyl phthalate	WS	N	4	ug/l	<0.6	<0.65	ND	ND	ND	ND	ND	0	0	0	0	19	-	-	-	-	-	-
SVOC	Caprolactam	WS	N	4	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Carbazole	WS	N	4	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	N	4	ug/l	<0.67	7.6	2.165	ND	3.6234	ND	6.5155	1	25	-	-	-	-	-	-	-	-	-
SVOC	Dibenz(a,h)anthracene	WS	N	4	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Dibenzofuran	WS	N	4	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	0	0	3.7	-	-	-	-	-	-
SVOC	Diethyl phthalate	WS	N	4	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	210	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WS	N	4	ug/l	<0.98	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	N	4	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	0	0	19	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	N	4	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	0	0	22	-	-	-	-	-	-
SVOC	Fluoranthene	WS	N	4	ug/l	<0.72	9.3	2.6075	ND	4.4617	ND	7.9635	1	25	4	100	0.04	-	-	-	-	-	-
SVOC	Fluorene	WS	N	4	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	Hexachlorobenzene	WS	N	4	ug/l	<0.47	<0.51	ND	ND	ND	ND	ND	0	0	4	100	0.0003	-	-	-	-	-	-
SVOC	Hexachlorobutadiene	WS	N	4	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
SVOC	Hexachlorocyclopentadiene	WS	N	4	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Hexachloroethane	WS	N	4	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	0	0	12	-	-	-	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WS	N	4	ug/l	<0.21	3.1	0.86	ND	1.4933	ND	2.653	1	25	-	-	-	-	-	-	-	-	-

Table 25. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Isophorone	WS	N	4	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Naphthalene	WS	N	4	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	-	-	-
SVOC	Nitrobenzene	WS	N	4	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WS	N	4	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	N-Nitrosodiphenylamine	WS	N	4	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	210	-	-	-	-	-	-
SVOC	Pentachlorophenol	WS	N	4	ug/l	<2.2	<2.4	ND	ND	ND	ND	ND	0	0	4	100	0.5	0	0	5.3	0	0.00	4
SVOC	Phenanthrene	WS	N	4	ug/l	<0.65	1.5	0.6325	ND	0.5785	ND	1.329	1	25	1	25	0.4	-	-	-	-	-	-
SVOC	Phenol	WS	N	4	ug/l	<0.41	<0.45	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-
SVOC	Pyrene	WS	N	4	ug/l	<0.83	7.0	2.075	ND	3.2834	ND	6.0175	1	25	4	100	0.025	-	-	-	-	-	-
VOC	1,1,1-Trichloroethane	WS	N	4	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	11	-	-	-	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WS	N	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	610	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	N	4	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloroethane	WS	N	4	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	1200	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	N	4	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	-	-	-
VOC	1,1-Dichloroethene	WS	N	4	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	25	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	N	4	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	8	-	-	-	-	-	-
VOC	1,2,4-Trichlorobenzene	WS	N	4	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	24	-	-	-	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WS	N	4	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,2-Dichlorobenzene	WS	N	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	-	-	-
VOC	1,2-Dichloroethane	WS	N	4	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	1,2-Dichloropropane	WS	N	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,3-Dichlorobenzene	WS	N	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	71	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	N	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	15	-	-	-	-	-	-
VOC	2-Butanone (MEK)	WS	N	4	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	0	0	14000	-	-	-	-	-	-
VOC	2-Hexanone	WS	N	4	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	99	-	-	-	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WS	N	4	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	170	-	-	-	-	-	-
VOC	Acetone	WS	N	4	ug/l	<1.1	12.0	3.4125	ND	5.725	ND	10.2825	1	25	0	0	1500	-	-	-	-	-	-
VOC	Benzene	WS	N	4	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	-	-	-
VOC	Bromoform	WS	N	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	Bromomethane	WS	N	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Carbon disulfide	WS	N	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.92	-	-	-	-	-	-
VOC	Carbon tetrachloride	WS	N	4	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	9.8	-	-	-	-	-	-
VOC	Chlorobenzene	WS	N	4	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
VOC	Chlorobromomethane	WS	N	4	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chlorodibromomethane	WS	N	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroethane	WS	N	4	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroform	WS	N	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	Chloromethane	WS	N	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 25. Round 1 through 4 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	cis-1,2-Dichloroethene	WS	N	4	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	N	4	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	4	100	0.055	-	-	-	-	-	-
VOC	Cyclohexane	WS	N	4	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorobromomethane	WS	N	4	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorodifluoromethane	WS	N	4	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Ethylbenzene	WS	N	4	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	7.3	-	-	-	-	-	-
VOC	Ethylene Dibromide	WS	N	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	N	4	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	2.6	-	-	-	-	-	-
VOC	Methyl acetate	WS	N	4	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl tert-butyl ether	WS	N	4	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	-	-	-
VOC	Methylcyclohexane	WS	N	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	N	4	ug/l	<0.21	0.9	0.3975	0.29	0.3755	ND	0.8355	2	50	0	0	98.1	-	-	-	-	-	-
VOC	m-Xylene & p-Xylene	WS	N	4	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	o-Xylene	WS	N	4	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
VOC	Styrene	WS	N	4	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	72	-	-	-	-	-	-
VOC	Tetrachloroethene	WS	N	4	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	98	-	-	-	-	-	-
VOC	Toluene	WS	N	4	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	trans-1,2-Dichloroethene	WS	N	4	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	N	4	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	4	100	0.055	-	-	-	-	-	-
VOC	Trichloroethene	WS	N	4	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	21	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	N	4	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Vinyl chloride	WS	N	4	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	0	0	930	-	-	-	-	-	-

Table 26. Round 1 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	22	ug/l	83,900	264,000	148,432	158,000	49,696	85,900	252,150	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	22	ug/l	<23	178.0	36.7864	ND	33.9923	ND	52.795	4	18	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	22	ug/l	335.0	3,060	1,621	1,745	926.6271	342.3	2,905	22	100	0	0	120000	-	-	-	-	-	-
GENCHEM	Fluoride	WS	T	22	ug/l	33.5	2,570	331.0273	57.5	730.3816	33.9	2,451	22	100	8	36	120	-	-	-	-	-	-
GENCHEM	Hardness as calcium carbonate	WS	T	22	ug/l	84,000	222,000	148,909	164,000	43,353	86,000	216,100	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	22	ug/l	<100	1,680	235.3182	ND	476.182	ND	1,479	5	23	-	-	-	-	-	-	-	-	-
GENCHEM	Orthophosphate as P	WS	T	12	ug/l	<42	<42	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	22	ug/l	1,900	18,100	4,824	3,510	4,460	1,910	17,282	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	22	mg/l	91.0	315.0	163.7273	169.5	59.9247	95.0	306.05	22	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	22	mg/l	<1	413.0	33.1682	1.6	101.262	ND	249.48	17	77	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	T	22	ug/l	<13.5	937.0	103.0523	33.55	214.7063	15.375	503.05	21	95	4	18	87	1	5	750	4	18	87
METALS	Antimony	WS	T	22	ug/l	<0.62	<0.76	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	-	-	-
METALS	Arsenic	WS	T	22	ug/l	<0.64	1.2	0.4836	ND	0.2671	ND	0.9465	6	27	0	0	3.1	0	0	340	0	0	150
METALS	Barium	WS	T	22	ug/l	78.0	305.0	136.1727	103.5	68.1377	78.62	267.85	22	100	22	100	4	-	-	-	-	-	-
METALS	Beryllium	WS	T	22	ug/l	<0.24	<0.29	ND	ND	ND	ND	ND	0	0	0	0	0.66	-	-	-	-	-	-
METALS	Cadmium	WS	T	22	ug/l	<0.71	<0.72	ND	ND	ND	ND	ND	0	0	22	100	0.09	0	0	0.52	22	100	0.238
METALS	Calcium	WS	T	22	ug/l	23,100	60,700	41,350	46,000	11,981	23,200	59,715	22	100	0	0	116000	-	-	-	-	-	-
METALS	Chromium	WS	T	22	ug/l	<1.3	3.9	ND	ND	ND	ND	1.7475	2	9	0	0	64.3	-	-	-	0	0	74.7
METALS	Cobalt	WS	T	22	ug/l	<1.3	1.3	ND	ND	ND	ND	ND	1	5	0	0	5.1	-	-	-	-	-	-
METALS	Copper	WS	T	22	ug/l	<1.4	5.4	1.6045	ND	1.2838	ND	4.06	10	45	22	100	0.23	2	9	3.79	0	0	8.038
METALS	Cyanide, Total	WS	T	22	ug/l	<2	213.0	21.9909	ND	61.3262	ND	199.49	6	27	4	18	5	2	9	22	4	18	5.2
METALS	Iron	WS	T	22	ug/l	<42.4	827.0	103.2591	ND	178.932	ND	299.7	10	45	3	14	158	-	-	-	0	0	1000
METALS	Lead	WS	T	22	ug/l	<0.38	0.48	ND	ND	ND	ND	0.4005	2	9	0	0	0.54	0	0	13.98	0	0	2.548
METALS	Magnesium	WS	T	22	ug/l	6,010	18,200	11,411	10,900	3,912	6,031	17,720	22	100	0	0	82000	-	-	-	-	-	-
METALS	Manganese	WS	T	22	ug/l	<2.5	57.1	9.35	6.0	12.1998	ND	21.6	15	68	0	0	120	-	-	-	-	-	-
METALS	Mercury	WS	T	22	ug/l	<0.14	<0.17	ND	ND	ND	ND	ND	0	0	22	100	0.026	0	0	1.7	0	0	0.91
METALS	Nickel	WS	T	22	ug/l	<1.4	<1.6	ND	ND	ND	ND	ND	0	0	0	0	5	0	0	145	0	0	45.009
METALS	Potassium	WS	T	22	ug/l	306.0	1,120	559.4545	532.5	244.1474	311.3	1,015	22	100	0	0	53000	-	-	-	-	-	-
METALS	Selenium	WS	T	22	ug/l	<0.73	<0.79	ND	ND	ND	ND	ND	0	0	0	0	1	0	0	20	0	0	5
METALS	Silver	WS	T	22	ug/l	<1.3	<1.5	ND	ND	ND	ND	ND	0	0	22	100	0.067	22	100	0.374	-	-	-
METALS	Sodium	WS	T	22	ug/l	951.0	36,900	6,065	2,605	10,070	961.6	34,925	22	100	0	0	680000	-	-	-	-	-	-
METALS	Thallium	WS	T	22	ug/l	<0.26	<0.31	ND	ND	ND	ND	ND	0	0	0	0	0.8	-	-	-	-	-	-
METALS	Vanadium	WS	T	22	ug/l	<1.9	2.2	1.4727	ND	0.5885	ND	2.195	10	45	0	0	20	-	-	-	-	-	-
METALS	Zinc	WS	T	22	ug/l	<6.5	19.9	ND	ND	ND	ND	15.755	2	9	0	0	30	0	0	37	0	0	103.361
OC_PEST	4,4'-DDD	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	3	100	0.001	-	-	-	-	-	-
OC_PEST	4,4'-DDE	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.001	-	-	-	-	-	-
OC_PEST	4,4'-DDT	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.0005	0	0	0.5	3	100	0.001
OC_PEST	Aldrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.004	0	0	1.5	0	0	1.5

Table 26. Round 1 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	alpha-BHC	WS	T	3	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	alpha-Chlordane	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0043	-	-	-	0	0	0.004
OC_PEST	beta-BHC	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	delta-BHC	WS	T	3	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.056	0	0	0.24	0	0	0.056
OC_PEST	Endosulfan I	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.003	0	0	0.11	0	0	0.056
OC_PEST	Endosulfan II	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.051	0	0	0.11	0	0	0.056
OC_PEST	Endosulfan sulfate	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.051	-	-	-	-	-	-
OC_PEST	Endrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0023	0	0	0.086	0	0	0.036
OC_PEST	Endrin aldehyde	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.036	-	-	-	-	-	-
OC_PEST	Endrin ketone	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.036	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.01	-	-	-	0	0	0.95
OC_PEST	gamma-Chlordane	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.0043	-	-	-	0	0	0.004
OC_PEST	Heptachlor	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.0019	0	0	0.26	0	0	0.004
OC_PEST	Heptachlor epoxide	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.0019	0	0	0.26	0	0	0.004
OC_PEST	Methoxychlor	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.019	-	-	-	0	0	0.03
OC_PEST	Toxaphene	WS	T	3	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	3	100	0.0002	0	0	0.73	3	100	0
PCB	Aroclor 1016	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1221	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1232	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1242	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1248	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1254	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1260	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1268	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	0.014	-	-	-	3	100	0.014
PCB	Aroclor-1262	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
SVOC	1,1'-Biphenyl	WS	T	3	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WS	T	3	ug/l	<0.43	<0.47	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	1,4-Dioxane	WS	T	3	ug/l	<3.1	<3.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WS	T	3	ug/l	<0.93	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	0	0	1	-	-	-	-	-	-
SVOC	2,4,5-Trichlorophenol	WS	T	3	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4,6-Trichlorophenol	WS	T	3	ug/l	<0.53	<0.58	ND	ND	ND	ND	ND	0	0	0	0	4.9	-	-	-	-	-	-
SVOC	2,4-Dichlorophenol	WS	T	3	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	11	-	-	-	-	-	-
SVOC	2,4-Dimethylphenol	WS	T	3	ug/l	<0.91	<0.99	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4-Dinitrophenol	WS	T	3	ug/l	<2.4	<2.6	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4-Dinitrotoluene	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	44	-	-	-	-	-	-

Table 26. Round 1 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,6-Dinitrotoluene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	-	-	-
SVOC	2-Chloronaphthalene	WS	T	3	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	T	3	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	24	-	-	-	-	-	-
SVOC	2-Methylnaphthalene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	4.7	-	-	-	-	-	-
SVOC	2-Methylphenol	WS	T	3	ug/l	<1.3	<1.4	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitrophenol	WS	T	3	ug/l	<0.59	<0.64	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	4.5	-	-	-	-	-	-
SVOC	3-Nitroaniline	WS	T	3	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WS	T	3	ug/l	<2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.5	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	T	3	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	T	3	ug/l	<0.73	<0.79	ND	ND	ND	ND	ND	0	0	0	0	232	-	-	-	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WS	T	3	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	T	3	ug/l	<0.48	<0.52	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitrophenol	WS	T	3	ug/l	<4.7	<5.1	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	5.8	-	-	-	-	-	-
SVOC	Acenaphthylene	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Anthracene	WS	T	3	ug/l	<0.57	<0.62	ND	ND	ND	ND	ND	0	0	3	100	0.012	-	-	-	-	-	-
SVOC	Atrazine	WS	T	3	ug/l	<0.77	<0.84	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
SVOC	Benzaldehyde	WS	T	3	ug/l	<0.86	<0.93	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]anthracene	WS	T	3	ug/l	<0.55	<0.6	ND	ND	ND	ND	ND	0	0	3	100	0.018	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	T	3	ug/l	<0.16	<0.17	ND	ND	ND	ND	ND	0	0	3	100	0.014	-	-	-	-	-	-
SVOC	Benzo[b]fluoranthene	WS	T	3	ug/l	<0.44	<0.48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[g,h,i]perylene	WS	T	3	ug/l	<0.75	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	T	3	ug/l	<0.18	<0.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-chloroethyl)ether	WS	T	3	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WS	T	3	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	Butyl benzyl phthalate	WS	T	3	ug/l	<0.6	<0.65	ND	ND	ND	ND	ND	0	0	0	0	19	-	-	-	-	-	-
SVOC	Caprolactam	WS	T	3	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Carbazole	WS	T	3	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	T	3	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Dibenz(a,h)anthracene	WS	T	3	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Dibenzofuran	WS	T	3	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	0	0	3.7	-	-	-	-	-	-
SVOC	Diethyl phthalate	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	210	-	-	-	-	-	-

Table 26. Round 1 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Dimethyl phthalate	WS	T	3	ug/l	<0.98	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	T	3	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	0	0	19	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	0	0	22	-	-	-	-	-	-
SVOC	Fluoranthene	WS	T	3	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	3	100	0.04	-	-	-	-	-	-
SVOC	Fluorene	WS	T	3	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	Hexachlorobenzene	WS	T	3	ug/l	<0.47	<0.51	ND	ND	ND	ND	ND	0	0	3	100	0.0003	-	-	-	-	-	-
SVOC	Hexachlorobutadiene	WS	T	3	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
SVOC	Hexachlorocyclopentadiene	WS	T	3	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Hexachloroethane	WS	T	3	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	0	0	12	-	-	-	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WS	T	3	ug/l	<0.21	<0.23	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Isophorone	WS	T	3	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Naphthalene	WS	T	3	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	-	-	-
SVOC	Nitrobenzene	WS	T	3	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WS	T	3	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	N-Nitrosodiphenylamine	WS	T	3	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	210	-	-	-	-	-	-
SVOC	Pentachlorophenol	WS	T	3	ug/l	<2.2	<2.4	ND	ND	ND	ND	ND	0	0	3	100	0.5	0	0	5.3	0	0	4
SVOC	Phenanthrene	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	0	0	0.4	-	-	-	-	-	-
SVOC	Phenol	WS	T	3	ug/l	<0.41	<0.45	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-
SVOC	Pyrene	WS	T	3	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	3	100	0.025	-	-	-	-	-	-
VOC	1,1,1-Trichloroethane	WS	T	3	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	11	-	-	-	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	610	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	T	3	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloroethane	WS	T	3	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	1200	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	T	3	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	-	-	-
VOC	1,1-Dichloroethene	WS	T	3	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	25	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	T	3	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	8	-	-	-	-	-	-
VOC	1,2,4-Trichlorobenzene	WS	T	3	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	24	-	-	-	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WS	T	3	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,2-Dichlorobenzene	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	-	-	-
VOC	1,2-Dichloroethane	WS	T	3	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	1,2-Dichloropropane	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,3-Dichlorobenzene	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	71	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	15	-	-	-	-	-	-
VOC	2-Butanone (MEK)	WS	T	3	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	0	0	14000	-	-	-	-	-	-
VOC	2-Hexanone	WS	T	3	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	99	-	-	-	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WS	T	3	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	170	-	-	-	-	-	-
VOC	Acetone	WS	T	3	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	-	-	-
VOC	Benzene	WS	T	3	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	-	-	-

Table 26. Round 1 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Bromoform	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	Bromomethane	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Carbon disulfide	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.92	-	-	-	-	-	-
VOC	Carbon tetrachloride	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	9.8	-	-	-	-	-	-
VOC	Chlorobenzene	WS	T	3	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
VOC	Chlorobromomethane	WS	T	3	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chlorodibromomethane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroethane	WS	T	3	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroform	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	Chloromethane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	cis-1,2-Dichloroethene	WS	T	3	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	3	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	3	100	0.055	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	3	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorobromomethane	WS	T	3	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorodifluoromethane	WS	T	3	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Ethylbenzene	WS	T	3	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	7.3	-	-	-	-	-	-
VOC	Ethylene Dibromide	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	3	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	2.6	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	3	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl tert-butyl ether	WS	T	3	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	-	-	-
VOC	Methylcyclohexane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	3	ug/l	<0.21	0.9	0.4933	0.47	0.3955	ND	0.857	2	67	0	0	98.1	-	-	-	-	-	-
VOC	m-Xylene & p-Xylene	WS	T	3	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	o-Xylene	WS	T	3	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
VOC	Styrene	WS	T	3	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	72	-	-	-	-	-	-
VOC	Tetrachloroethene	WS	T	3	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	98	-	-	-	-	-	-
VOC	Toluene	WS	T	3	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	trans-1,2-Dichloroethene	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	3	100	0.055	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	21	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	3	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Vinyl chloride	WS	T	3	ug/l	<0.06	<0.06	0.03	0.03	0.00E+00	0.03	0.03	0	0	0	0	930	-	-	-	-	-	-
VOC	Chlorobenzene	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
VOC	Chlorobromomethane	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chlorodibromomethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroethane	WS	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroform	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	Chloromethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 26. Round 1 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	cis-1,2-Dichloroethene	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	1	100	0.055	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorobromomethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorodifluoromethane	WS	T	1	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Ethylbenzene	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	7.3	-	-	-	-	-	-
VOC	Ethylene Dibromide	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	2.6	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl tert-butyl ether	WS	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	-	-	-
VOC	Methylcyclohexane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	98.1	-	-	-	-	-	-
VOC	m-Xylene & p-Xylene	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	o-Xylene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
VOC	Styrene	WS	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	72	-	-	-	-	-	-
VOC	Tetrachloroethene	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	98	-	-	-	-	-	-
VOC	Toluene	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	trans-1,2-Dichloroethene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	1	100	0.055	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	21	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Vinyl chloride	WS	T	1	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	0	0	930	-	-	-	-	-	-

Table 27. Round 2 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Summary Data Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	19	ug/l	86,900	269,000	159,126	183,000	59,594	87,440	232,100	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	19	ug/l	<72	<72	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	19	ug/l	351.0	2,910	1,378	1,580	741.2583	359.1	2,370	19	100	0	0	120000	-	-	-	-	-	-
GENCHEM	Fluoride	WS	T	19	ug/l	106.0	2,100	465.1579	189.0	579.427	106.0	1,839	19	100	11	58	120	-	-	-	-	-	-
GENCHEM	Hardness as calcium carbonate	WS	T	19	ug/l	90,000	304,000	178,211	196,000	67,800	90,000	264,400	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	19	ug/l	<100	1,620	219.9474	ND	450.4951	ND	1,368	4	21	-	-	-	-	-	-	-	-	-
GENCHEM	Orthophosphate as P	WS	T	19	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	19	ug/l	2,190	73,100	9,515	4,010	16,205	2,226	23,870	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	19	mg/l	69.0	309.0	172.0526	174.0	75.2392	79.8	286.5	19	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	19	mg/l	<1	153.0	26.0789	1.9	48.0043	ND	117.0	11	58	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	T	19	ug/l	<18.2	5,750	485.9105	44.4	1,332	ND	2,024	17	89	6	32	87	2	11	750	6	31.58	87
METALS	Antimony	WS	T	19	ug/l	<0.62	<0.62	ND	ND	ND	ND	ND	0	0	0	0	30	-	-	-	-	-	-
METALS	Arsenic	WS	T	19	ug/l	<0.64	3.7	ND	ND	ND	ND	1.99	2	11	1	5	3.1	0	0	340	0	0.00	150
METALS	Barium	WS	T	19	ug/l	99.7	424.0	149.4579	118.0	78.5644	100.87	244.9	19	100	19	100	4	-	-	-	-	-	-
METALS	Beryllium	WS	T	19	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	0.66	-	-	-	-	-	-
METALS	Cadmium	WS	T	19	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	19	100	0.09	0	0	0.52	19	100.00	0.238
METALS	Calcium	WS	T	19	ug/l	24,300	82,100	46,858	52,400	19,264	24,480	77,510	19	100	0	0	116000	-	-	-	-	-	-
METALS	Chromium	WS	T	19	ug/l	<1.3	3.4	ND	ND	ND	ND	1.6	2	11	0	0	64.3	-	-	-	0	0.00	74.7
METALS	Cobalt	WS	T	19	ug/l	<1.3	2.4	0.8474	ND	0.5037	ND	2.04	3	16	0	0	5.1	-	-	-	-	-	-
METALS	Copper	WS	T	19	ug/l	<1.4	9.8	2.0105	ND	2.564	ND	6.56	6	32	19	100	0.23	4	21	3.79	1	5.26	8.038
METALS	Cyanide, Total	WS	T	19	ug/l	<2	192.0	24.2895	ND	57.3862	ND	179.4	6	32	6	32	5	3	16	22	6	31.58	5.2
METALS	Iron	WS	T	19	ug/l	<42.4	4,760	512.3789	ND	1,220	ND	3,095	8	42	7	37	158	-	-	-	2	10.53	1000
METALS	Lead	WS	T	19	ug/l	<0.38	4.5	0.7774	ND	1.1975	ND	3.06	5	26	5	26	0.54	0	0	13.98	2	10.53	2.548
METALS	Magnesium	WS	T	19	ug/l	6,750	19,500	12,256	13,600	4,416	6,750	18,060	19	100	0	0	82000	-	-	-	-	-	-
METALS	Manganese	WS	T	19	ug/l	<2.5	3,750	223.2947	5.5	855.7305	ND	565.8	14	74	3	16	120	-	-	-	-	-	-
METALS	Mercury	WS	T	19	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	19	100	0.026	0	0	1.7	0	0.00	0.91
METALS	Nickel	WS	T	19	ug/l	<1.4	3.9	1.0	ND	0.8131	ND	2.46	3	16	0	0	5	0	0	145	0	0.00	45.009
METALS	Potassium	WS	T	19	ug/l	309.0	1,250	575.6842	484.0	272.9974	312.6	1,079	19	100	0	0	53000	-	-	-	-	-	-
METALS	Selenium	WS	T	19	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	1	0	0	20	0	0.00	5
METALS	Silver	WS	T	19	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	19	100	0.067	19	100	0.374	-	-	-
METALS	Sodium	WS	T	19	ug/l	1,040	35,600	7,591	2,630	10,767	1,058	31,460	19	100	0	0	680000	-	-	-	-	-	-
METALS	Thallium	WS	T	19	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.8	-	-	-	-	-	-
METALS	Vanadium	WS	T	19	ug/l	<1.9	3.9	ND	ND	ND	ND	2.1	2	11	0	0	20	-	-	-	-	-	-
METALS	Zinc	WS	T	19	ug/l	<7	19.2	5.9105	3.5	5.722	3.5	18.93	3	16	0	0	30	0	0	37	0	0.00	103.361
OC_PEST	4,4'-DDD	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	3	100	0.001	-	-	-	-	-	-
OC_PEST	4,4'-DDE	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.001	-	-	-	-	-	-
OC_PEST	4,4'-DDT	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.0005	0	0	0.5	3	100	0.001
OC_PEST	Aldrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.004	0	0	1.5	0	0	1.5

Table 27. Round 2 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Summary Data Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	alpha-BHC	WS	T	3	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	alpha-Chlordane	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0043	-	-	-	0	0	0.004
OC_PEST	beta-BHC	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	delta-BHC	WS	T	3	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.056	0	0	0.24	0	0	0.056
OC_PEST	Endosulfan I	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.003	0	0	0.11	0	0	0.056
OC_PEST	Endosulfan II	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.051	0	0	0.11	0	0	0.056
OC_PEST	Endosulfan sulfate	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.051	-	-	-	-	-	-
OC_PEST	Endrin	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0023	0	0	0.086	0	0	0.036
OC_PEST	Endrin aldehyde	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.036	-	-	-	-	-	-
OC_PEST	Endrin ketone	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.036	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.01	-	-	-	0	0	0.95
OC_PEST	gamma-Chlordane	WS	T	3	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	0.0043	-	-	-	0	0	0.004
OC_PEST	Heptachlor	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.0019	0	0	0.26	0	0	0.004
OC_PEST	Heptachlor epoxide	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	3	100	0.0019	0	0	0.26	0	0	0.004
OC_PEST	Methoxychlor	WS	T	3	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.019	-	-	-	0	0	0.03
OC_PEST	Toxaphene	WS	T	3	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	3	100	0.0002	0	0	0.73	3	100	0
PCB	Aroclor 1016	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1221	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1232	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1242	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1248	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1254	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1260	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
PCB	Aroclor 1268	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	3	100	0.014	-	-	-	3	100	0.014
PCB	Aroclor-1262	WS	T	3	ug/l	<0.084	<0.084	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	T	3	ug/l	<0.098	<0.098	ND	ND	ND	ND	ND	0	0	3	100	7E-05	-	-	-	3	100	0.014
SVOC	1,1'-Biphenyl	WS	T	3	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WS	T	3	ug/l	<0.43	<0.47	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	1,4-Dioxane	WS	T	3	ug/l	<3.1	<3.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WS	T	3	ug/l	<0.93	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	0	0	1	-	-	-	-	-	-
SVOC	2,4,5-Trichlorophenol	WS	T	3	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4,6-Trichlorophenol	WS	T	3	ug/l	<0.53	<0.58	ND	ND	ND	ND	ND	0	0	0	0	4.9	-	-	-	-	-	-
SVOC	2,4-Dichlorophenol	WS	T	3	ug/l	<0.63	<0.68	ND	ND	ND	ND	ND	0	0	0	0	11	-	-	-	-	-	-
SVOC	2,4-Dimethylphenol	WS	T	3	ug/l	<0.91	<0.99	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4-Dinitrophenol	WS	T	3	ug/l	<2.4	<2.6	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4-Dinitrotoluene	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	44	-	-	-	-	-	-

Table 27. Round 2 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Summary Data Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	2,6-Dinitrotoluene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	-	-	-
SVOC	2-Chloronaphthalene	WS	T	3	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	T	3	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	24	-	-	-	-	-	-
SVOC	2-Methylnaphthalene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	4.7	-	-	-	-	-	-
SVOC	2-Methylphenol	WS	T	3	ug/l	<1.3	<1.4	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitrophenol	WS	T	3	ug/l	<0.59	<0.64	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	4.5	-	-	-	-	-	-
SVOC	3-Nitroaniline	WS	T	3	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4,6-Dinitro-2-methylphenol	WS	T	3	ug/l	<2	<2.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1.5	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	T	3	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	T	3	ug/l	<0.73	<0.79	ND	ND	ND	ND	ND	0	0	0	0	232	-	-	-	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WS	T	3	ug/l	<0.96	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	T	3	ug/l	<0.48	<0.52	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitrophenol	WS	T	3	ug/l	<4.7	<5.1	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	T	3	ug/l	<0.88	<0.96	ND	ND	ND	ND	ND	0	0	0	0	5.8	-	-	-	-	-	-
SVOC	Acenaphthylene	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Anthracene	WS	T	3	ug/l	<0.57	<0.62	ND	ND	ND	ND	ND	0	0	3	100	0.012	-	-	-	-	-	-
SVOC	Atrazine	WS	T	3	ug/l	<0.77	<0.84	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
SVOC	Benzaldehyde	WS	T	3	ug/l	<0.86	<0.93	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]anthracene	WS	T	3	ug/l	<0.55	<0.6	ND	ND	ND	ND	ND	0	0	3	100	0.018	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	T	3	ug/l	<0.16	<0.17	ND	ND	ND	ND	ND	0	0	3	100	0.014	-	-	-	-	-	-
SVOC	Benzo[b]fluoranthene	WS	T	3	ug/l	<0.44	<0.48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[g,h,i]perylene	WS	T	3	ug/l	<0.75	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	T	3	ug/l	<0.18	<0.2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-chloroethyl)ether	WS	T	3	ug/l	<0.12	<0.13	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WS	T	3	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	Butyl benzyl phthalate	WS	T	3	ug/l	<0.6	<0.65	ND	ND	ND	ND	ND	0	0	0	0	19	-	-	-	-	-	-
SVOC	Caprolactam	WS	T	3	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Carbazole	WS	T	3	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	T	3	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Dibenz(a,h)anthracene	WS	T	3	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Dibenzofuran	WS	T	3	ug/l	<0.85	<0.92	ND	ND	ND	ND	ND	0	0	0	0	3.7	-	-	-	-	-	-
SVOC	Diethyl phthalate	WS	T	3	ug/l	<1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	210	-	-	-	-	-	-

Table 27. Round 2 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Summary Data Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Dimethyl phthalate	WS	T	3	ug/l	<0.98	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	T	3	ug/l	<0.82	<0.89	ND	ND	ND	ND	ND	0	0	0	0	19	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	T	3	ug/l	<0.69	<0.75	ND	ND	ND	ND	ND	0	0	0	0	22	-	-	-	-	-	-
SVOC	Fluoranthene	WS	T	3	ug/l	<0.72	<0.78	ND	ND	ND	ND	ND	0	0	3	100	0.04	-	-	-	-	-	-
SVOC	Fluorene	WS	T	3	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	Hexachlorobenzene	WS	T	3	ug/l	<0.47	<0.51	ND	ND	ND	ND	ND	0	0	3	100	0.0003	-	-	-	-	-	-
SVOC	Hexachlorobutadiene	WS	T	3	ug/l	<0.76	<0.83	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
SVOC	Hexachlorocyclopentadiene	WS	T	3	ug/l	<0.61	<0.66	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Hexachloroethane	WS	T	3	ug/l	<0.09	<0.098	ND	ND	ND	ND	ND	0	0	0	0	12	-	-	-	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WS	T	3	ug/l	<0.21	<0.23	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Isophorone	WS	T	3	ug/l	<0.67	<0.73	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Naphthalene	WS	T	3	ug/l	<0.8	<0.87	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	-	-	-
SVOC	Nitrobenzene	WS	T	3	ug/l	<0.49	<0.53	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WS	T	3	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	N-Nitrosodiphenylamine	WS	T	3	ug/l	<0.74	<0.8	ND	ND	ND	ND	ND	0	0	0	0	210	-	-	-	-	-	-
SVOC	Pentachlorophenol	WS	T	3	ug/l	<2.2	<2.4	ND	ND	ND	ND	ND	0	0	3	100	0.5	0	0	5.3	0	0	4
SVOC	Phenanthrene	WS	T	3	ug/l	<0.65	<0.71	ND	ND	ND	ND	ND	0	0	0	0	0.4	-	-	-	-	-	-
SVOC	Phenol	WS	T	3	ug/l	<0.41	<0.45	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-
SVOC	Pyrene	WS	T	3	ug/l	<0.83	<0.9	ND	ND	ND	ND	ND	0	0	3	100	0.025	-	-	-	-	-	-
VOC	1,1,1-Trichloroethane	WS	T	3	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	11	-	-	-	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	610	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	T	3	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloroethane	WS	T	3	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	1200	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	T	3	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	-	-	-
VOC	1,1-Dichloroethene	WS	T	3	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	25	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	T	3	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	8	-	-	-	-	-	-
VOC	1,2,4-Trichlorobenzene	WS	T	3	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	24	-	-	-	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WS	T	3	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,2-Dichlorobenzene	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	-	-	-
VOC	1,2-Dichloroethane	WS	T	3	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	1,2-Dichloropropane	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,3-Dichlorobenzene	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	71	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	15	-	-	-	-	-	-
VOC	2-Butanone (MEK)	WS	T	3	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	0	0	14000	-	-	-	-	-	-
VOC	2-Hexanone	WS	T	3	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	99	-	-	-	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WS	T	3	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	170	-	-	-	-	-	-
VOC	Acetone	WS	T	3	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	0	0	1500	-	-	-	-	-	-
VOC	Benzene	WS	T	3	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	-	-	-

Table 27. Round 2 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Summary Data Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	Bromoform	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	Bromomethane	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Carbon disulfide	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.92	-	-	-	-	-	-
VOC	Carbon tetrachloride	WS	T	3	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	9.8	-	-	-	-	-	-
VOC	Chlorobenzene	WS	T	3	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
VOC	Chlorobromomethane	WS	T	3	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chlorodibromomethane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroethane	WS	T	3	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroform	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	Chloromethane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	cis-1,2-Dichloroethene	WS	T	3	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	3	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	3	100	0.055	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	3	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorobromomethane	WS	T	3	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorodifluoromethane	WS	T	3	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Ethylbenzene	WS	T	3	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	7.3	-	-	-	-	-	-
VOC	Ethylene Dibromide	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	3	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	2.6	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	3	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl tert-butyl ether	WS	T	3	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	-	-	-
VOC	Methylcyclohexane	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	3	ug/l	<0.21	0.9	0.4933	0.47	0.3955	ND	0.857	2	67	0	0	98.1	-	-	-	-	-	-
VOC	m-Xylene & p-Xylene	WS	T	3	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	o-Xylene	WS	T	3	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
VOC	Styrene	WS	T	3	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	72	-	-	-	-	-	-
VOC	Tetrachloroethene	WS	T	3	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	98	-	-	-	-	-	-
VOC	Toluene	WS	T	3	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	trans-1,2-Dichloroethene	WS	T	3	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	3	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	3	100	0.055	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	3	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	21	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	3	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Vinyl chloride	WS	T	3	ug/l	<0.06	<0.06	0.03	0.03	0.00E+00	0.03	0.03	0	0	0	0	930	-	-	-	-	-	-
VOC	Chlorobenzene	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
VOC	Chlorobromomethane	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chlorodibromomethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroethane	WS	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroform	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	Chloromethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 27. Round 2 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Summary Data Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	cis-1,2-Dichloroethene	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	1	100	0.055	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorobromomethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorodifluoromethane	WS	T	1	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Ethylbenzene	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	7.3	-	-	-	-	-	-
VOC	Ethylene Dibromide	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	2.6	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl tert-butyl ether	WS	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	-	-	-
VOC	Methylcyclohexane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	98.1	-	-	-	-	-	-
VOC	m-Xylene & p-Xylene	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	o-Xylene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
VOC	Styrene	WS	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	72	-	-	-	-	-	-
VOC	Tetrachloroethene	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	98	-	-	-	-	-	-
VOC	Toluene	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	trans-1,2-Dichloroethene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	1	100	0.055	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	21	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Vinyl chloride	WS	T	1	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	0	0	930	-	-	-	-	-	-

Table 28. Round 3 Surface Water Analytical Results Statistical Summary – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	24	ug/l	79,600	217,000	149,379	169,500	49,622	81,340	207,850	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	24	ug/l	<72	86.0	ND	ND	ND	ND	75.44	2	8	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	24	ug/l	320.0	3,100	1,556	1,525	967.1837	370.15	3,044	24	100	0	0	120000	-	-	-	-	-	-
GENCHEM	Fluoride	WS	T	24	ug/l	84.2	2,600	373.9875	130.5	629.4292	87.095	1,896	24	100	16	67	120	-	-	-	-	-	-
GENCHEM	Hardness as calcium carbonate	WS	T	24	ug/l	82,000	224,000	147,500	163,000	49,267	84,000	204,000	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	24	ug/l	<100	273.0	136.0833	125.5	70.9972	ND	253.5	18	75	-	-	-	-	-	-	-	-	-
GENCHEM	Orthophosphate as P	WS	T	17	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	24	ug/l	2,160	78,900	7,496	3,995	15,365	2,233	12,180	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	24	mg/l	82.0	296.0	152.875	164.0	55.4376	85.3	230.65	24	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	24	mg/l	<1	82.8	14.6125	6.15	22.5906	ND	74.395	20	83	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	T	24	ug/l	<18.2	1,540	275.0375	106.0	435.2826	ND	1,360	20	83	13	54	87	3	13	750	13	54.17	87
METALS	Antimony	WS	T	24	ug/l	<0.62	0.78	0.4183	ND	0.1748	ND	0.7295	7	29	0	0	30	-	-	-	-	-	-
METALS	Arsenic	WS	T	24	ug/l	<0.64	2.2	ND	ND	ND	ND	0.874	3	13	0	0	3.1	0	0	340	0	0.00	150
METALS	Barium	WS	T	24	ug/l	63.4	244.0	117.0958	100.65	57.1348	70.545	238.7	24	100	24	100	4	-	-	-	-	-	-
METALS	Beryllium	WS	T	24	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	0.66	-	-	-	-	-	-
METALS	Cadmium	WS	T	24	ug/l	<0.71	<0.71	ND	ND	ND	ND	ND	0	0	24	100	0.09	0	0	0.52	24	100.00	0.238
METALS	Calcium	WS	T	24	ug/l	21,700	63,300	39,533	44,100	13,436	22,180	55,770	24	100	0	0	116000	-	-	-	-	-	-
METALS	Chromium	WS	T	24	ug/l	<1.3	37.7	2.8563	ND	7.6379	ND	8.21	7	29	0	0	64.3	-	-	-	0	0.00	74.7
METALS	Cobalt	WS	T	24	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	5.1	-	-	-	-	-	-
METALS	Copper	WS	T	24	ug/l	<1.4	3.8	1.2	ND	0.9089	ND	3.235	7	29	24	100	0.23	1	4	3.79	0	0.00	8.038
METALS	Cyanide, Free	WS	T	7	ug/l	<1.5	8.0	3.7714	1	3.8437	0.75	8.7	3	43	3	43	5	0	0	22	3	42.86	5.2
METALS	Cyanide, Total	WS	T	24	ug/l	<2	24.7	3.8167	ND	6.5206	ND	19.8	5	21	5	21	5	1	4	22	5	20.83	5.2
METALS	Iron	WS	T	24	ug/l	<42.4	1,640	296.4083	105.5	461.6047	ND	1,490	17	71	8	33	158	-	-	-	2	8.33	1000
METALS	Lead	WS	T	24	ug/l	<0.38	1.2	0.3313	ND	0.2989	ND	1.1145	6	25	4	17	0.54	0	0	13.98	0	0.00	2.548
METALS	Magnesium	WS	T	24	ug/l	6,060	14,000	9,794	10,350	3,076	6,162	13,900	24	100	0	0	82000	-	-	-	-	-	-
METALS	Manganese	WS	T	24	ug/l	<2.5	52.0	11.9292	5.65	14.3909	ND	47.955	21	88	0	0	120	-	-	-	-	-	-
METALS	Mercury	WS	T	24	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	24	100	0.026	0	0	1.7	0	0.00	0.91
METALS	Nickel	WS	T	24	ug/l	<1.4	1.9	ND	ND	ND	ND	1.295	2	8	0	0	5	0	0	145	0	0.00	45.009
METALS	Potassium	WS	T	24	ug/l	367.0	1,100	564.875	532.5	165.2953	369.5	770.95	24	100	0	0	53000	-	-	-	-	-	-
METALS	Selenium	WS	T	24	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	1	0	0	20	0	0.00	5
METALS	Silver	WS	T	24	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	24	100	0.067	24	100	0.374	-	-	-
METALS	Sodium	WS	T	24	ug/l	1,010	26,300	3,808	2,425	5,042	1,030	5,493	24	100	0	0	680000	-	-	-	-	-	-
METALS	Thallium	WS	T	24	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.8	-	-	-	-	-	-
METALS	Vanadium	WS	T	24	ug/l	<1.9	6.9	ND	ND	ND	ND	1.7575	2	8	0	0	20	-	-	-	-	-	-
METALS	Zinc	WS	T	24	ug/l	<7	<7	ND	ND	ND	ND	ND	0	0	0	0	30	0	0	37	0	0.00	103.361

Table 29. Round 4 Surface Water Analytical Results Statistical Summary– Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
GENCHEM	Alkalinity	WS	T	23	ug/l	13,900	233,000	137,570	175,000	62,105	69,000	199,100	23	100	-	-	-	-	-	-	-	-	-
GENCHEM	Ammonia	WS	T	23	ug/l	<72	1,840	122.7435	ND	375.0499	ND	122.27	4	17	-	-	-	-	-	-	-	-	-
GENCHEM	Chloride	WS	T	23	ug/l	227.0	2,300	1,129	1,390	671.2694	241.2	1,759	23	100	0	0	120000	-	-	-	-	-	-
GENCHEM	Fluoride	WS	DI	23	ug/l	109.0	21,500	1,174	130.0	4,446	117.1	1,730	23	100	17	74	120	-	-	-	-	-	-
GENCHEM	Fluoride	WS	T	23	ug/l	118.0	22,400	1,213	135.0	4,630	119.2	1,586	23	100	21	91	120	-	-	-	-	-	-
GENCHEM	Hardness as calcium carbonate	WS	T	23	ug/l	50,000	216,000	132,957	164,000	54,954	66,400	187,600	23	100	-	-	-	-	-	-	-	-	-
GENCHEM	Nitrate Nitrite as N	WS	T	23	ug/l	<100	1,700	262.6087	127.0	434.6847	ND	1,428	19	83	-	-	-	-	-	-	-	-	-
GENCHEM	Orthophosphate as P	WS	T	23	ug/l	<48	<48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Sulfate	WS	T	23	ug/l	1,880	20,300	4,050	2,620	4,275	1,901	11,841	23	100	-	-	kkk	-	-	-	-	-	-
GENCHEM	Sulfide	WS	T	23	ug/l	<579	<579	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
GENCHEM	Total Dissolved Solids	WS	T	23	mg/l	62.0	336.0	157.6522	191.0	75.904	71.1	249.3	23	100	-	-	-	-	-	-	-	-	-
GENCHEM	Total Suspended Solids	WS	T	23	mg/l	<1	70.5	25.187	18.4	23.7919	n.d.	61.9	19	83	-	-	-	-	-	-	-	-	-
METALS	Aluminum	WS	T	23	ug/l	<18.2	8,630	622.5261	49.5	1,778	ND	987.9	16	70	9	39	87	4	17	750	9	39.13	87
METALS	Aluminum	WS	DI	23	ug/l	<18.2	4,780	ND	ND	ND	ND	ND	1	4	1	4	87	1	4	750	1	4.35	87
METALS	Antimony	WS	DI	23	ug/l	<0.62	7.2	ND	ND	ND	ND	ND	1	4	0	0	30	-	-	-	-	-	-
METALS	Antimony	WS	T	23	ug/l	<0.62	7.7	ND	ND	ND	ND	ND	1	4	0	0	30	-	-	-	-	-	-
METALS	Arsenic	WS	DI	23	ug/l	<0.64	1.0	ND	ND	ND	ND	0.906	3	13	0	0	3.1	0	0	340	0	0.00	150
METALS	Arsenic	WS	T	23	ug/l	<0.64	2.4	ND	ND	ND	ND	0.815	2	9	0	0	3.1	0	0	340	0	0.00	150
METALS	Barium	WS	DI	23	ug/l	26.4	270.0	99.5652	86.5	58.6305	63.61	242.6	23	100	23	100	4	-	-	-	-	-	-
METALS	Barium	WS	T	23	ug/l	43.4	275.0	108.3391	88.8	60.22	62.86	248.7	23	100	23	100	4	-	-	-	-	-	-
METALS	Beryllium	WS	DI	23	ug/l	<0.24	0.51	ND	ND	ND	ND	ND	1	4	0	0	0.66	-	-	-	-	-	-
METALS	Beryllium	WS	T	23	ug/l	<0.24	0.71	ND	ND	ND	ND	ND	1	4	1	4	0.66	-	-	-	-	-	-
METALS	Cadmium	WS	DI	23	ug/l	<0.71	2.5	ND	ND	ND	ND	ND	1	4	23	100	0.09	1	4	0.52	23	100.00	0.238
METALS	Cadmium	WS	T	23	ug/l	<0.71	3.0	ND	ND	ND	ND	ND	1	4	23	100	0.09	1	4	0.52	23	100.00	0.238
METALS	Calcium	WS	DI	23	ug/l	7,020	54,100	35,697	39,800	15,709	18,200	52,030	23	100	0	0	116000	-	-	-	-	-	-
METALS	Calcium	WS	T	23	ug/l	7,860	62,400	37,246	41,100	16,543	17,610	54,440	23	100	0	0	116000	-	-	-	-	-	-
METALS	Chromium	WS	T	23	ug/l	<1.3	2.7	ND	ND	ND	ND	ND	1	4	0	0	64.3	-	-	-	0	0.00	74.7
METALS	Chromium	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	64.3	-	-	-	0	0.00	74.7
METALS	Cobalt	WS	T	23	ug/l	<1.3	1.6	ND	ND	ND	ND	ND	1	4	0	0	5.1	-	-	-	-	-	-
METALS	Cobalt	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	5.1	-	-	-	-	-	-
METALS	Copper	WS	T	23	ug/l	<1.4	16.5	1.713	ND	3.3718	ND	4.96	5	22	23	100	0.23	2	9	3.79	1	4.35	8.038
METALS	Copper	WS	DI	23	ug/l	<1.4	26.4	ND	ND	ND	ND	2.9	3	13	23	100	0.23	1	4	3.79	1	4.35	8.038
METALS	Cyanide, Free	WS	DI	7	ug/l	<1.5	42.2	8.2857	1.7	15.0962	ND	31.22	5	71	3	43	5	1	14	22	3	42.86	5.2
METALS	Cyanide, Free	WS	T	7	ug/l	<1.5	45.6	8.2214	2.1	16.5397	ND	33.15	4	57	1	14	5	1	14	22	1	14.29	5.2
METALS	Cyanide, Total	WS	DI	23	ug/l	<2	162.0	12.0739	ND	35.5998	ND	62.63	5	22	5	22	5	2	9	22	5	21.74	5.2
METALS	Cyanide, Total	WS	T	23	ug/l	<2	197.0	13.6609	ND	43.0212	ND	70.63	4	17	4	17	5	2	9	22	4	17.39	5.2
METALS	Iron	WS	T	23	ug/l	<42.4	1,210	303.9826	ND	405.5771	ND	1,068	10	43	9	39	158	-	-	-	2	8.70	1000
METALS	Iron	WS	DI	23	ug/l	<42.4	164.0	ND	ND	ND	ND	60.05	3	13	1	4	158	-	-	-	0	0.00	1000

Table 29. Round 4 Surface Water Analytical Results Statistical Summary– Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
METALS	Lead	WS	T	23	ug/l	<0.38	7.6	0.6578	ND	1.5308	ND	0.961	9	39	6	26	0.54	0	0	13.98	1	4.35	2.548
METALS	Lead	WS	DI	23	ug/l	<0.38	<0.38	ND	ND	ND	ND	ND	0	0	0	0	0.54	0	0	13.98	0	0.00	2.548
METALS	Magnesium	WS	DI	23	ug/l	384.0	14,800	8,824	11,000	4,017	4,465	13,160	23	100	0	0	82000	-	-	-	-	-	-
METALS	Magnesium	WS	T	23	ug/l	804.0	16,300	9,676	12,100	4,145	4,681	13,930	23	100	0	0	82000	-	-	-	-	-	-
METALS	Manganese	WS	T	23	ug/l	<2.5	43.2	14.0609	8.1	13.2947	ND	36.92	20	87	0	0	120	-	-	-	-	-	-
METALS	Manganese	WS	DI	23	ug/l	<2.5	31.8	5.2261	2.5	8.1144	ND	25.64	12	52	0	0	120	-	-	-	-	-	-
METALS	Mercury	WS	DI	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.026	0	0	1.7	0	0.00	0.91
METALS	Mercury	WS	T	23	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	23	100	0.026	0	0	1.7	0	0.00	0.91
METALS	Nickel	WS	DI	23	ug/l	<1.4	32.2	ND	ND	ND	ND	19.96	2	9	2	9	5	0	0	145	0	0.00	45.009
METALS	Nickel	WS	T	23	ug/l	<1.4	55.9	ND	ND	ND	ND	1.96	2	9	1	4	5	0	0	145	1	4.35	45.009
METALS	Potassium	WS	DI	23	ug/l	237.0	970.0	433.4348	419.0	190.8824	240.6	759.2	23	100	0	0	53000	-	-	-	-	-	-
METALS	Potassium	WS	T	23	ug/l	242.0	1,060	535.6522	480.0	186.9316	248.0	809.5	23	100	0	0	53000	-	-	-	-	-	-
METALS	Selenium	WS	DI	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	1	0	0	20	0	0.00	5
METALS	Selenium	WS	T	23	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	1	0	0	20	0	0.00	5
METALS	Silver	WS	DI	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	23	100	0.067	23	100	0.374	-	-	-
METALS	Silver	WS	T	23	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	23	100	0.067	23	100	0.374	-	-	-
METALS	Sodium	WS	DI	23	ug/l	562.0	23,500	3,824	2,020	5,408	570.4	13,910	23	100	0	0	680000	-	-	-	-	-	-
METALS	Sodium	WS	T	23	ug/l	666.0	25,800	4,300	2,220	6,134	678.5	17,450	23	100	0	0	680000	-	-	-	-	-	-
METALS	Thallium	WS	T	23	ug/l	<0.26	0.27	ND	ND	ND	ND	ND	1	4	0	0	0.8	-	-	-	-	-	-
METALS	Thallium	WS	DI	23	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	0.8	-	-	-	-	-	-
METALS	Vanadium	WS	DI	23	ug/l	<1.9	4.3	ND	ND	ND	ND	ND	1	4	0	0	20	-	-	-	-	-	-
METALS	Vanadium	WS	T	23	ug/l	<1.9	18.0	ND	ND	ND	ND	ND	1	4	0	0	20	-	-	-	-	-	-
METALS	Zinc	WS	T	23	ug/l	<7	537.0	28.5739	ND	110.8994	ND	15.09	6	26	1	4	30	1	4	37	1	4.35	103.361
METALS	Zinc	WS	DI	23	ug/l	<7	512.0	ND	ND	ND	ND	ND	1	4	1	4	30	1	4	37	1	4.35	103.361
OC_PEST	4,4'-DDD	WS	T	1	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	1	100	0.001	-	-	-	-	-	-
OC_PEST	4,4'-DDE	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.001	-	-	-	-	-	-
OC_PEST	4,4'-DDT	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	1	100	0.0005	0	0	0.5	1	100.00	0.001
OC_PEST	Aldrin	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	0	0	0.004	0	0	1.5	0	0.00	1.5
OC_PEST	alpha-BHC	WS	T	1	ug/l	<0.007	<0.007	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	alpha-Chlordane	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.0043	-	-	-	0	0.00	0.004
OC_PEST	beta-BHC	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	delta-BHC	WS	T	1	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	0	0	2.2	-	-	-	-	-	-
OC_PEST	Dieldrin	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	0	0	0.056	0	0	0.24	0	0.00	0.056
OC_PEST	Endosulfan I	WS	T	1	ug/l	<0.002	<0.002	ND	ND	ND	ND	ND	0	0	0	0	0.003	0	0	0.11	0	0.00	0.056
OC_PEST	Endosulfan II	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.051	0	0	0.11	0	0.00	0.056
OC_PEST	Endosulfan sulfate	WS	T	1	ug/l	<0.006	<0.006	ND	ND	ND	ND	ND	0	0	0	0	0.051	-	-	-	-	-	-
OC_PEST	Endrin	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.0023	0	0	0.086	0	0.00	0.036
OC_PEST	Endrin aldehyde	WS	T	1	ug/l	<0.008	<0.008	ND	ND	ND	ND	ND	0	0	0	0	0.036	-	-	-	-	-	-

Table 29. Round 4 Surface Water Analytical Results Statistical Summary– Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
OC_PEST	Endrin ketone	WS	T	1	ug/l	<0.008	<0.008	ND	ND	ND	ND	ND	0	0	0	0	0.036	-	-	-	-	-	-
OC_PEST	gamma-BHC (Lindane)	WS	T	1	ug/l	<0.012	<0.012	ND	ND	ND	ND	ND	0	0	0	0	0.01	-	-	-	0	0.00	0.95
OC_PEST	gamma-Chlordane	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	0	0	0.0043	-	-	-	0	0.00	0.004
OC_PEST	Heptachlor	WS	T	1	ug/l	<0.003	<0.003	ND	ND	ND	ND	ND	0	0	0	0	0.0019	0	0	0.26	0	0.00	0.004
OC_PEST	Heptachlor epoxide	WS	T	1	ug/l	<0.005	<0.005	ND	ND	ND	ND	ND	0	0	1	100	0.0019	0	0	0.26	0	0.00	0.004
OC_PEST	Methoxychlor	WS	T	1	ug/l	<0.004	<0.004	ND	ND	ND	ND	ND	0	0	0	0	0.019	-	-	-	0	0.00	0.03
OC_PEST	Toxaphene	WS	T	1	ug/l	<0.11	<0.11	ND	ND	ND	ND	ND	0	0	1	100	0.0002	0	0	0.73	1	100.00	0
PCB	Aroclor 1016	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	7E-05	-	-	-	1	100.00	0.014
PCB	Aroclor 1221	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	7E-05	-	-	-	1	100.00	0.014
PCB	Aroclor 1232	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	7E-05	-	-	-	1	100.00	0.014
PCB	Aroclor 1242	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	7E-05	-	-	-	1	100.00	0.014
PCB	Aroclor 1248	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	7E-05	-	-	-	1	100.00	0.014
PCB	Aroclor 1254	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	7E-05	-	-	-	1	100.00	0.014
PCB	Aroclor 1260	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	7E-05	-	-	-	1	100.00	0.014
PCB	Aroclor 1268	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	1	100	0.014	-	-	-	1	100.00	0.014
PCB	Aroclor-1262	WS	T	1	ug/l	<0.099	<0.099	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
PCB	Polychlorinated biphenyls, Total	WS	T	1	ug/l	<0.1	<0.1	ND	ND	ND	ND	ND	0	0	1	100	7E-05	-	-	-	1	100.00	0.014
SVOC	1,1'-Biphenyl	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	14	-	-	-	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	WS	T	1	ug/l	<0.43	<0.43	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	1,4-Dioxane	WS	T	1	ug/l	<3.1	<3.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,2'-oxybis[1-chloropropane]	WS	T	1	ug/l	<0.93	<0.93	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,3,4,6-Tetrachlorophenol	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	0	0	1	-	-	-	-	-	-
SVOC	2,4,5-Trichlorophenol	WS	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4,6-Trichlorophenol	WS	T	1	ug/l	<0.53	<0.53	ND	ND	ND	ND	ND	0	0	0	0	4.9	-	-	-	-	-	-
SVOC	2,4-Dichlorophenol	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	11	-	-	-	-	-	-
SVOC	2,4-Dimethylphenol	WS	T	1	ug/l	<0.91	<0.91	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4-Dinitrophenol	WS	T	1	ug/l	<2.4	<2.4	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2,4-Dinitrotoluene	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	44	-	-	-	-	-	-
SVOC	2,6-Dinitrotoluene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	81	-	-	-	-	-	-
SVOC	2-Chloronaphthalene	WS	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Chlorophenol	WS	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	24	-	-	-	-	-	-
SVOC	2-Methylnaphthalene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	4.7	-	-	-	-	-	-
SVOC	2-Methylphenol	WS	T	1	ug/l	<1.3	<1.3	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
SVOC	2-Nitroaniline	WS	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	2-Nitrophenol	WS	T	1	ug/l	<0.59	<0.59	ND	ND	ND	ND	ND	0	0	0	0	300	-	-	-	-	-	-
SVOC	3 & 4 Methylphenol	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	3,3'-Dichlorobenzidine	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	4.5	-	-	-	-	-	-
SVOC	3-Nitroaniline	WS	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 29. Round 4 Surface Water Analytical Results Statistical Summary– Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	4,6-Dinitro-2-methylphenol	WS	T	1	ug/l	<2	<2	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Bromophenyl phenyl ether	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	1.5	-	-	-	-	-	-
SVOC	4-Chloro-3-methylphenol	WS	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Chloroaniline	WS	T	1	ug/l	<0.73	<0.73	ND	ND	ND	ND	ND	0	0	0	0	232	-	-	-	-	-	-
SVOC	4-Chlorophenyl phenyl ether	WS	T	1	ug/l	<0.96	<0.96	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitroaniline	WS	T	1	ug/l	<0.48	<0.48	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	4-Nitrophenol	WS	T	1	ug/l	<4.7	<4.7	ND	ND	ND	ND	ND	0	0	0	0	60	-	-	-	-	-	-
SVOC	Acenaphthene	WS	T	1	ug/l	<0.88	<0.88	ND	ND	ND	ND	ND	0	0	0	0	5.8	-	-	-	-	-	-
SVOC	Acenaphthylene	WS	T	1	ug/l	<0.65	<0.65	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Acetophenone	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Anthracene	WS	T	1	ug/l	<0.57	<0.57	ND	ND	ND	ND	ND	0	0	1	100	0.012	-	-	-	-	-	-
SVOC	Atrazine	WS	T	1	ug/l	<0.77	<0.77	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
SVOC	Benzaldehyde	WS	T	1	ug/l	<0.86	<0.86	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Benzo[a]anthracene	WS	T	1	ug/l	3.0	3.0	3.0	3.0	-	3.0	3.0	1	100	1	100	0.018	-	-	-	-	-	-
SVOC	Benzo[a]pyrene	WS	T	1	ug/l	3.9	3.9	3.9	3.9	-	3.9	3.9	1	100	1	100	0.014	-	-	-	-	-	-
SVOC	Benzo[b]fluoranthene	WS	T	1	ug/l	10.0	10.0	10.0	10.0	-	10.0	10.0	1	100	-	-	-	-	-	-	-	-	-
SVOC	Benzo[g,h,i]perylene	WS	T	1	ug/l	3.9	3.9	3.9	3.9	-	3.9	3.9	1	100	-	-	-	-	-	-	-	-	-
SVOC	Benzo[k]fluoranthene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-chloroethoxy)methane	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-chloroethyl)ether	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Bis(2-ethylhexyl) phthalate	WS	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	Butyl benzyl phthalate	WS	T	1	ug/l	<0.6	<0.6	ND	ND	ND	ND	ND	0	0	0	0	19	-	-	-	-	-	-
SVOC	Caprolactam	WS	T	1	ug/l	<1.1	<1.1	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Carbazole	WS	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Chrysene	WS	T	1	ug/l	7.6	7.6	7.6	7.6	-	7.6	7.6	1	100	-	-	-	-	-	-	-	-	-
SVOC	Dibenz(a,h)anthracene	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Dibenzofuran	WS	T	1	ug/l	<0.85	<0.85	ND	ND	ND	ND	ND	0	0	0	0	3.7	-	-	-	-	-	-
SVOC	Diethyl phthalate	WS	T	1	ug/l	<1	<1	ND	ND	ND	ND	ND	0	0	0	0	210	-	-	-	-	-	-
SVOC	Dimethyl phthalate	WS	T	1	ug/l	<0.98	<0.98	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Di-n-butyl phthalate	WS	T	1	ug/l	<0.82	<0.82	ND	ND	ND	ND	ND	0	0	0	0	19	-	-	-	-	-	-
SVOC	Di-n-octyl phthalate	WS	T	1	ug/l	<0.69	<0.69	ND	ND	ND	ND	ND	0	0	0	0	22	-	-	-	-	-	-
SVOC	Fluoranthene	WS	T	1	ug/l	9.3	9.3	9.3	9.3	-	9.3	9.3	1	100	1	100	0.04	-	-	-	-	-	-
SVOC	Fluorene	WS	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	3	-	-	-	-	-	-
SVOC	Hexachlorobenzene	WS	T	1	ug/l	<0.47	<0.47	ND	ND	ND	ND	ND	0	0	1	100	0.0003	-	-	-	-	-	-
SVOC	Hexachlorobutadiene	WS	T	1	ug/l	<0.76	<0.76	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
SVOC	Hexachlorocyclopentadiene	WS	T	1	ug/l	<0.61	<0.61	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Hexachloroethane	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	12	-	-	-	-	-	-
SVOC	Indeno[1,2,3-cd]pyrene	WS	T	1	ug/l	3.1	3.1	3.1	3.1	-	3.1	3.1	1	100	-	-	-	-	-	-	-	-	-

Table 29. Round 4 Surface Water Analytical Results Statistical Summary– Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
SVOC	Isophorone	WS	T	1	ug/l	<0.67	<0.67	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	Naphthalene	WS	T	1	ug/l	<0.8	<0.8	ND	ND	ND	ND	ND	0	0	0	0	1.1	-	-	-	-	-	-
SVOC	Nitrobenzene	WS	T	1	ug/l	<0.49	<0.49	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	N-Nitrosodi-n-propylamine	WS	T	1	ug/l	<0.83	<0.83	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
SVOC	N-Nitrosodiphenylamine	WS	T	1	ug/l	<0.74	<0.74	ND	ND	ND	ND	ND	0	0	0	0	210	-	-	-	-	-	-
SVOC	Pentachlorophenol	WS	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	1	100	0.5	0	0	5.3	0	0.00	4
SVOC	Phenanthrene	WS	T	1	ug/l	1.5	1.5	1.5	1.5	-	1.5	1.5	1	100	1	100	0.4	-	-	-	-	-	-
SVOC	Phenol	WS	T	1	ug/l	<0.41	<0.41	ND	ND	ND	ND	ND	0	0	0	0	4	-	-	-	-	-	-
SVOC	Pyrene	WS	T	1	ug/l	7.0	7.0	7.0	7.0	-	7.0	7.0	1	100	1	100	0.025	-	-	-	-	-	-
VOC	1,1,1-Trichloroethane	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	11	-	-	-	-	-	-
VOC	1,1,2,2-Tetrachloroethane	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	0	0	610	-	-	-	-	-	-
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane	WS	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,1,2-Trichloroethane	WS	T	1	ug/l	<0.08	<0.08	ND	ND	ND	ND	ND	0	0	0	0	1200	-	-	-	-	-	-
VOC	1,1-Dichloroethane	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	47	-	-	-	-	-	-
VOC	1,1-Dichloroethene	WS	T	1	ug/l	<0.34	<0.34	ND	ND	ND	ND	ND	0	0	0	0	25	-	-	-	-	-	-
VOC	1,2,3-Trichlorobenzene	WS	T	1	ug/l	<0.35	<0.35	ND	ND	ND	ND	ND	0	0	0	0	8	-	-	-	-	-	-
VOC	1,2,4-Trichlorobenzene	WS	T	1	ug/l	<0.27	<0.27	ND	ND	ND	ND	ND	0	0	0	0	24	-	-	-	-	-	-
VOC	1,2-Dibromo-3-Chloropropane	WS	T	1	ug/l	<0.23	<0.23	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,2-Dichlorobenzene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.7	-	-	-	-	-	-
VOC	1,2-Dichloroethane	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	100	-	-	-	-	-	-
VOC	1,2-Dichloropropane	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	1,3-Dichlorobenzene	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	71	-	-	-	-	-	-
VOC	1,4-Dichlorobenzene	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	15	-	-	-	-	-	-
VOC	2-Butanone (MEK)	WS	T	1	ug/l	<2.2	<2.2	ND	ND	ND	ND	ND	0	0	0	0	14000	-	-	-	-	-	-
VOC	2-Hexanone	WS	T	1	ug/l	<0.72	<0.72	ND	ND	ND	ND	ND	0	0	0	0	99	-	-	-	-	-	-
VOC	4-Methyl-2-pentanone (MIBK)	WS	T	1	ug/l	<0.63	<0.63	ND	ND	ND	ND	ND	0	0	0	0	170	-	-	-	-	-	-
VOC	Acetone	WS	T	1	ug/l	12.0	12.0	12.0	12.0	-	12.0	12.0	1	100	0	0	1500	-	-	-	-	-	-
VOC	Benzene	WS	T	1	ug/l	<0.09	<0.09	ND	ND	ND	ND	ND	0	0	0	0	130	-	-	-	-	-	-
VOC	Bromoform	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	320	-	-	-	-	-	-
VOC	Bromomethane	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Carbon disulfide	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	0.92	-	-	-	-	-	-
VOC	Carbon tetrachloride	WS	T	1	ug/l	<0.33	<0.33	ND	ND	ND	ND	ND	0	0	0	0	9.8	-	-	-	-	-	-
VOC	Chlorobenzene	WS	T	1	ug/l	<0.24	<0.24	ND	ND	ND	ND	ND	0	0	0	0	1.3	-	-	-	-	-	-
VOC	Chlorobromomethane	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chlorodibromomethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroethane	WS	T	1	ug/l	<0.37	<0.37	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Chloroform	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	Chloromethane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-

Table 29. Round 4 Surface Water Analytical Results Statistical Summary– Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

															Minimum ESV			DEQ 7 Acute			DEQ 7 Chronic		
Group	Determinand	Matrix	Fraction	No. of Results	Unit	Min	Max	Mean	Median	Standard Deviation	5th Percentile	95th Percentile	# > LOD	% > LOD	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level	No. Exceeding	% Exceeding	Screening Level
VOC	cis-1,2-Dichloroethene	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	cis-1,3-Dichloropropene	WS	T	1	ug/l	<0.16	<0.16	ND	ND	ND	ND	ND	0	0	1	100	0.055	-	-	-	-	-	-
VOC	Cyclohexane	WS	T	1	ug/l	<0.26	<0.26	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorobromomethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Dichlorodifluoromethane	WS	T	1	ug/l	<0.14	<0.14	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Ethylbenzene	WS	T	1	ug/l	<0.3	<0.3	ND	ND	ND	ND	ND	0	0	0	0	7.3	-	-	-	-	-	-
VOC	Ethylene Dibromide	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Isopropylbenzene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	2.6	-	-	-	-	-	-
VOC	Methyl acetate	WS	T	1	ug/l	<0.58	<0.58	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methyl tert-butyl ether	WS	T	1	ug/l	<0.13	<0.13	ND	ND	ND	ND	ND	0	0	0	0	10000	-	-	-	-	-	-
VOC	Methylcyclohexane	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Methylene Chloride	WS	T	1	ug/l	<0.21	<0.21	ND	ND	ND	ND	ND	0	0	0	0	98.1	-	-	-	-	-	-
VOC	m-Xylene & p-Xylene	WS	T	1	ug/l	<0.28	<0.28	ND	ND	ND	ND	ND	0	0	0	0	1.8	-	-	-	-	-	-
VOC	o-Xylene	WS	T	1	ug/l	<0.32	<0.32	ND	ND	ND	ND	ND	0	0	0	0	13	-	-	-	-	-	-
VOC	Styrene	WS	T	1	ug/l	<0.17	<0.17	ND	ND	ND	ND	ND	0	0	0	0	72	-	-	-	-	-	-
VOC	Tetrachloroethene	WS	T	1	ug/l	<0.12	<0.12	ND	ND	ND	ND	ND	0	0	0	0	98	-	-	-	-	-	-
VOC	Toluene	WS	T	1	ug/l	<0.25	<0.25	ND	ND	ND	ND	ND	0	0	0	0	2	-	-	-	-	-	-
VOC	trans-1,2-Dichloroethene	WS	T	1	ug/l	<0.18	<0.18	ND	ND	ND	ND	ND	0	0	0	0	590	-	-	-	-	-	-
VOC	trans-1,3-Dichloropropene	WS	T	1	ug/l	<0.19	<0.19	ND	ND	ND	ND	ND	0	0	1	100	0.055	-	-	-	-	-	-
VOC	Trichloroethene	WS	T	1	ug/l	<0.22	<0.22	ND	ND	ND	ND	ND	0	0	0	0	21	-	-	-	-	-	-
VOC	Trichlorofluoromethane	WS	T	1	ug/l	<0.15	<0.15	ND	ND	ND	ND	ND	0	0	-	-	-	-	-	-	-	-	-
VOC	Vinyl chloride	WS	T	1	ug/l	<0.06	<0.06	ND	ND	ND	ND	ND	0	0	0	0	930	-	-	-	-	-	-

Table 30. Comparison Table of Concentrations of Total and Dissolved Analytes in Surface Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Sample Date	Sample Designation	Sample Type	Antimony		Cyanide, Total		Cyanide, Free		Thallium		Fluoride	
				Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
CFSWP-001	06/14/2017	CFSWP-001-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	118	118 J+
CFSWP-002	06/14/2017	CFSWP-002-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	119	109 J+
CFSWP-003	06/14/2017	CFSWP-003-SW	N	0.62 U	0.62 U	9.5 J	12.5	3.5 J	5.4	0.26 U	0.26 U	192	185 J+
CFSWP-004	06/14/2017	CFSWP-004-SW	N	0.62 U	0.62 U	11.5	11.7	4.1 J	5.6	0.26 U	0.26 U	175	167 J+
CFSWP-005	06/14/2017	CFSWP-005-SW	N	0.62 U	0.62 U	**197**	**162**	45.6	42.2	0.26 U	0.26 U	555	558 J+
CFSWP-006	06/14/2017	CFSWP-006-SW	N	0.62 U	0.62 U	2 U	2 U	1.5 U	1.6 J	0.26 U	0.26 U	122	119 J+
CFSWP-007	06/14/2017	CFSWP-007-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	123	118 J+
CFSWP-008	06/14/2017	CFSWP-008-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	124	117 J+
CFSWP-009	06/12/2017	CFSWP-009-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	188	185 J+
CFSWP-010	06/12/2017	CFSWP-010-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	181	177 J+
CFSWP-011	06/12/2017	CFSWP-011-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	131	128 J+
CFSWP-012	06/12/2017	CFSWP-012-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	131	129 J+
CFSWP-013	06/12/2017	CFSWP-013-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	131	126 J+
CFSWP-014	06/13/2017	CFSWP-014-SW	N	0.62 U	0.62 U	2 U	2 U	1.5 U	1.5 U	0.26 U	0.26 U	137	130 J+
CFSWP-015	06/13/2017	CFSWP-DUP7-SW	FD	0.62 U	6.2 U	2 U	2 U	1.5 U	1.5 U	0.26 U	0.26 U	135	121 J+
CFSWP-015	06/13/2017	CFSWP-015-SW	N	0.62 U	0.62 U	2 U	2 U	1.5 U	1.5 U	0.26 U	0.26 U	136	130 J+
CFSWP-016	06/12/2017	CFSWP-DUP6-SW	FD	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	135	131 J+
CFSWP-016	06/12/2017	CFSWP-016-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	137	138 J+
CFSWP-017	06/14/2017	CFSWP-017-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	121	119 J+
CFSWP-018	06/15/2017	CFSWP-018-SW	N	0.62 U	0.62 U	77.2	68.2	NA	NA	0.26 U	0.26 U	1700	1860
CFSWP-019	06/15/2017	CFSWP-019-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	305	304
CFSWP-020	06/15/2017	CFSWP-020-SW	N	0.62 U	0.62 U	2 U	5.3 J	2.1 J	1.7 J	0.26 U	0.26 U	308	289
CFSWP-021	06/15/2017	CFSWP-021-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	243	188
CFSWP-024	06/15/2017	CFSWP-024-SW	N	**7.7**	**7.2**	2 U	2 U	NA	NA	**0.27 J**	0.26 U	**22400 J+**	**21500**
CFSWP-025	06/13/2017	CFSWP-025-SW	N	0.62 U	0.62 U	2 U	2 U	NA	NA	0.26 U	0.26 U	134	130 J+

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Table 31. Comparison Table of Seasonal Variability for Cyanide and Fluoride in Surface Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample Location	Site Feature	Cyanide, Total				Fluoride			
		Round 1	Round 2	Round 3	Round 4	Round 1	Round 2	Round 3	Round 4
CFSWP-001	Site Feature	2 U	2 U	2 U	2 U	35.8 J-	211 J-	84.2	118
CFSWP-002	Flathead River	2 U	2 U	2 U	2 U	35.9 J-	547 J-	95	119
CFSWP-003	Flathead River	18.8	36.2	7.7 J	9.5 J	181	615 J-	198 J	192
CFSWP-004	Seep Area	209	178	21.3	11.5	2560	1810 J-	342 J	175
CFSWP-005	Seep Area	213	192	24.7	197	2570	2100 J-	457 J	555
CFSWP-006	Seep Area	3.2 J	2 U	2 U	2 U	37.3 J	106 J-	122 J	122
CFSWP-007	Flathead River	2 U	2 U	2 U	2 U	33.8 J-	110 J-	114 J	123
CFSWP-008	Flathead River	2 U	2 U	2 U	2 U	33.5 J-	107 J-	96.8	124
CFSWP-009	Flathead River	4 U	DRY	2 U	2 U	80.3	DRY	105	188
CFSWP-010	Cedar Creek Reservoir Overflow Ditch	4 U	DRY	2 U	2 U	39.4 J	DRY	2600	181
CFSWP-011	Cedar Creek Reservoir Overflow Ditch	4 U	DRY	2 U	2 U	38.7 J	DRY	103	131
CFSWP-012	Cedar Creek Reservoir Overflow Ditch	4 U	DRY	2 U	2 U	39.5 J	DRY	101	131
CFSWP-013	Cedar Creek Reservoir Overflow Ditch	4 U	2 U	2 U	2 U	39.2 J	473 J-	308	131
CFSWP-014	Cedar Creek Reservoir Overflow Ditch	2 U	15.3 J	2 U	2 U	55.8 J	117 J-	126	137
CFSWP-015	Cedar Creek	2.3 J	10.6	2 U	2 U	62.4 J	119 J-	129	135
CFSWP-016	Cedar Creek	2 U	2 U	2 U	2 U	58.8 J	123 J-	132	135
CFSWP-017	Flathead River	2 U	2 U	2 U	2 U	56.2 J-	106 J-	85.7	121
CFSWP-018	South Percolation Ponds	4 U	2 U	2 U	77.2	353	828 J-	365	1700
CFSWP-019	South Percolation Ponds	4 U	2 U	2 U	2 U	379	785 J-	350	305
CFSWP-020	South Percolation Ponds	12.5	16.4	11.3	2 U	250	265 J-	330 J	308
CFSWP-021	Northern SW Area	4 U	2 U	2 U	2 U	166	189 J-	231	243
CFSWP-022	Northern SW Area	4 U	DRY	2 U	DRY	177	DRY	223	DRY
CFSWP-023	Northwest Percolation Pond	DRY	DRY	7.6 J	DRY	DRY	DRY	2150	DRY
CFSWP-024	Northeast Percolation Pond	DRY	DRY	DRY	2 U	DRY	DRY	DRY	22400 J+
CFSWP-025	Cedar Creek	NA	2 U	2 U	2 U	NA	115 J-	128	134

Green shading indicates minimum concentration across sampling rounds
Orange shading indicates maximum concentration across sampling rounds

FIGURES

1. RI/FS Site Boundary
2. Site Features
3. Piper Diagram Summary

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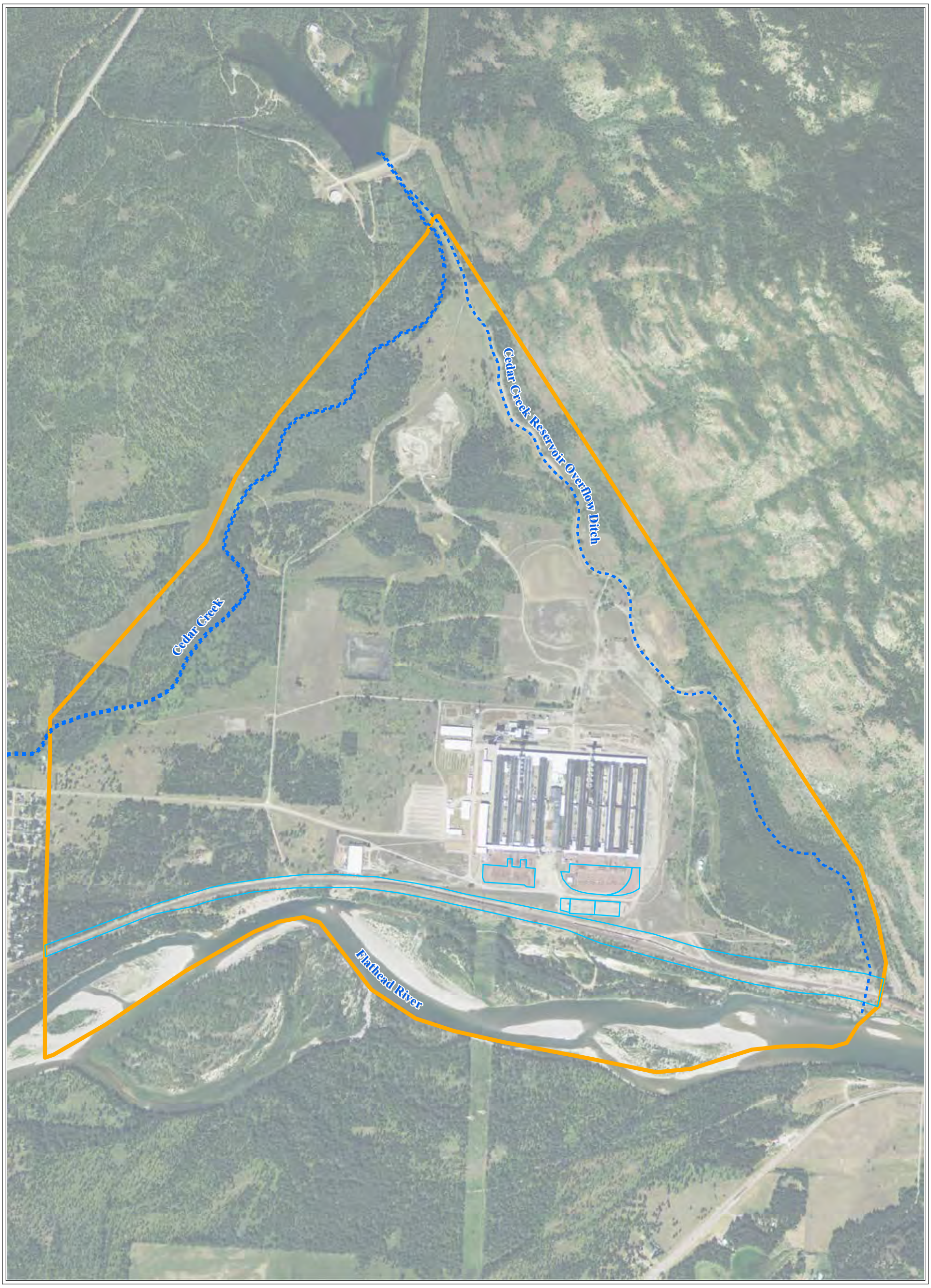

LEGEND

- APPROXIMATE THIRD-PARTY PROPERTY BOUNDARIES
- SITE BOUNDARY
- CREEK FEATURES

N

550 0 550 1,100 Feet

Title:

RI/FS SITE BOUNDARY

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 31OCT17	FIGURE
Prepared by: M.R.	Scale: AS SHOWN	1
Project Mgr: M.R.	Project: 2476.0001Y002	
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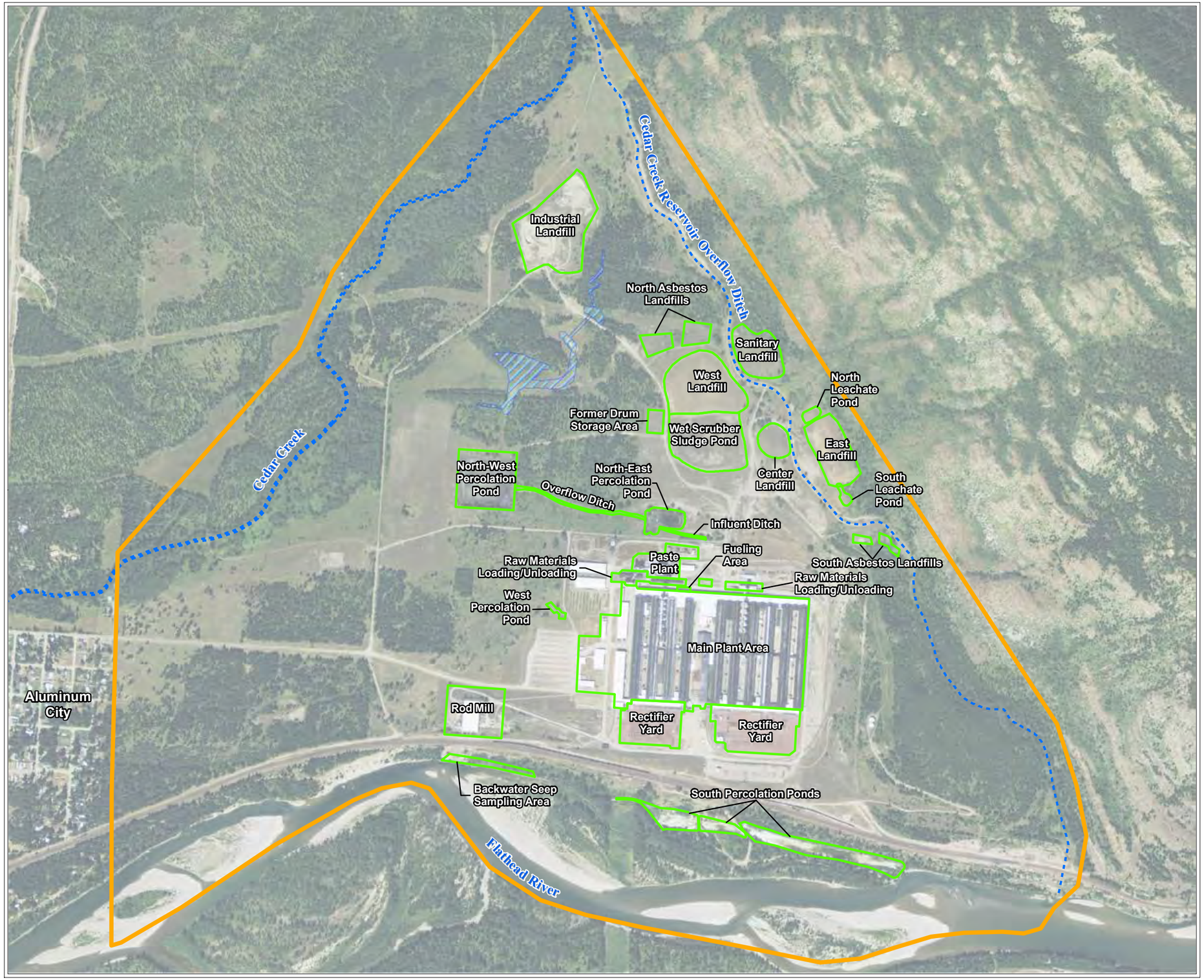

LEGEND

- SITE FEATURES
- SITE BOUNDARY
- CREEK FEATURES
- NORTHERN SURFACE WATER FEATURE EXTENT

1,000 0 1,000 Feet

Title:

SITE FEATURES

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	FIGURE
Prepared by: M.R.	Scale: AS SHOWN	2
Project Mgr: M.R.	Project: 2476.0001Y002	
File: 2476.0001Y170.2.mxd		

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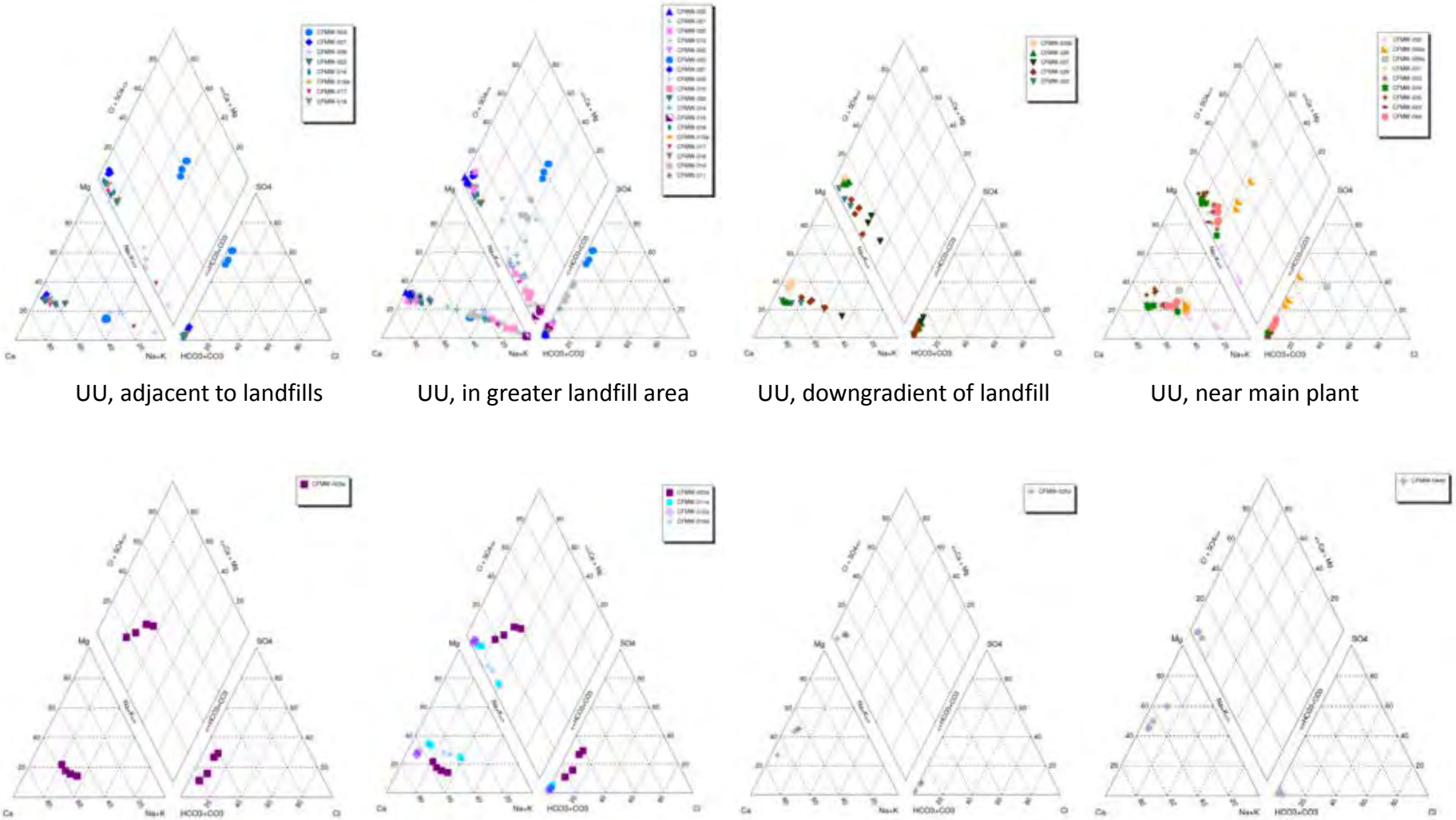


Figure 3. Piper diagrams illustrating the proportions of major ion concentrations in various subsets of Site groundwater; UU refers to monitoring wells screened in the upper hydrogeologic unit and BUU refers to monitoring wells screened below the upper hydrogeologic unit, respectively. Only wells with pH values less than 10 and ion balances less than 20% are shown.

APPENDICES

(Provided on CD in Bound Copy)

A. USGS Flathead River Station Discharge and Elevation Graphs
   1. Flathead River Average Annual Daily Discharge (1952 to 2017)
   2. Flathead River Average Daily Discharge and Elevation (April 2016 to June 2017)

B. Hydrographs from Long Term Pressure Transducer Data

C. Field Data Sheets
   1. Groundwater Sample Field Data Sheets
   2. Surface Water Sample Field Data Sheets
   3. Slug Testing Field Data Sheets

D. Surface Water Discharge Calculations

E. Executed Record of Modification Forms

F. Investigation Derived Waste Water Manifests and Sample Results

G. Groundwater Laboratory Analytical Data Tables – Rounds 1 through 4
   1. VOCs in Groundwater
   2. SVOCs in Groundwater
   3. Metals in Groundwater
   4. General Chemistry in Groundwater

H. Groundwater Thematic Maps – Rounds 1 through 4
   1. Concentrations of Total Cyanide in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
   2. Concentrations of Total Free Cyanide Rounds 3 and 4 in Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
   3. Concentrations of Dissolved Cyanide in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit

4. Concentrations of Dissolved Free Cyanide in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
5. Concentrations of Total Fluoride in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
6. Concentrations of Dissolved Fluoride in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
7. Concentrations of Total Aluminum in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
8. Concentrations of Total Arsenic in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
9. Concentrations of Total Cobalt in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
10. Concentrations of Total Copper in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
11. Concentrations of Total Iron in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
12. Concentrations of Total Lead in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
13. Concentrations of Total Manganese in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
14. Concentrations of Total Thallium in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
15. Concentrations of Dissolved Aluminum in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
16. Concentrations of Dissolved Arsenic in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
17. Concentrations of Dissolved Cobalt in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
18. Concentrations of Dissolved Copper in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit

19. Concentrations of Dissolved Iron in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
20. Concentrations of Dissolved Lead in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
21. Concentrations of Dissolved Manganese in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
22. Concentrations of Dissolved Thallium in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
23. Concentrations of Total Cyanide in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
24. Concentrations of Total Free Cyanide in Rounds 3 and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
25. Concentrations of Dissolved Cyanide in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
26. Concentrations of Dissolved Free Cyanide in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
27. Concentrations of Total Fluoride in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
28. Concentrations of Dissolved Fluoride in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
29. Concentrations of Total Aluminum in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
30. Concentrations of Total Arsenic in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
31. Concentrations of Total Cobalt in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
32. Concentrations of Total Copper in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
33. Concentrations of Total Iron in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
34. Concentrations of Total Lead in Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit

35. Concentrations of Total Manganese in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
36. Concentrations of Total Thallium in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
37. Concentrations of Dissolved Aluminum in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
38. Concentrations of Dissolved Arsenic in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
39. Concentrations of Dissolved Cobalt in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
40. Concentrations of Dissolved Copper in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
41. Concentrations of Dissolved Iron in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
42. Concentrations of Dissolved Lead in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
43. Concentrations of Dissolved Manganese in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
44. Concentrations of Dissolved Thallium in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
45. Concentrations of Alkalinity in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
46. Concentrations of Ammonia in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
47. Concentrations of Chloride in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
48. Concentrations of Hardness as Calcium Carbonate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
49. Concentrations of Nitrate and Nitrite in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
50. Concentrations of Orthophosphate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit

51. Concentrations of Sulfate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
52. Concentrations of Alkalinity in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
53. Concentrations of Ammonia in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
54. Concentrations of Chloride in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
55. Concentrations of Total Hardness as Calcium Carbonate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
56. Concentrations of Total Nitrate and Nitrite in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
57. Concentrations of Orthophosphate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
58. Concentrations of Sulfate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit

I. USEPA Vapor Intrusion Screening Level (VISL) Calculator

J. Slug Testing Curves

1. Geoprobe Software Slug Testing Curves
2. Aqtesolv Software Slug Testing Curves

K. Monitoring Well Construction Logs

L. Surface Water Laboratory Analytical Data Tables – Rounds 1 through 4

1. VOCs in Surface Water – Human Health Screening Levels
2. SVOCs in Surface Water – Human Health Screening Levels
3. Metals in Surface Water – Human Health Screening Levels
4. PCBs in Surface Water – Human Health Screening Levels
5. Pesticides in Surface Water – Human Health Screening Levels
6. General Chemistry in Surface Water – Human Health Screening Levels
7. VOCs in Surface Water – Ecological Screening Levels
8. SVOCs in Surface Water – Ecological Screening Levels
9. Metals in Surface Water – Ecological Screening Levels

10. PCBs in Surface Water – Ecological Screening Levels
11. Pesticides in Surface Water – Ecological Screening Levels
12. General Chemistry in Surface Water – Ecological Screening Levels

M. Surface Water Thematic Maps – Rounds 1 through 4

1. Concentrations of Total Cyanide in Rounds 1,2,3, and 4 Surface Water
2. Concentrations of Free Cyanide in Rounds 3 and 4 Surface Water
3. Concentrations of Dissolved Cyanide in Round 4 Surface Water
4. Concentrations of Dissolved Free Cyanide in Round 4 Surface Water
5. Concentrations of Total Fluoride in Rounds 1,2,3, and 4 Surface Water
6. Concentrations of Dissolved Fluoride in Round 4 Surface Water
7. Concentrations of Total Aluminum in Rounds 1,2,3, and 4 Surface Water
8. Concentrations of Total Arsenic in Rounds 1,2,3, and 4 Surface Water
9. Concentrations of Total Cobalt in Rounds 1,2,3, and 4 Surface Water
10. Concentrations of Total Copper in Rounds 1,2,3, and 4 Surface Water
11. Concentrations of Total Iron in Rounds 1,2,3, and 4 Surface Water
12. Concentrations of Total Lead in Rounds 1,2,3, and 4 Surface Water
13. Concentrations of Total Manganese in Rounds 1,2,3, and 4 Surface Water
14. Concentrations of Total Thallium in Rounds 1,2,3, and 4 Surface Water
15. Concentrations of Dissolved Aluminum in Round 4 Surface Water
16. Concentrations of Dissolved Arsenic in Round 4 Surface Water
17. Concentrations of Dissolved Cobalt in Round 4 Surface Water
18. Concentrations of Dissolved Copper in Round 4 Surface Water
19. Concentrations of Dissolved Iron in Round 4 Surface Water
20. Concentrations of Dissolved Lead in Round 4 Surface Water
21. Concentrations of Dissolved Manganese in Round 4 Surface Water
22. Concentrations of Dissolved Thallium in Round 4 Surface Water
23. Concentrations of Alkalinity in Rounds 1,2,3, and 4 Surface Water

24. Concentrations of Ammonia in Rounds 1,2,3, and 4 Surface Water
25. Concentrations of Chloride in Rounds 1,2,3, and 4 Surface Water
26. Concentrations of Hardness as Calcium Carbonate in Rounds 1,2,3, and 4 Surface Water
27. Concentrations of Nitrate and Nitrite in Rounds 1,2,3, and 4 Surface Water
28. Concentrations of Orthophosphate in Rounds 1,2,3, and 4 Surface Water
29. Concentrations of Sulfate in Rounds 1,2,3, and 4 Surface Water
30. Concentrations of Sulfide in Round 4 Surface Water

N. Piper Plots for Groundwater and Surface Water Geochemistry
1. Piper Plots for Monitoring Wells Screened in Upper Hydrogeologic Unit
2. Piper Plots for Monitoring Wells Screened Below the Upper Hydrogeologic Unit
3. Piper Plots for Surface Water

O. Stiff Diagrams for Groundwater and Surface Water Geochemistry
1. Stiff Diagrams for Monitoring Wells Screened in Upper Hydrogeologic Unit
2. Stiff Diagrams for Monitoring Wells Screened Below the Upper Hydrogeologic Unit
3. Stiff Diagrams for Surface Water

P. Sample Summary Report of General Chemistry in Groundwater and Surface Water
1. Sample Summary Report of General Chemistry for Monitoring Wells Screened in Upper Hydrogeologic Unit
2. Sample Summary Report of General Chemistry for Monitoring Wells Screened Below the Upper Hydrogeologic Unit
3. Sample Summary Report of General Chemistry in Surface Water

Q. General Chemistry Ion Balance

R. Geochemical Modeling Evaluation

S. Data Validation Reports

T. Method Detection Limit Comparison Table

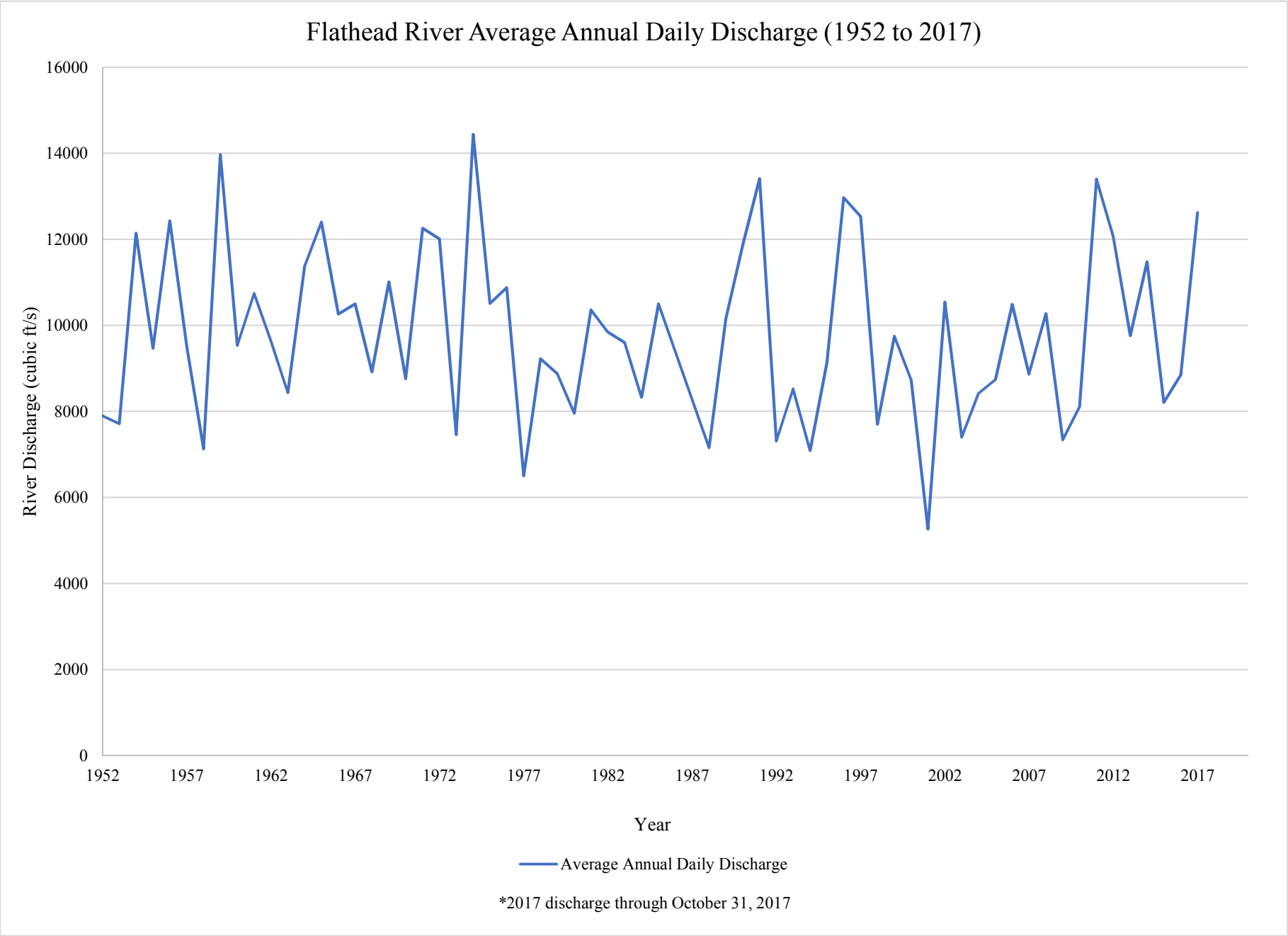
1. Method Detection Limit Comparison Table in Groundwater
2. Method Detection Limit Comparison Table in Surface Water – Human Health Screening Levels
3. Method Detection Limit Comparison Table in Surface Water – Ecological Screening Levels

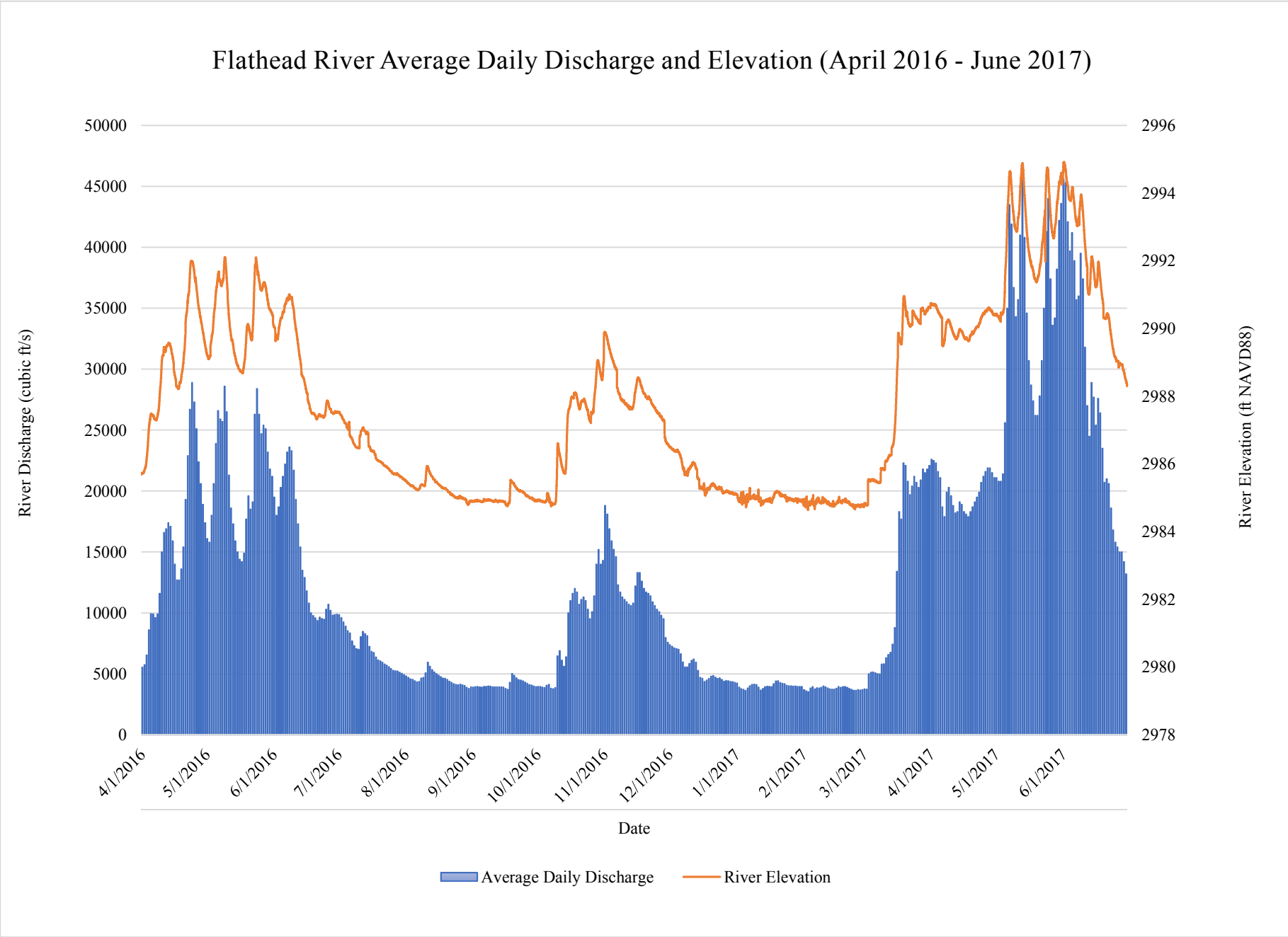
APPENDIX A

USGS Flathead River Station Discharge and Elevation Graphs

1. Flathead River Annual Average Discharge (1952 to 2017)
2. Flathead River Daily Mean Discharge and Elevation (April 2016 to June 2017)

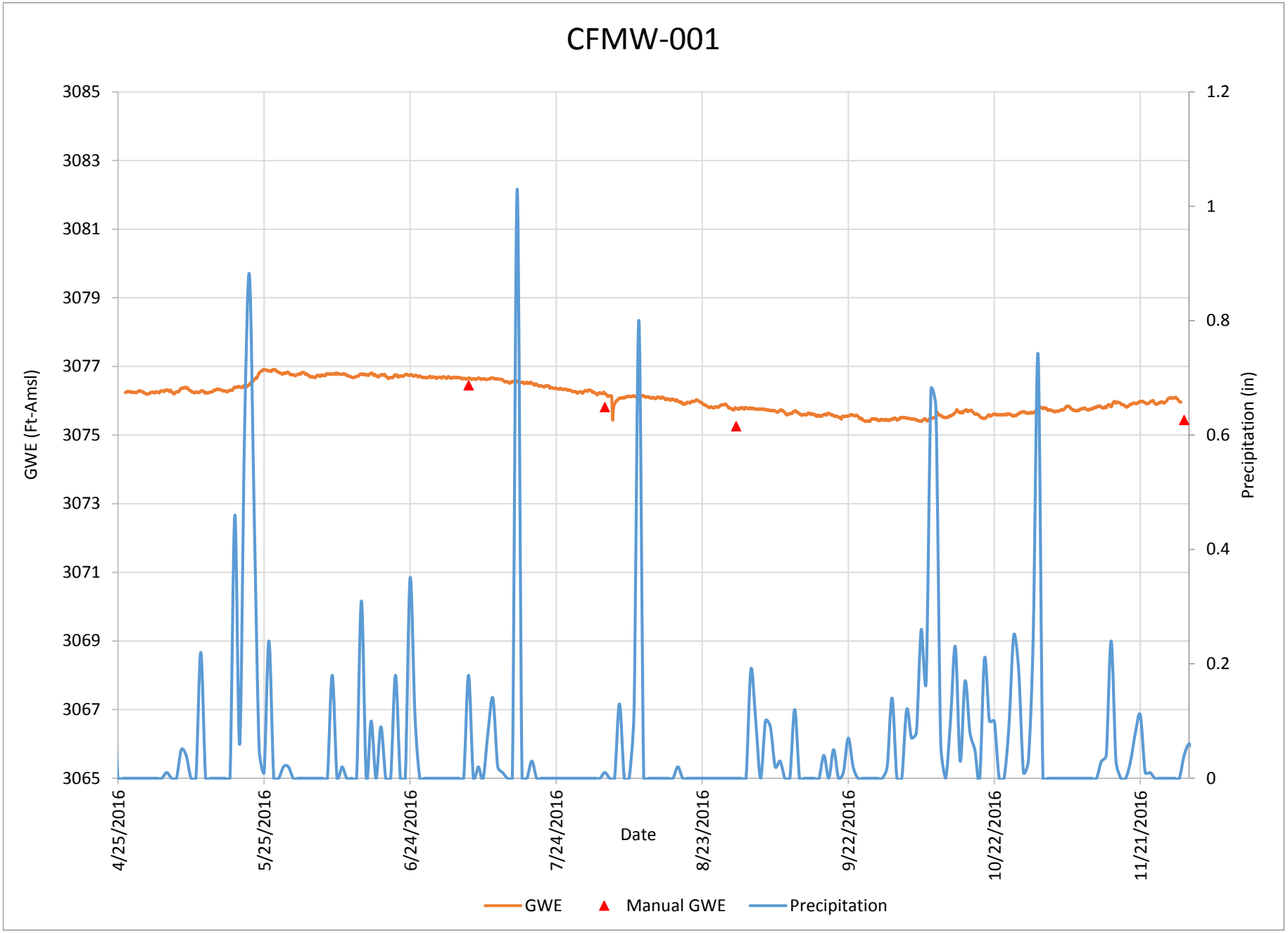
Appendix A1. Flathead River Average Annual Daily Discharge (1952 to 2017)
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

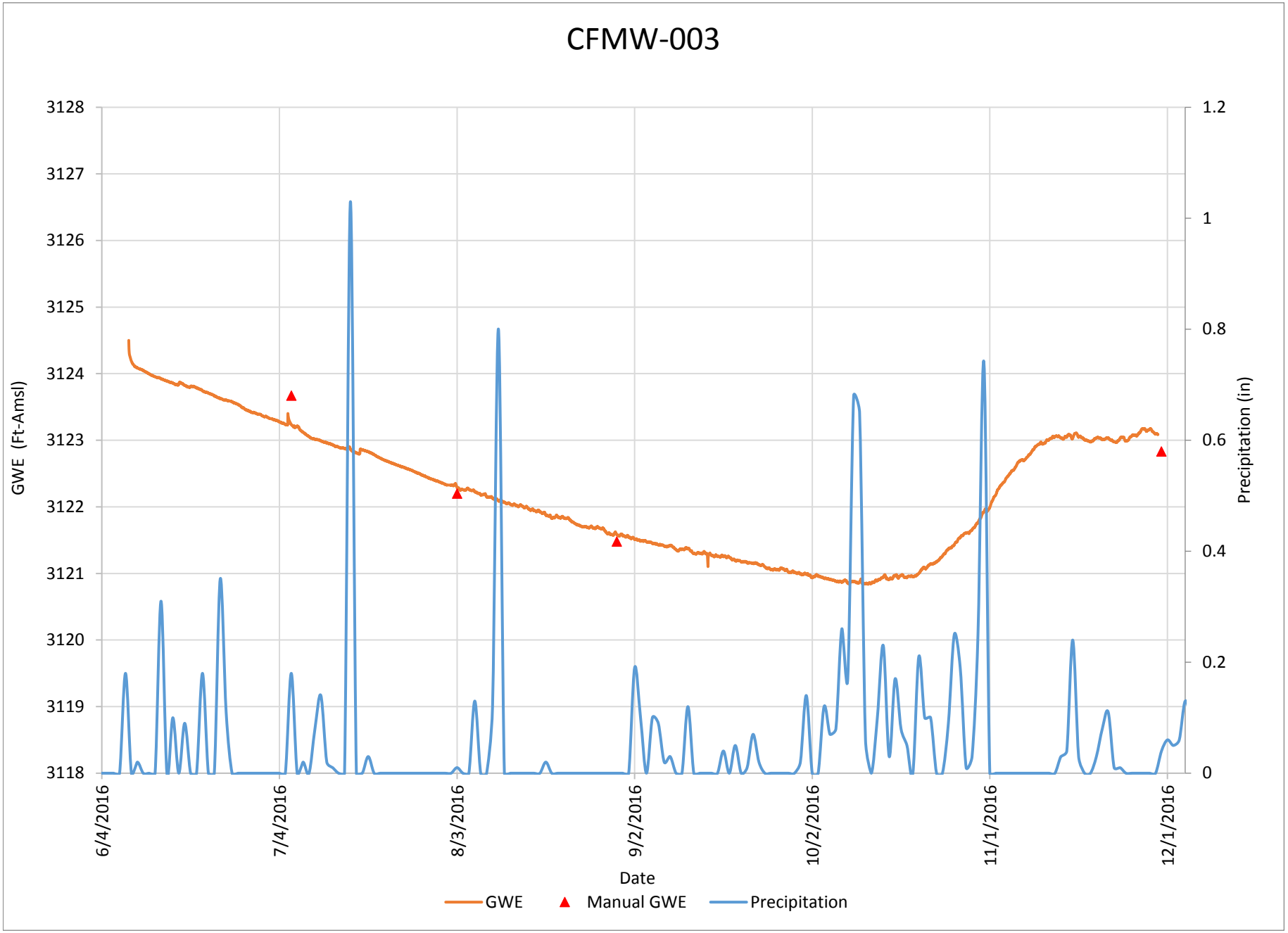


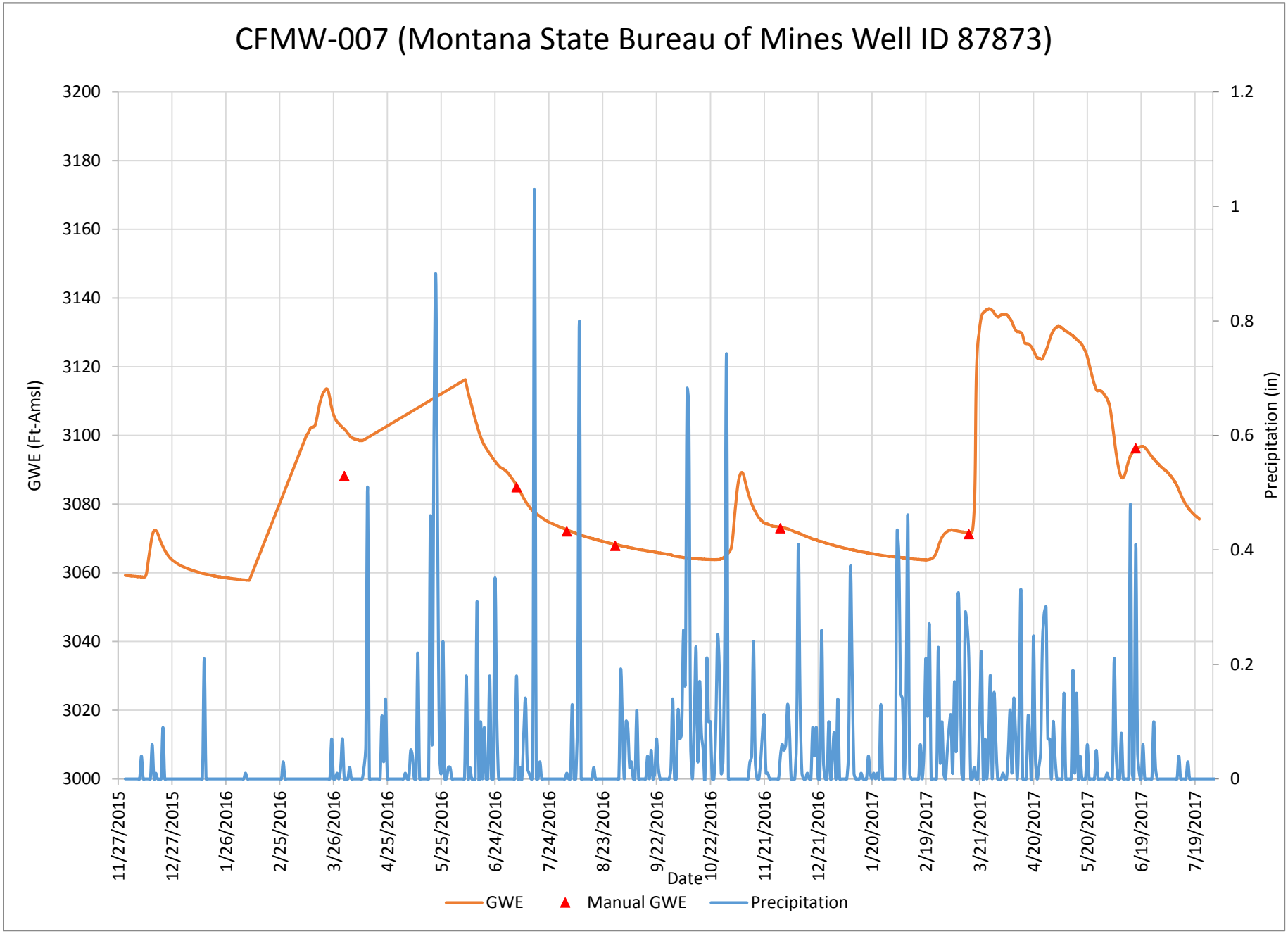

Flathead River Average Daily Discharge and Elevation (April 2016 - June 2017)
River Discharge (cubic ft/s)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
River Elevation (ft NAVD88)
2996
2994
2992
2990
2988
2986
2984
2982
2980
2978
4/1/2016
5/1/2016
6/1/2016
7/1/2016
8/1/2016
9/1/2016
10/1/2016
11/1/2016
12/1/2016
1/1/2017
2/1/2017
3/1/2017
4/1/2017
5/1/2017
6/1/2017
Date
Average Daily Discharge
River Elevation

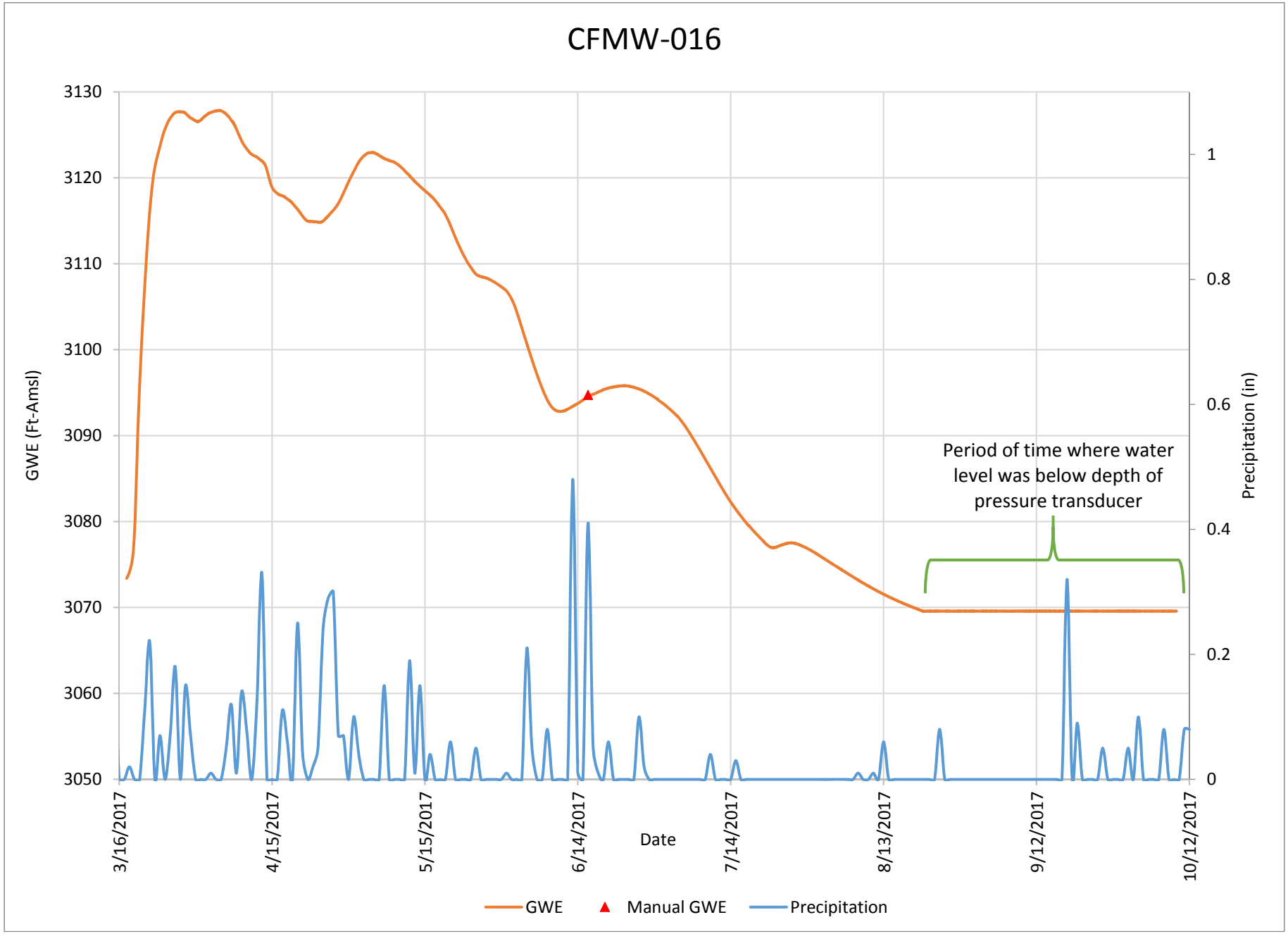
APPENDIX B

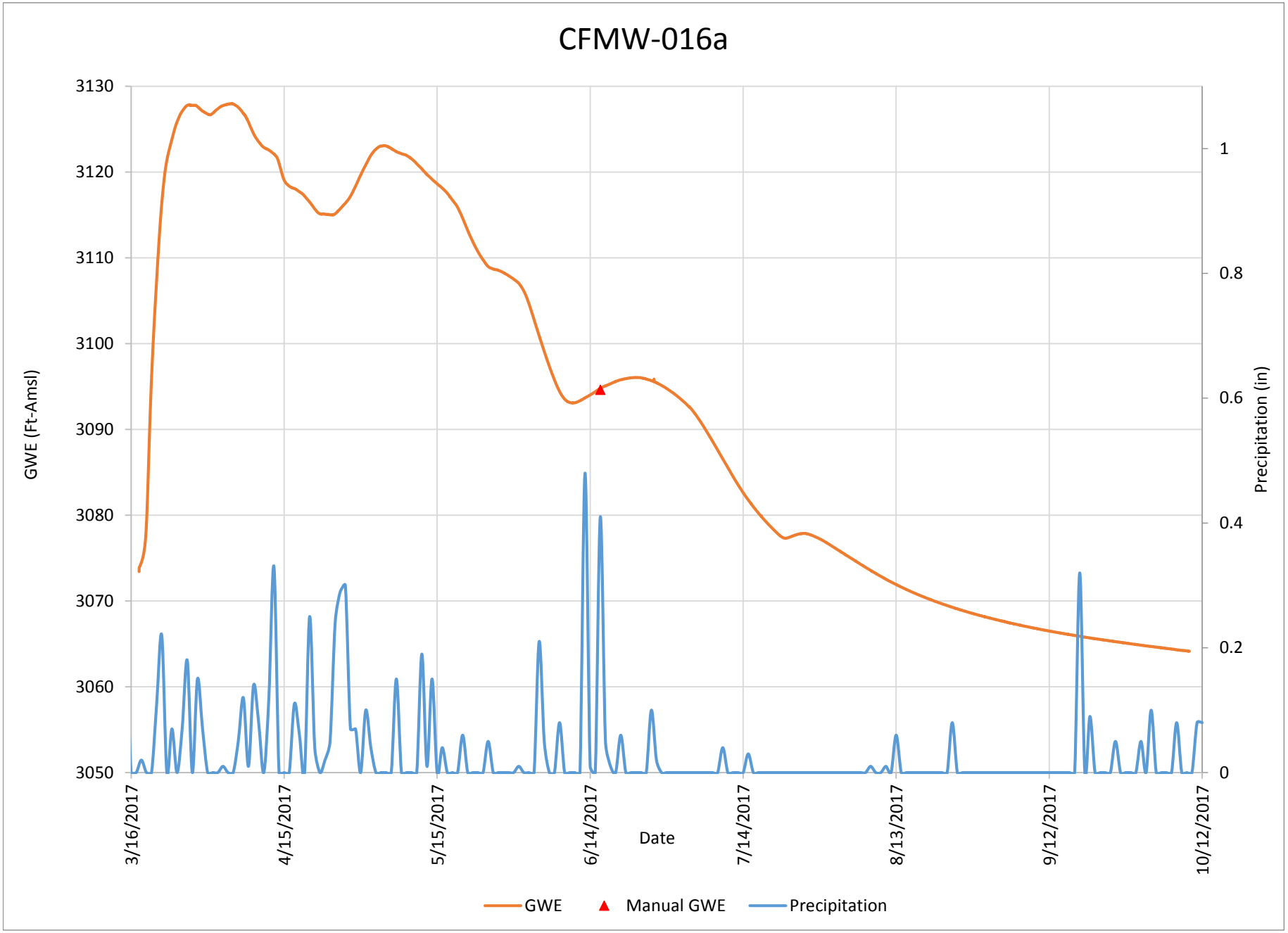
Hydrographs from Long Term Pressure Transducer Data

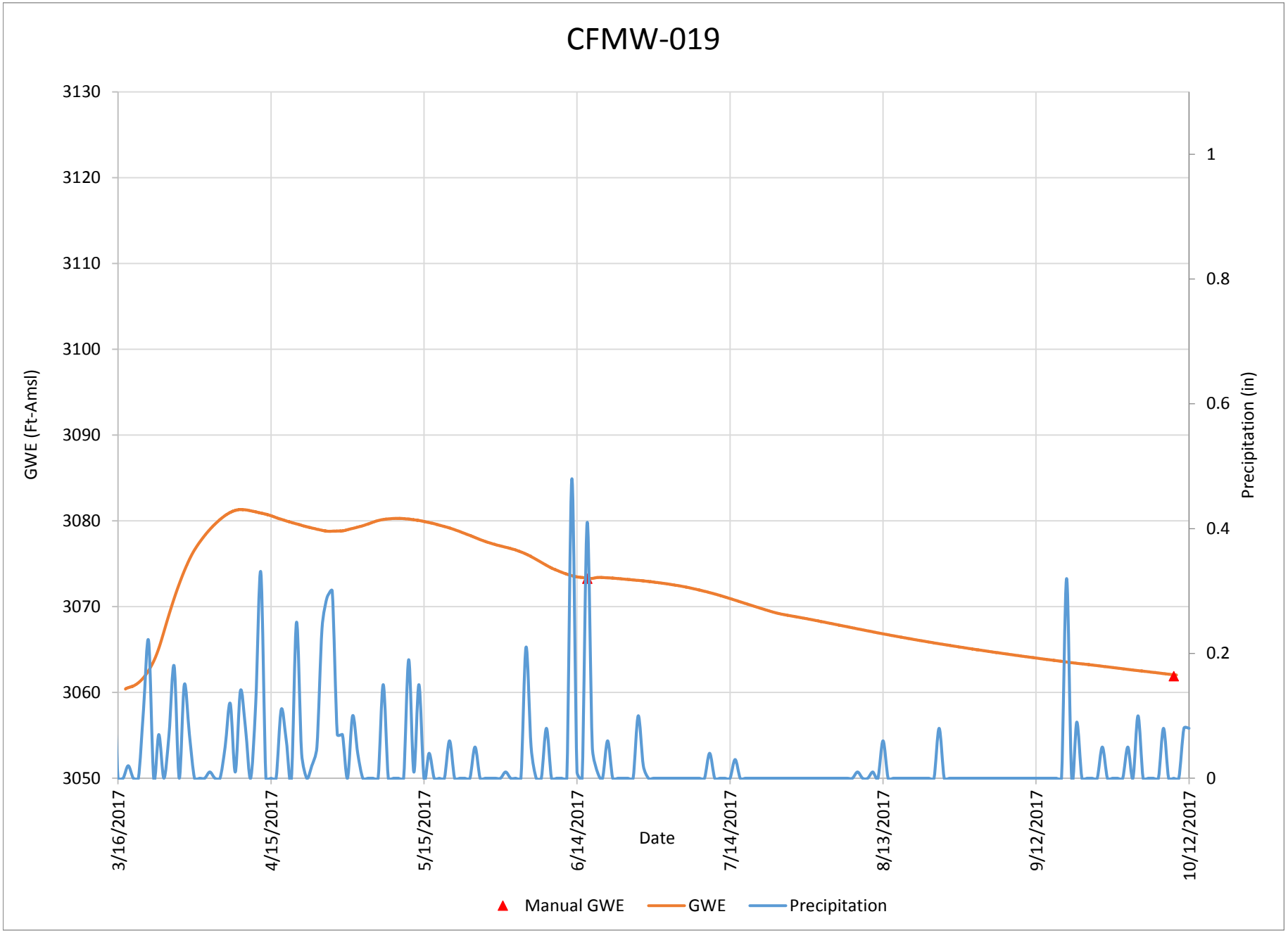

CFMW-001
GWE (Ft-Amsl)
3085
3083
3081
3079
3077
3075
3073
3071
3069
3067
3065
Precipitation (in)
1.2
1
0.8
0.6
0.4
0.2
0
4/25/2016
5/25/2016
6/24/2016
7/24/2016
8/23/2016
9/22/2016
10/22/2016
11/21/2016
Date
GWE
Manual GWE
Precipitation

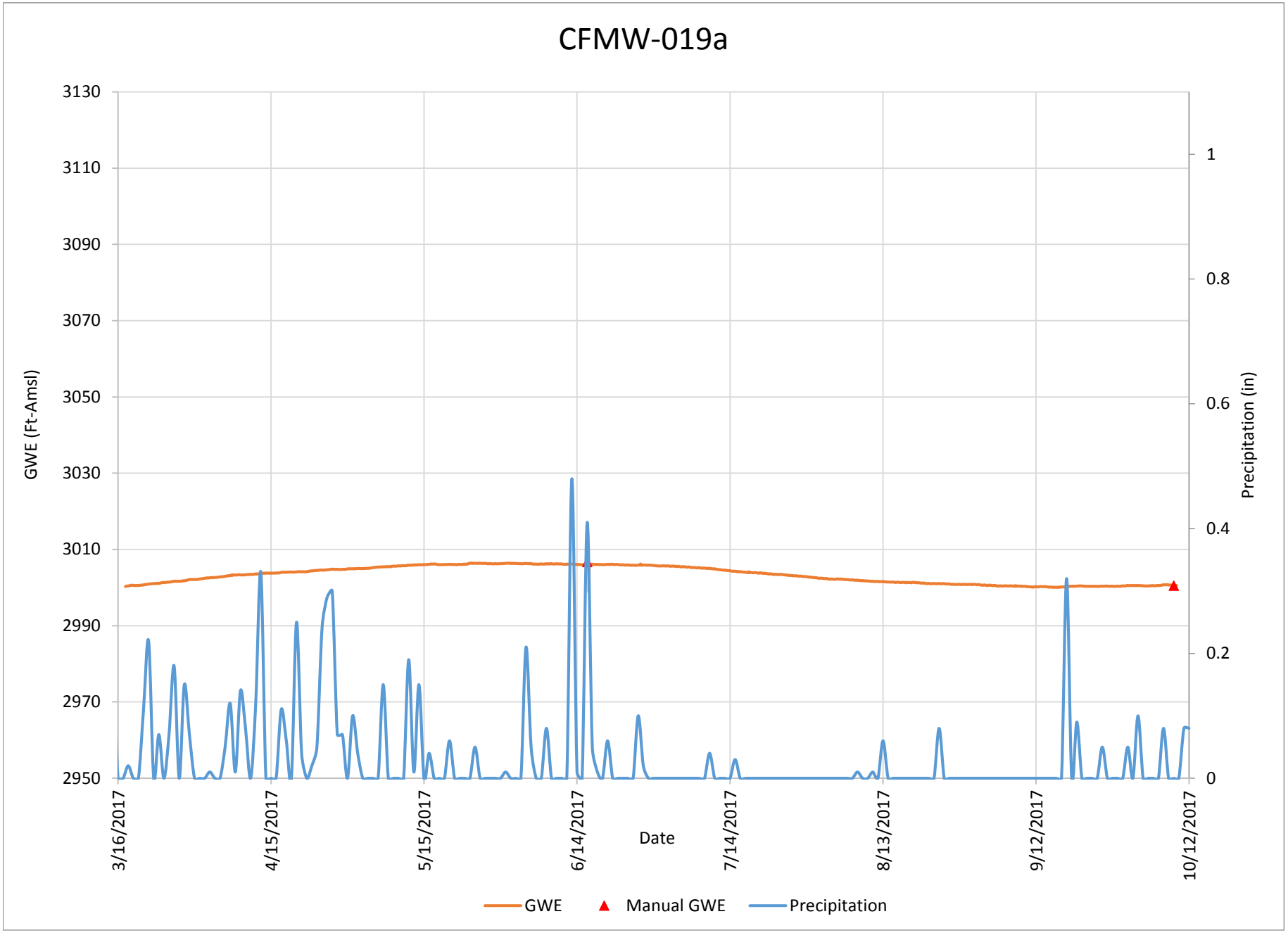

CFMW-003
3128
3127
3126
3125
3124
3123
3122
3121
3120
3119
3118
GWE (Ft-Amsl)
1.2
1
0.8
0.6
0.4
0.2
0
Precipitation (in)
6/4/2016
7/4/2016
8/3/2016
9/2/2016
10/2/2016
11/1/2016
12/1/2016
Date
GWE
Manual GWE
Precipitation

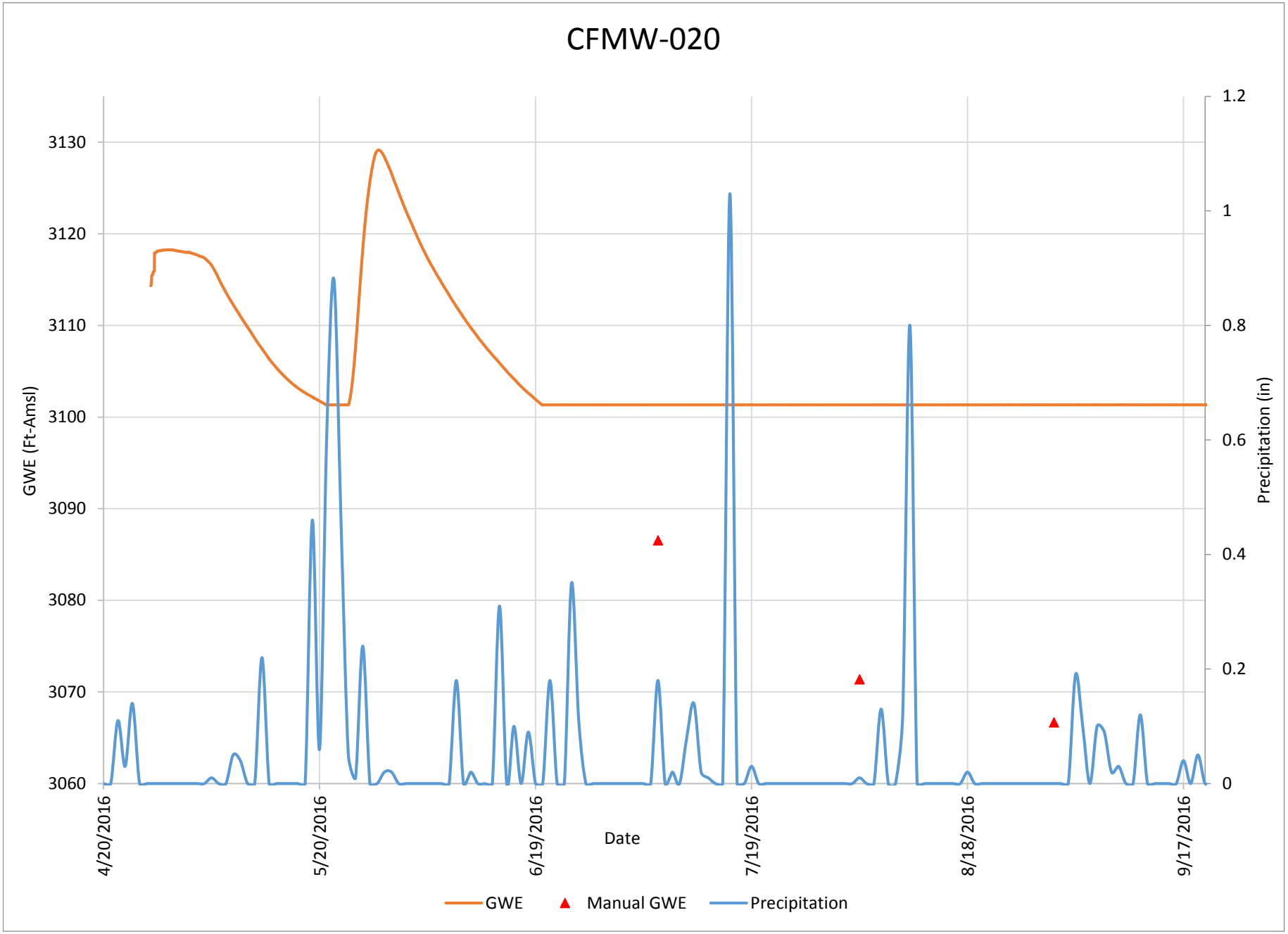

CFMW-007 (Montana State Bureau of Mines Well ID 87873)
GWE (Ft-Amsl)
Precipitation (in)
3200
3180
3160
3140
3120
3100
3080
3060
3040
3020
3000
1.2
1
0.8
0.6
0.4
0.2
0
11/27/2015
12/27/2015
1/26/2016
2/25/2016
3/26/2016
4/25/2016
5/25/2016
6/24/2016
7/24/2016
8/23/2016
9/22/2016
10/22/2016
11/21/2016
12/21/2016
1/20/2017
2/19/2017
3/21/2017
4/20/2017
5/20/2017
6/19/2017
7/19/2017
Date
GWE
Manual GWE
Precipitation

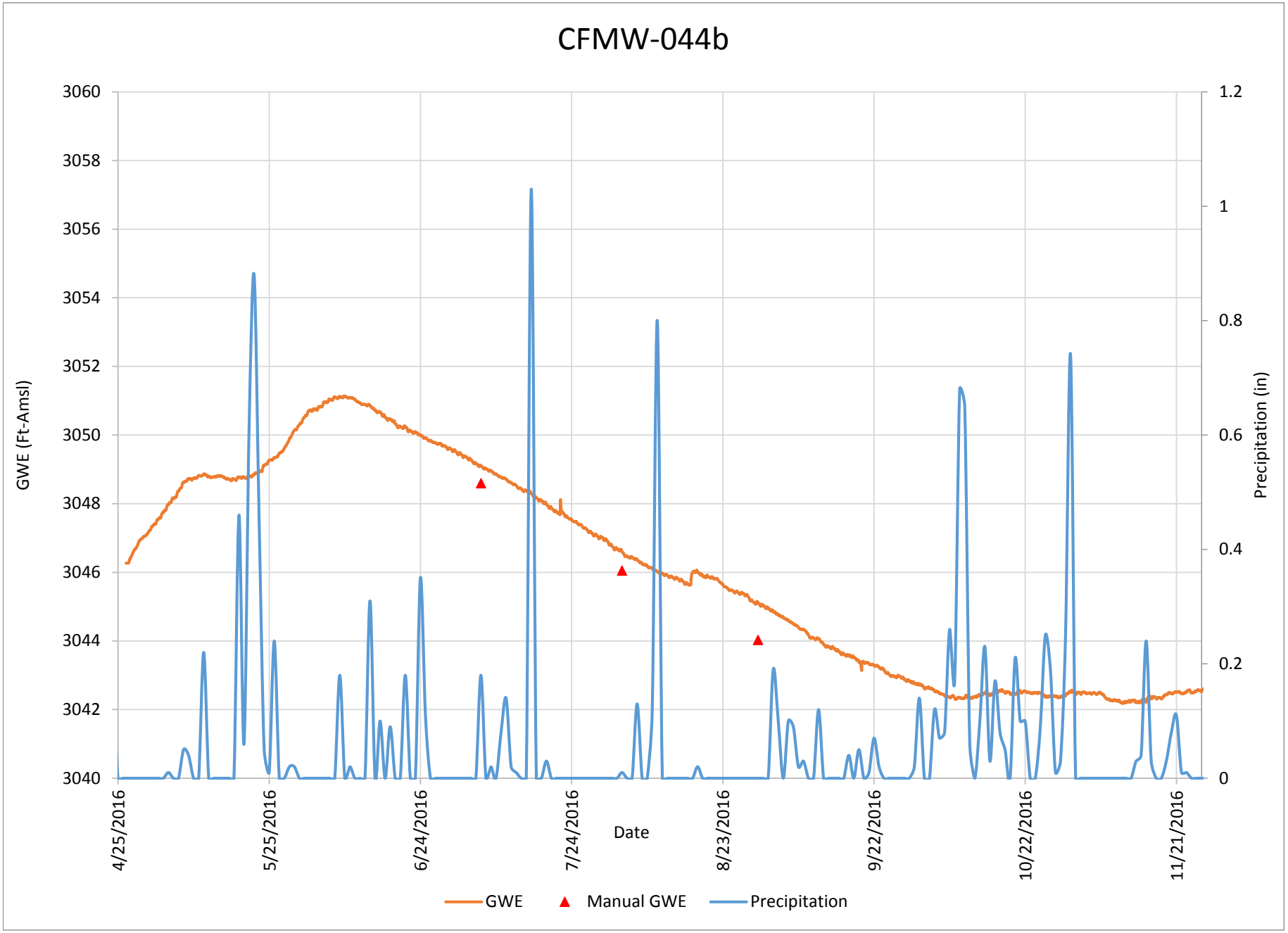

CFMW-016
GWE (Ft-Amsl)
3130
3120
3110
3100
3090
3080
3070
3060
3050
Precipitation (in)
1
0.8
0.6
0.4
0.2
0
Period of time where water level was below depth of pressure transducer
3/16/2017
4/15/2017
5/15/2017
6/14/2017
7/14/2017
8/13/2017
9/12/2017
10/12/2017
Date
GWE
Manual GWE
Precipitation

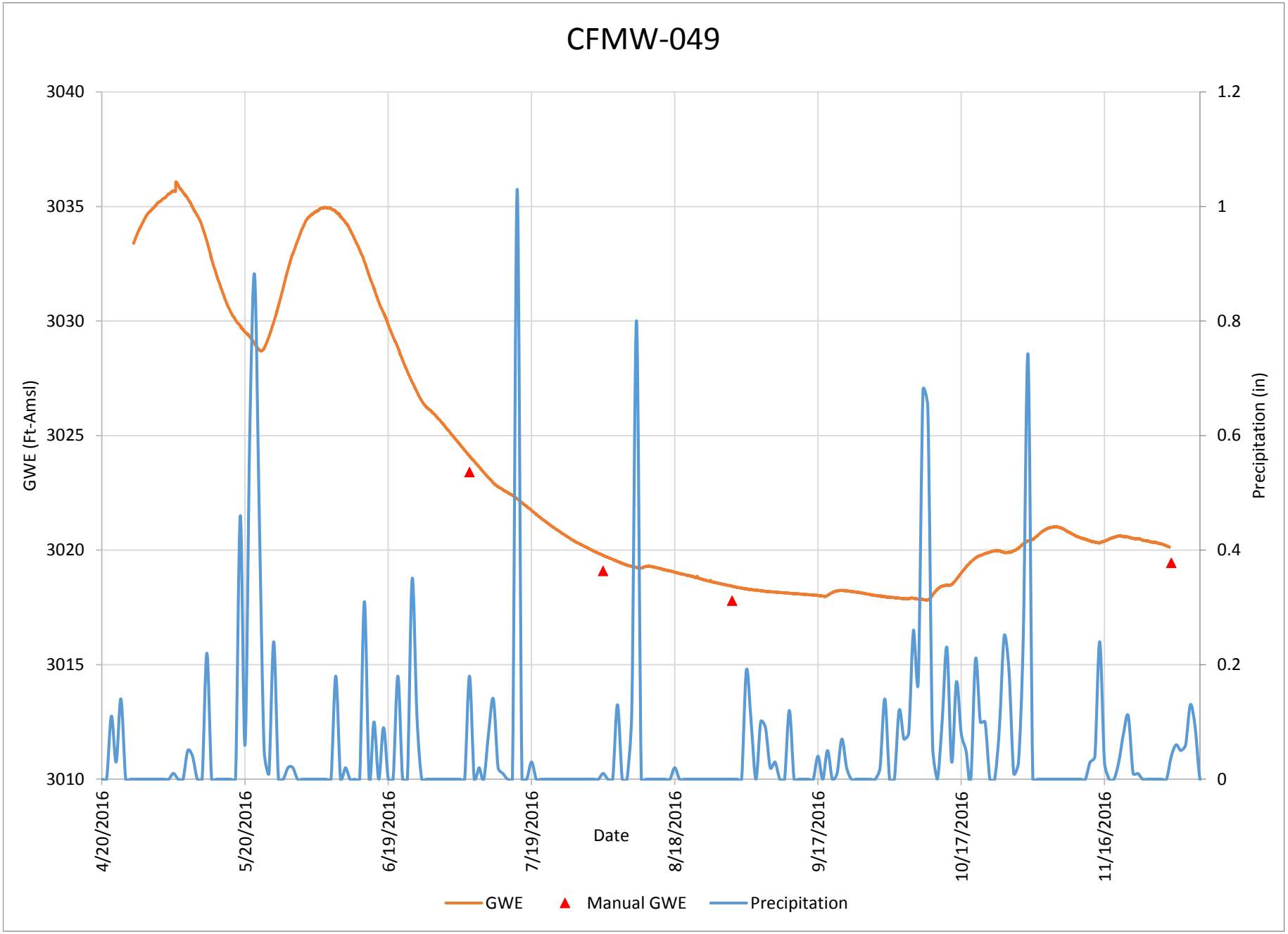

CFMW-016a
GWE (Ft-Amsl)
3130
3120
3110
3100
3090
3080
3070
3060
3050
Precipitation (in)
1
0.8
0.6
0.4
0.2
0
3/16/2017
4/15/2017
5/15/2017
6/14/2017
7/14/2017
8/13/2017
9/12/2017
10/12/2017
Date
GWE
Manual GWE
Precipitation

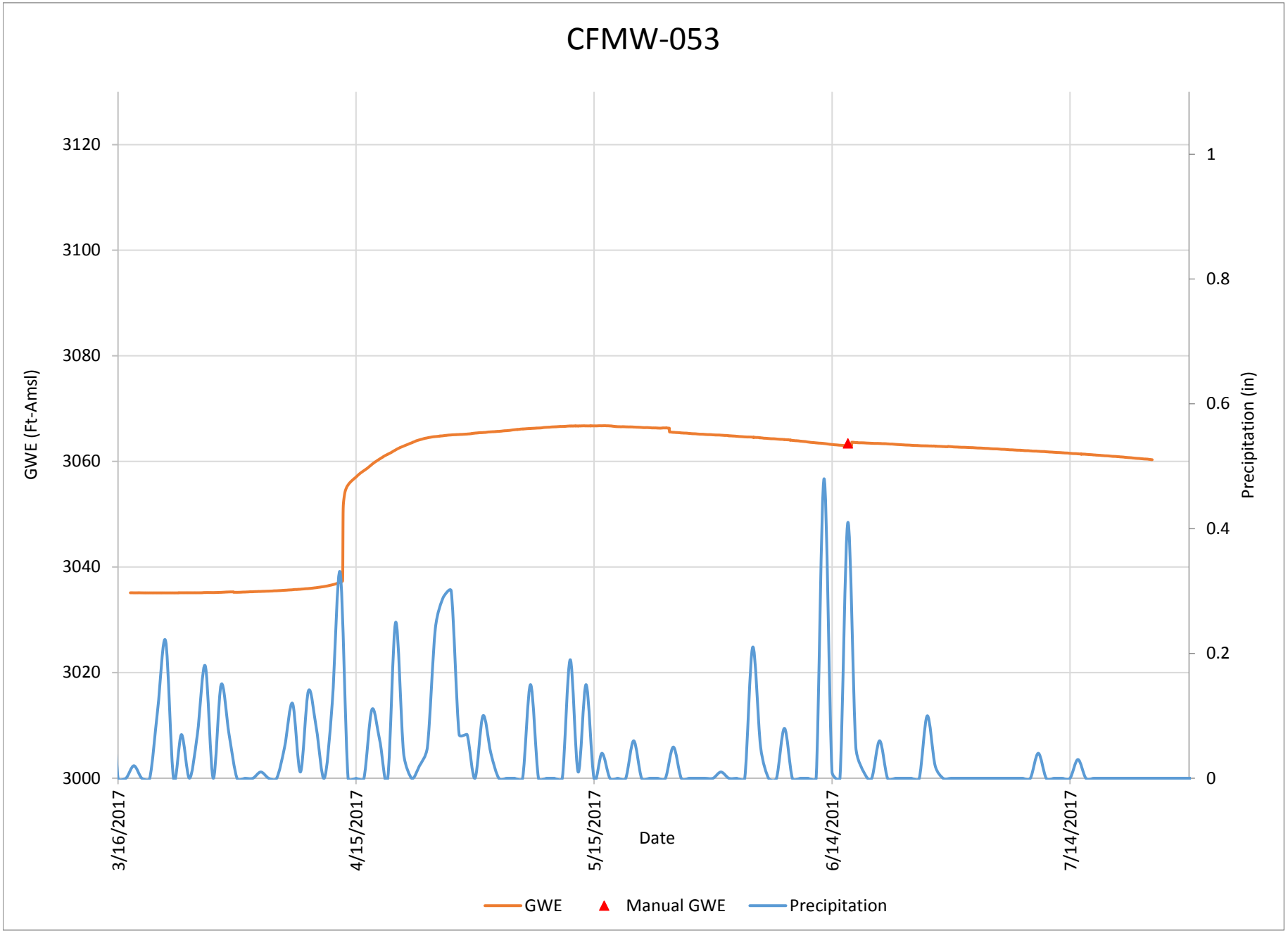

CFMW-019
GWE (Ft-Amsl)
3130
3120
3110
3100
3090
3080
3070
3060
3050
Precipitation (in)
1
0.8
0.6
0.4
0.2
0
3/16/2017
4/15/2017
5/15/2017
6/14/2017
7/14/2017
8/13/2017
9/12/2017
10/12/2017
Date
Manual GWE
GWE
Precipitation

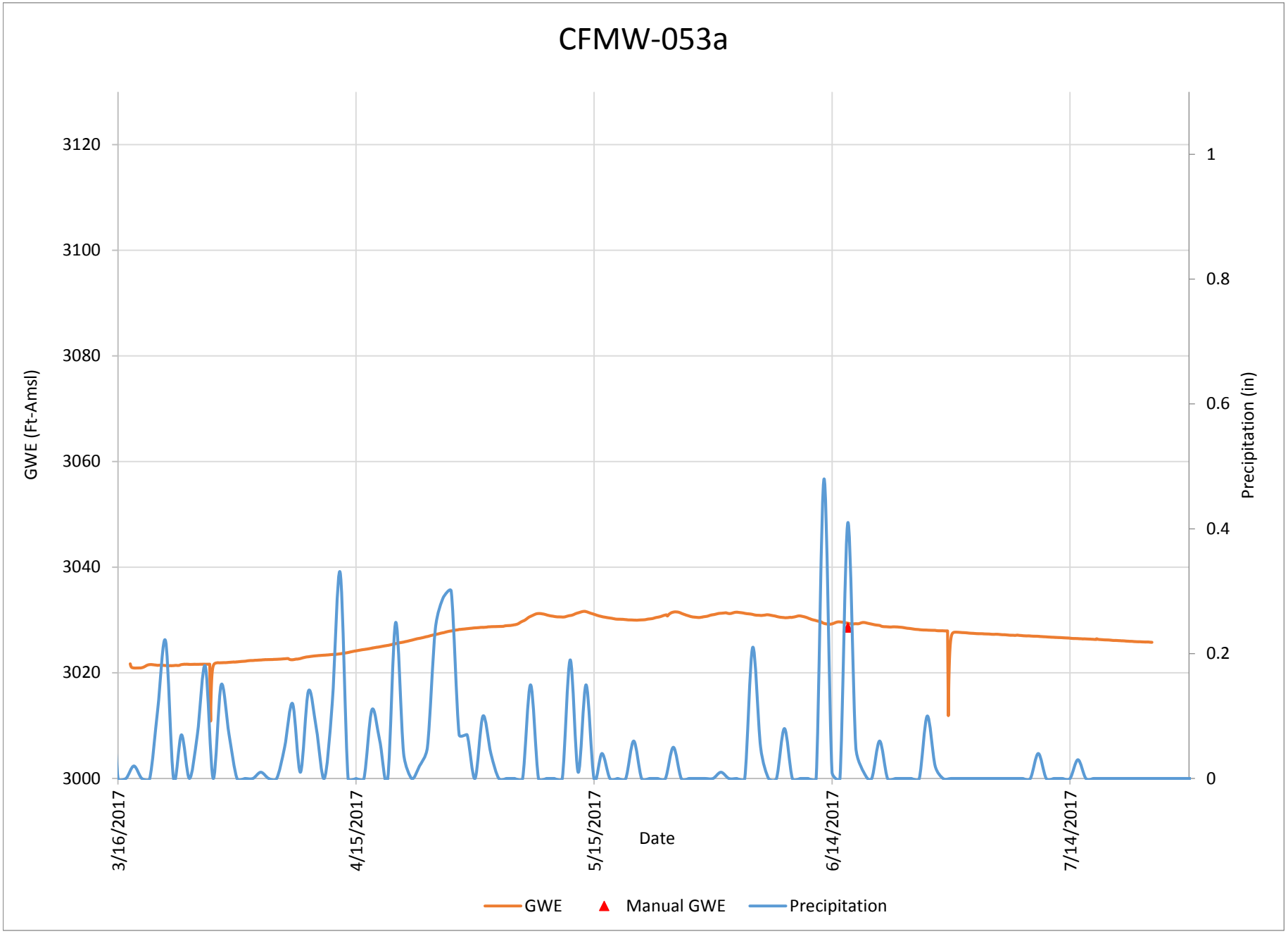

CFMW-019a
GWE (Ft-Amsl)
3130
3110
3090
3070
3050
3030
3010
2990
2970
2950
Precipitation (in)
1
0.8
0.6
0.4
0.2
0
3/16/2017
4/15/2017
5/15/2017
6/14/2017
7/14/2017
8/13/2017
9/12/2017
10/12/2017
Date
GWE
Manual GWE
Precipitation

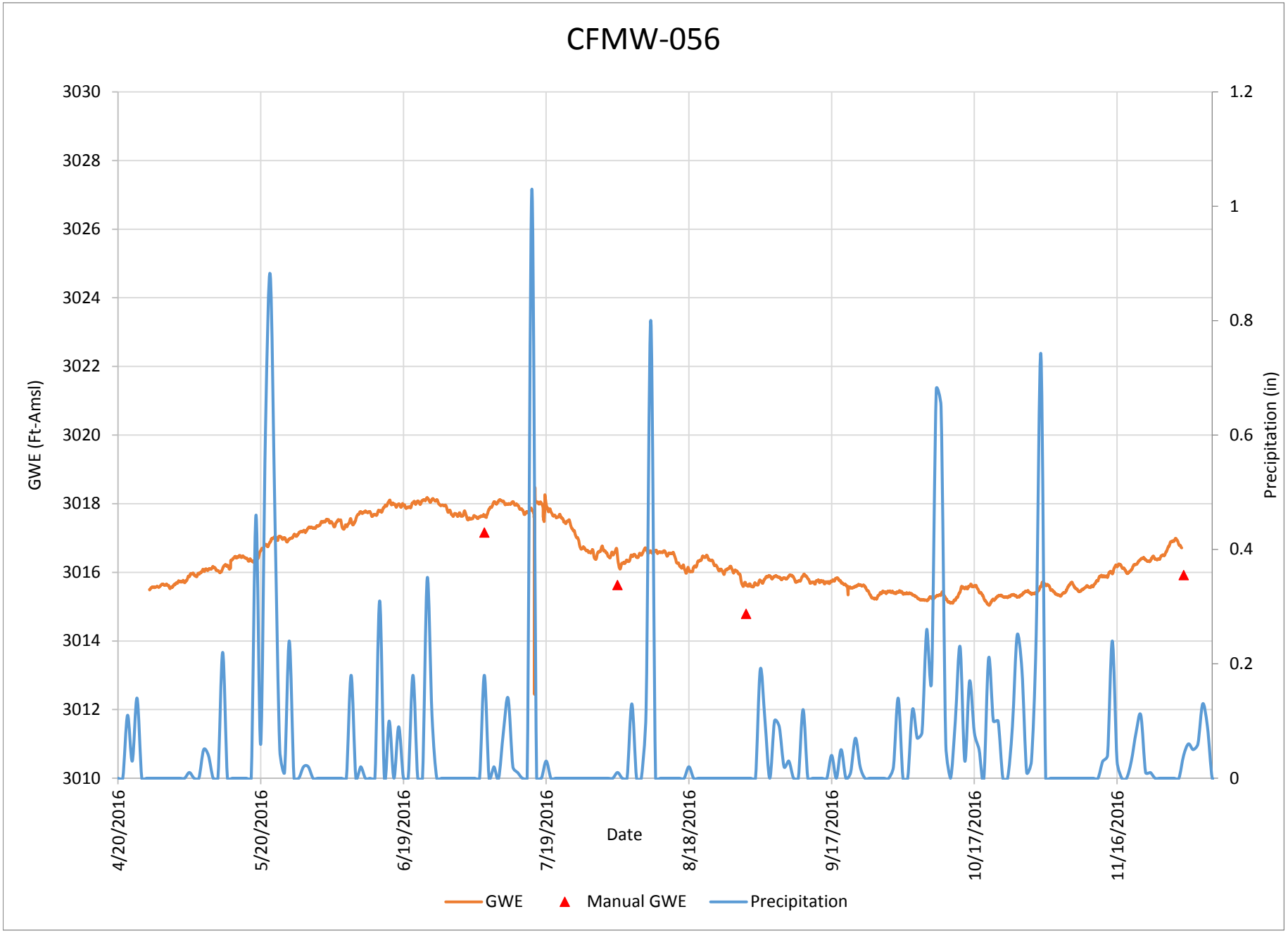

CFMW-020
GWE (Ft-Amsl)
3130
3120
3110
3100
3090
3080
3070
3060
Precipitation (in)
1.2
1
0.8
0.6
0.4
0.2
0
4/20/2016
5/20/2016
6/19/2016
7/19/2016
8/18/2016
9/17/2016
Date
GWE
Manual GWE
Precipitation


CFMW-044b
GWE (Ft-Amsl)
3060
3058
3056
3054
3052
3050
3048
3046
3044
3042
3040
Precipitation (in)
1.2
1
0.8
0.6
0.4
0.2
0
4/25/2016
5/25/2016
6/24/2016
7/24/2016
8/23/2016
9/22/2016
10/22/2016
11/21/2016
Date
GWE
Manual GWE
Precipitation


CFMW-049
3040
3035
3030
3025
3020
3015
3010
GWE (Ft-Amsl)
1.2
1
0.8
0.6
0.4
0.2
0
Precipitation (in)
4/20/2016
5/20/2016
6/19/2016
7/19/2016
8/18/2016
9/17/2016
10/17/2016
11/16/2016
Date
GWE
Manual GWE
Precipitation


CFMW-053
GWE (Ft-Amsl)
3120
3100
3080
3060
3040
3020
3000
Precipitation (in)
1
0.8
0.6
0.4
0.2
0
3/16/2017
4/15/2017
5/15/2017
6/14/2017
7/14/2017
Date
GWE
Manual GWE
Precipitation


CFMW-053a
GWE (Ft-Amsl)
3120
3100
3080
3060
3040
3020
3000
Precipitation (in)
1
0.8
0.6
0.4
0.2
0
3/16/2017
4/15/2017
5/15/2017
6/14/2017
7/14/2017
Date
GWE
Manual GWE
Precipitation


CFMW-056
GWE (Ft-Amsl)
3030
3028
3026
3024
3022
3020
3018
3016
3014
3012
3010
Precipitation (in)
1.2
1
0.8
0.6
0.4
0.2
0
4/20/2016
5/20/2016
6/19/2016
7/19/2016
8/18/2016
9/17/2016
10/17/2016
11/16/2016
Date
GWE
Manual GWE
Precipitation

APPENDIX C

Field Data Sheets

1. Groundwater Sample Field Data Sheets
2. Surface Water Sample Field Data Sheets
3. Slug Testing Field Data Sheets

APPENDIX C-1

Groundwater Sample Field Data Sheets

Well Sampling Sheet

Well ID: CFMW-001 Date: 9/20/16

DTW: 98.54 Depth of Pump Intake: ~151'

DTB: 155.20 Total Volume Purged: ~3.5

Purge Start:		Time:	1045	CPM:	3	psi:	80	Discharge Rate:	10
Purge End:		Time:	1330	CPM:	3	psi:	80	Discharge Rate:	10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1250	98.85	250	14.88	0.247	0.00	9.56	4	941	
1255	98.92		13.03	0.354	0.00	7.40	-36	802	
1300	98.90		12.64	0.360	0.00	7.02	-25	710	
1305	98.93		12.44	0.363	0.00	6.83	-18	661	
1310	98.99		12.53	0.361	0.00	6.77	-16	598	
1315	99.03		12.43	0.353	0.00	6.70	-20	575	
1320	98.99		12.26	0.348	0.00	6.66	-24	545	
1325	99.06		12.28	0.347	0.00	6.67	-31	508	~3.5

Purge Water Description: slightly cloudy

Sample ID: CFMW-001-GW Sample Time: 1330

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba FA01191

Pump FA01196

Control FA02269

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-002 Date: 9-12-16

DTW: 81.41 Depth of Pump Intake: 82.65

DTB: 82.65 Total Volume Purged: 2.5

Purge Start:	0800	Time:	0800	CPM:	4	psi:	50	Discharge Rate:	150 mL/min
Purge End:	0925	Time:	0925	CPM:	4	psi:	50	Discharge Rate:	100 mL/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0809	81.65	150	9.31	0.855	6.74	7.32	278	827	0.2
0814	81.65	150	8.81	0.862	5.45	7.86	306	386	0.3
0819	81.65	100	8.66	0.858	4.85	7.97	313	224	0.5
0824	81.65	100	8.61	0.864	4.25	8.02	317	125	0.8
0829	81.65	100	8.61	0.869	3.72	8.04	316	70.5	1.0
0834	81.65	100	8.58	0.882	2.45	8.07	316	41.9	1.2
0839	81.65	100	8.55	0.889	2.28	8.08	317	45.5	1.4
0842	81.65	100	8.55	0.893	2.15	8.05	317	29.1	1.7
0845	81.65	100	8.52	0.895	2.06	8.09	318	22.4	1.9
0848	81.65	100	8.47	0.913	1.99	8.10	318	22.7	2.1
0851	81.65	100	8.45	0.909	1.96	8.10	319	20.5	2.3

Purge Water Description: Cloudy at beginning then clear, slight yellow color

Sample ID: CFMW-002-GW Sample Time: 0855

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA0877

Pump: FA0081

Control box: FA01037

Well Sampling Sheet

Well ID: CFMW-003 Date: 9/14/16

DTW: 23.78 Depth of Pump Intake: ~50'

DTB: 54.42 Total Volume Purged: 8.25 gals

Purge Start:		Time:	0734	CPM:	3	psi:	38	Discharge Rate:	9
Purge End:		Time:	0915	CPM:	3	psi:	38	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0742	23.98	300	–	–	–	–	–	–	
0747	23.97	300	–	–	–	–	–	–	
0757	23.98	300	–	–	–	–	–	–	
0807	23.98	300	–	–	–	–	–	–	
0812	23.98	300	8.45	2.65	2.09	7.17	383	>1000	
0822	23.98	300	8.45	2.64	1.92	7.20	381	611	
0827	|	|	8.55	2.63	1.61	7.28	374	967	
0832	|	|	8.70	2.61	1.39	7.34	368	652	
0837	|	|	8.69	2.60	1.34	7.37	365	474	
0842	|	|	8.68	2.60	1.27	7.41	361	387	
0859	23.98	|	8.04	2.64	1.17	7.53	347	275	
0904	|	300	8.16	2.64	1.12	7.50	347	222	~7.5 gals
0909	|	|	8.31	2.62	1.01	7.41	349	204	
0912	23.98	300	8.37	2.62	0.97	7.36	350	184	~8.25

Purge Water Description: cloudy

Sample ID: CFMW-003-GW Sample Time: 0915

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Note - Horiba not reading extra until 0812 due to heavy silts in water.

Horiba FA00877 Pump FA01196

Control Box FA02121

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Well Sampling Sheet

Well ID: CFMW-003a
Date: 9/20/16
DTW: 151.15
Depth of Pump Intake: 200.0
DTB: 203.21
Total Volume Purged: 22

Purge Start:		Time:	740	CPM:	3	psi:	105	Discharge Rate:	9
Purge End:		Time:	1020	CPM:	3	psi:	105	Discharge Rate:	7.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
751	152.25	80	10.46	0.354	6.95	7.80	-298	1000	0.1
756	152.57	80	10.09	0.351	4.24	7.83	-392	1000	0.2
801	152.90	80	9.91	0.353	3.39	7.51	-430	1000	0.3
806	153.36	80	9.78	0.357	2.92	7.29	-458	1000	0.4
811	153.41	60	9.75	0.360	2.61	7.29	-473	1000	0.5
816	153.53	60	9.72	0.362	2.42	7.37	-481	1000	0.6
821	153.55	60	9.68	0.362	2.28	7.48	-484	1000	0.7
826	153.58	60	9.67	0.355	2.16	7.69	-488	1000	0.8
831	153.58	60	9.66	0.343	2.05	7.92	-495	1000	0.9
836	153.59	60	9.67	0.329	1.94	8.13	-494	1000	1.0
841	153.54	60	9.69	0.317	1.86	8.32	-505	1000	1.1
844	153.49	60	9.69	0.313	1.81	8.42	-505	1000	1.2
847	153.44	60	9.72	0.308	1.79	8.53	-507	1000	1.3
852	153.39	60	9.75	0.301	1.75	8.63	-510	1000	1.4
855	153.34	60	9.83	0.296	1.71	8.76	-506	1000	1.5
858	153.26	60	9.83	0.293	1.68	8.84	-509	1000	1.6

← changed tame

Purge Water Description: brown and cloudy ~~in beginning then clear~~ MB.

Sample ID: CFMW-003a-GW
Sample Time: 0915
Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA00877
pump: FA01081
control box: FA02184

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Well Sampling Sheet

Well ID: CFMW-003A

Date: 9/20/16

DTW: 151.15

Depth of Pump Intake: 200.0

DTB: 203.21

Total Volume Purged: 2.2

Purge Start:		Time:	740	CPM:	3	psi:	105	Discharge Rate:	9
Purge End:		Time:	1020	CPM:	3	psi:	105	Discharge Rate:	25

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
901	153.23	60	9.82	0.288	1.66	8.94	-508	1000	1.7
904	153.23	60	9.79	0.284	1.62	9.05	-512	1000	1.8
907	153.23	60	9.79	0.282	1.59	9.09	-511	1000	1.9
910	153.23	60	9.77	0.281	1.59	9.10	-514	1000	2.0

Purge Water Description: Cloudy, brown color

Sample ID: CFMW-003A-GW

Sample Time: 0915

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Honda: FA00877

Pump: FA01081

Control box: FA02184

Well Sampling Sheet

Well ID: CFMW-007 Date: 9-21-16

DTW: 83.55 Depth of Pump Intake: 156.0

DTB: 159.70 Total Volume Purged: 2.50

Purge Start:		Time:	800	CPM:	3	psi:	120	Discharge Rate:	9.
Purge End:		Time:	930	CPM:	3	psi:	110	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
820	83.55	330	9.07	0.433	18.13	5.98	472	181	0.25
825	83.55	330	8.47	0.364	5.57	7.92	389	151	0.5
830	83.55	330	8.32	0.361	4.03	8.18	370	144	0.75
835	83.55	330	8.30	0.361	3.38	8.34	355	116	1.00
840	83.55	330	8.23	0.361	3.02	8.38	347	117	1.25
845	83.55	330	8.27	0.362	2.77	8.45	340	113	1.50
850	83.55	330	8.24	0.362	2.65	8.40	339	123	1.75
855	83.55	330	8.21	0.362	2.49	8.40	335	992	2.00
900	83.55	330	8.24	0.362	2.43	8.45	333	107	2.25
903	83.55	330	8.24	0.362	2.33	8.46	330	99.6	2.45

Purge Water Description: clear w/ brown color

Sample ID: CFMW-007-GW Sample Time: 0905

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

pump: FA01081

control box FA02184

Well Sampling Sheet

Well ID: CFMW-008 Date: 9-21-16

DTW: 88.00 Depth of Pump Intake: 186.0

DTB: 189.21 Total Volume Purged:

Purge Start:		Time:	1045	CPM:	3	psi:	100	Discharge Rate:	12
Purge End:		Time:	1155	CPM:	3	psi:	100	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1053	88.27	150	11.17	0.620	7.96	9.39	281	128	0.1
1058	88.27	150	10.50	0.578	6.50	9.35	254	195	0.2
1103	88.27	150	10.21	0.611	3.93	9.35	238	214	0.3
1108	88.27	150	10.14	0.619	2.53	9.34	224	208	0.4
1113	88.27	150	10.08	0.624	1.92	9.33	213	190	0.5
1118	88.27	150	10.09	0.626	1.59	9.32	203	196	0.6
1123	88.27	150	10.05	0.628	1.41	9.32	195	191	0.7
1126	88.27	150	10.13	0.628	1.33	9.32	189	196	0.8
1129	88.27	150	10.12	0.629	1.27	9.32	185	198	0.9
1132	88.27	150	10.16	0.630	1.23	9.32	181	183	1.0

Purge Water Description: clear with greyish brown color

Sample ID: CFMW-008-GW Sample Time: 1135

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA00877

Pump: FA01051

control box: FA02184

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-008a

Date: 9/14/16

DTW: 64.99

Depth of Pump Intake: ~95

DTB: 99.55

Total Volume Purged: ~6 gallons

Purge Start:		Time:	0951	CPM:	3	psi:	75	Discharge Rate:	9
Purge End:	9/15/16	Time:	1540	CPM:	3	psi:	100	Discharge Rate:	10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1010	67.55	250	9.01	7.44	9.20	14.00	-280	18.8	~0.5
1016	70.69		8.97	7.11	8.42	14.00	-286	16.0	
1021	71.69	100	8.99	6.63	7.40	13.99	-293	3.21	
1025	71.88		9.17	6.35	6.80	13.89	-297	3.29	
1030	72.51		9.91	6.02	6.00	13.86	-307	5.08	
1035	72.89		10.04	5.99	5.89	13.92	-311	5.87	
1040	73.28	100	10.34	5.90	5.65	14.00	-320	5.65	
1045	74.82	300	10.27	5.73	5.54	14.00	-329	5.54	
1050	76.32		9.46	5.23	5.23	14.00	-347	26.7	
1100	81.10		9.47	5.16	5.06	14.00	-349	17.3	
1108	84.23		9.40	4.66	4.71	14.00	-351	24.4	
1116	86.78		9.50	4.45	4.49	14.00	-353	3.69	~4.5
1140	7 top of pump		9.82	4.90	4.25	14.00	-360	46.0	~5.5
1213	91.38								

Purge Water Description:

Sample ID: CFMW-008a-GW

Sample Time: 9/15/16 @ 1540

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES: Horiba - FA01191 pump control box FA02121 FA01196

1040 increased pump rate

Pumped well dry. will allow for recharge and reassess

Sampled 9/15/16

Page #1

Well Sampling Sheet

Well ID: CFMW-010

Date: 9-12-16

DTW: ~~86.70~~ 82.82

Depth of Pump Intake: 85.00

DTB: ~~82.82~~ 86.70

Total Volume Purged: 4

Purge Start:	0950	Time:	0950	CPM:	4	psi:	50	Discharge Rate:	160 ml/min
Purge End:	1120	Time:	1120	CPM:	4	psi:	50	Discharge Rate:	160 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0955	82.91	160	9.48	1.37	11.66	8.48	280	max	0.2
1000	82.90	160	9.13	1.37	3.33	8.34	285	max	0.4
1005	82.88	160	9.05	1.46	2.19	8.39	282	max	0.6
1010	82.88	160	9.02	1.59	1.80	8.51	277	max	0.8
1015	82.88	160	8.98	1.74	1.61	8.65	272	max	1.0
1020	82.88	160	8.99	1.90	1.43	8.77	267	max	1.2
1025	82.88	160	9.12	1.94	1.35	8.79	266	416	1.4
1028	82.88	160	9.39	1.97	1.22	8.78	265	max	1.6
1031	82.88	160	9.49	1.98	1.19	8.78	265	915	1.8
1034	82.88	160	9.51	1.98	1.18	8.78	265	797	2.0
1037	82.88	160	9.63	1.98	1.16	8.77	264	762	2.2
1040	82.88	160	9.63	1.99	1.17	8.77	264	665	2.4
1043	82.88	160	9.64	1.99	1.18	8.77	264	606	2.6
1047	82.88	160	9.70	1.99	1.13	8.78	263	522	2.8
1050	82.88	160	9.78	2.00	1.08	8.97	254	466	3.0
1053	82.88	160	9.80	2.00	1.06	9.05	250	438	3.2

Purge Water Description: Cloudy, light brown color

Sample ID: CFMW-010-GW

Sample Time: 1105

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

pump: FA01051

control box: FA01037

Page #2

Well Sampling Sheet

Well ID: CFMW-010 Date: 9-12-16

DTW: 82.82 Depth of Pump Intake: 85.00

DTB: 86.70 Total Volume Purged: 4

Purge Start:	0950	Time:	0950	CPM:	4	psi:	50	Discharge Rate:	160
Purge End:	1120	Time:	1120	CPM:	4	psi:	50	Discharge Rate:	160

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1056	82.88	160	9.83	2.01	1.05	9.02	252	394	3.5
1059	82.88	160	9.85	2.01	1.04	9.01	252	401	3.6
1102	82.88	160	9.97	2.01	1.00	9.00	252	313	3.8

Purge Water Description: cloudy, light brown color

Sample ID: CFMW-010-GW Sample Time: 1105

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA0577

PUMP: FA01081

control box: FA01037

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-011 Date: 9/13/16

DTW: 39.54 Depth of Pump Intake: ~51

DTB: 52.90 Total Volume Purged: ~5 gals

Purge Start:		Time:	~~1455~~ 1518	CPM:	3	psi:	37.5	Discharge Rate:	9
Purge End:		Time:	1613	CPM:	3	psi:	37.5	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Turbidity Volume Purged (gallons)
1520	39.58	250							
1525	39.58		9.75	0.383	32.30	7.65	266		>1000
1530			9.90	0.383	42.06	7.49	284		>1000
1535	39.58		8.78	0.383	39.81	7.46	286		823
1540	39.58		8.71	0.384	38.24	7.39	292	2	358
1545			8.68	0.383	40.94	7.34	295		155
1550			8.59	0.384	43.96	7.32	297	3	92.8
1555	39.58		8.60	0.383	45.66	7.30	298		35.4
1558			8.58	0.384	45.74	7.29	299		35.3
1601			8.52	0.385	40.61	7.28	299		20.9
1604			8.58	0.384	34.04	7.28	299	4	16.5
1607			8.54	0.384	42.28	7.29	299		14.5
1610			8.46	0.385	23.34	7.28	300		13.5
1613	39.58	✓	8.50	0.385	12.83	7.28	299	5	14.4

Volume

Purge Water Description: clear & no color

Sample ID: CFMW-011-GW Sample Time: 1615

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01191

Control box FA02121

Pump FA01196

Well Sampling Sheet

Well ID: CFMW-011a Date: 9-20-16

DTW: 101.01 Depth of Pump Intake: 168

DTB: 171.12 Total Volume Purged: 3.0

Purge Start:		Time:	1040	CPM:	3	psi:	115	Discharge Rate:	9
Purge End:		Time:	1240	CPM:	3	psi:	115	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1050	101.28	280	10.04	0.252	11.90	11.11	-634	1000	0.2
1055	101.32	280	9.17	0.240	4.41	11.23	-685	1000	0.4
1100	101.36	280	8.94	0.241	3.03	11.00	-672	1000	0.6
1105	101.38	280	8.91	0.244	2.42	10.84	-659	1000	0.8
1110	cleaned out Horiba to check turbidity sensor, turbidity sensor OK								
1114	101.34	280	9.79	0.242	2.61	10.70	-606	919	1.0
1119	101.27	280	9.13	0.260	1.93	10.34	-618	887	1.2
1124	101.40	280	9.10	0.262	1.72	10.45	-629	811	1.4
1129	101.41	280	9.05	0.261	1.57	10.40	-627	697	1.6
1134	101.38	280	9.05	0.265	1.48	10.31	-616	618	1.8
1139	101.40	280	9.00	0.266	1.42	10.24	-609	554	2.0
1144	101.36	280	8.92	0.267	1.35	10.24	-603	539	2.2
1147	101.37	280	8.95	0.270	1.33	10.17	-601	534	2.3
1150	101.38	280	8.90	0.271	1.31	10.18	-599	514	2.4

Purge Water Description: cloudy, in beginning then remained slightly cloudy, brown color

Sample ID: CFMW-011a-GW Sample Time: 1155

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

pump: FA01081

control box: FA02184

Well Sampling Sheet

Well ID: CFMW-012 Date: 9/12/16

DTW: 76.60 (TOC) Depth of Pump Intake: ~80' (TOC)

DTB: 81.84 (TOC) Total Volume Purged: 2.25 gals

Purge Start:		Time:	0800	CPM:	4	psi:	70	Discharge Rate:	5
Purge End:		Time:	0859	CPM:	4	psi:	70	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0820	77.30	200	8.82	1.05	4.75	8.86	231	.84	~.15
0825	77.43	200	8.73	1.04	11.45	8.87	232	3.02	
0830	77.64	200	8.60	1.05	5.28	8.92	230	0.45	~1 gal
0835	77.84	200	8.59	1.05	2.46	8.95	228	0.25	
0840	78.09	200	8.57	1.05	5.01	8.99	227	1.12	
0845	78.24	200	8.58	1.05	4.62	9.03	224	1.19	~2 gal
0850	78.32	200	8.58	1.05	4.31	9.04	223	1.07	

Purge Water Description: clear w/ orange tint

Sample ID: CFMW-012-GW Sample Time: 0850

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01911

Control box: FA02121

Pump FA01196

Well Sampling Sheet

Well ID: CFMW-012a
Date: 9/15/16
DTW: 145.41
Depth of Pump Intake: ~209
DTB: 213.40
Total Volume Purged: 5

Purge Start:		Time:	0758	CPM:	3	psi:	100	Discharge Rate:	12
Purge End:		Time:	0940	CPM:	3	psi:	100	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0810	145.41	225	9.81	0.364	0.0	6.27	98	444	
0815			9.40	0.364	0.0	6.48	63	~~0~~ 340	
0820		225	9.19	0.365	0.0	6.62	41	286	
0825			8.97	0.368	0.0	6.73	24	268	
0830		225	8.79	0.369	0.0	6.79	14	213	
0835			8.69	0.371	0.0	6.88	1	186	
0840	145.41		8.59	0.372	0.0	6.95	-9	152	
0845			8.47	0.374	0.0	7.00	-19	112	
0850	145.42	225	8.34	0.375	0.0	7.09	-33	92.4	
0900			8.27	0.377	0.0	7.15	-44	81.1	
0903			8.25	0.378	0.0	7.13	-49	73.3	
0906			8.23	0.378	0.0	7.13	-53	67.7	~5
0910	145.42	225	sample						

Purge Water Description: ~~slight cloudy~~ ~~cl~~ SM clear & colorless

Sample ID: CFMW-012a
Sample Time: 0910
Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	X

Analysis	
AQ TCL VOCS 8260	~~X~~ no SM
AQ TCL SVOCs 8270	~~X~~ no SM
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
CFMW - DUP2 -GW
@ ~~14~~ SM 1200 hrs
Horiba FA 01191
Control Box FA02269
Pump FA01196

Well Sampling Sheet

Well ID: CFMW-014 Date: 9-12-16

DTW: 78.49 (TOC) Depth of Pump Intake: ~77

DTB: 93.43 (toc) Total Volume Purged: 2.25

Purge Start:		Time:	1125	CPM:	4	psi:	65	Discharge Rate:	10.0
Purge End:		Time:	1220	CPM:	4	psi:	65	Discharge Rate:	10.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1125	78.49	250							
1135	78.50	"	9.65	1.03	0.0	7.42	290	0.00	
1140	78.50	"	9.15	1.04	0.0	7.43	292	0.00	~1
1145	78.50	"	9.00	1.03	0.0	7.40	294	0.49	
1150		"	8.86	1.03	0.0	7.36	297	0.00	2.16
1155		"	8.90	1.04	0.0	7.32	298	0.00	
1200		"	8.99	1.04	0.0	7.33	296	0.00	2.25

Purge Water Description: clear with slight yellow tint

Sample ID: CFMW-014-GW Sample Time: 1200

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
EB1 collected prior
Horiba FA01911
Control Box FA02121
Pump FA01196

Well Sampling Sheet

Well ID: CFMW-015 Date: 9-12-16

DTW: ~~76.48~~ 76.58 (TOC) Depth of Pump Intake: ~93

DTB: 94.56 (TOC) Total Volume Purged: ~1.75 gallons

Purge Start:		Time:	1250	CPM:	4	psi:	65	Discharge Rate:	5
Purge End:		Time:	1405	CPM:	4	psi:	65	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1300	76.58	150 mL	12.59	2.52	0.0	9.39	140	4.05	
1305	76.58		11.52	2.50	0.0	9.48	113	2.86	0.25
1310	76.58		11.53	2.55	0.0	9.48	102	2.13	
1315			11.30	2.56	0.0	9.48	101	2.56	
~~1320~~			~~11.30~~	~~2.56~~	~~0.0~~	~~9.48~~	~~101~~	~~2.56~~	~~0.5 gal~~
1320			11.24	2.56	0.0	9.48	101	6.35	
1325			11.17	2.56	0.0	9.47	102	5.92	
1330			11.24	2.56	0.0	9.47	102	6.26	1.75

Purge Water Description: clear with orange tint

Sample ID: CFMW-015-GW Sample Time: 1330

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba FA01911
Control Box FA02121
Pump FA01196

Well Sampling Sheet

Well ID: CFMW-016 Date: 9/14/16

DTW: 97.70 Depth of Pump Intake: —

DTB: 97.93 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

No sample collected due to insufficient water volume.

Well Sampling Sheet

Well ID: CFMW-016a

Date: 9-21-16

DTW: 102.44

Depth of Pump Intake: ~126

DTB: 128.36

Total Volume Purged: 5

Purge Start:		Time:	0855	CPM:	3	psi:	75	Discharge Rate:	9
Purge End:		Time:	1100	CPM:	3	psi:	75	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0905	102.53	275	9.96	2.45	0.00	12.40	-53	82.2	
0910	102.55		9.40	1.81	0.00	12.31	-75	52	
0915	102.58		9.25	1.40	0.00	12.15	-85	50.6	
0920	102.55		9.18	1.13	0.00	12.03	-88	58.9	
0925	102.55		9.12	0.950	0.00	11.90	-84	71.2	
0930	102.55		9.12	0.861	0.00	11.85	-82	59.3	
0935	102.55		9.12	0.697	0.00	11.72	-80	53.3	
0940	102.55		9.07	0.638	0.08	11.65	-76	54.6	
0945	102.55		9.06	0.606	0.07	11.63	-75	57.4	~3.25
0950			9.02	0.556	0.05	11.62	-76	50.1	
0955			9.03	0.502	0.09	11.60	-77	49.7	
1000			8.99	0.448	0.00	11.55	-75	46.3	
1005			9.02	0.381	0.00	11.42	-72	44.7	
1010			9.07	0.379	0.00	11.40	-68	40.8	
1015	102.55		9.04	0.371	0.00	11.39	-67	41.4	~5

Purge Water Description: slight cloudy + colorless

Sample ID: CFMW-016a-GW

Sample Time: 1015

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

CFMW-EB8-AQ collected prior @ 0830

Horiba FA01192 Pump FA01196 Control FA02269

Well Sampling Sheet

Well ID: CFMW-017 Date: 9/14/16

DTW: DRY Depth of Pump Intake: —

DTB: 140.88 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

No sample collected due to insufficient volume. Well dry

Well Sampling Sheet

Well ID: CFMW-018 Date: 9/14/16

DTW: ~~126.70~~ DRY Depth of Pump Intake: —

DTB: 126.75 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

No sample collected due to insufficient water volume. Well Dry

Well Sampling Sheet

Well ID: CFMW-019 Date: 9-12-16

DTW: 74.42 Depth of Pump Intake: 87.00

DTB: 96.5 Total Volume Purged: 1.8

Purge Start:	1325	Time:	1325	CPM:	4	psi:	60	Discharge Rate:	150
Purge End:	1440	Time:	1440	CPM:	4	psi:	60	Discharge Rate:	150

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1340	74.44	150	10.38	0.848	0.23	8.39	251	29.8	0.2
1345	74.43	150	10.74	0.845	4.27	8.05	280	21.2	0.4
1350	74.43	150	10.50	0.844	3.86	7.83	295	17.2	0.6
1355	74.43	150	10.71	0.843	3.66	7.76	299	15.0	0.8
1400	74.43	150	10.40	0.842	3.50	7.73	301	13.3	1.0
1405	74.43	150	10.43	0.841	3.42	7.71	301	13.4	1.2
1410	74.43	150	10.53	0.840	3.42	7.69	303	11.9	1.4
1413	74.43	150	10.57	0.839	3.38	7.69	304	11.8	1.5
1416	74.43	150	10.62	0.839	3.37	7.69	306	10.9	1.6

Purge Water Description:

Sample ID: CFMW-019-GW Sample Time: 1420

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

Pump: FA01051

Control box: FA01037

Well Sampling Sheet

Well ID: CFMW-0199 Date: 9-20-16

DTW: 141.58 Depth of Pump Intake: 220.0

DTB: 223.20 Total Volume Purged: 2.2 gallons

Purge Start:		Time:	1315	CPM:	3	psi:	125	Discharge Rate:	10.5
Purge End:		Time:	1420	CPM:	3	psi:	115	Discharge Rate:	10.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1325	141.64	90	12.98	0.574	3.20	12.39	-761	1000	0.2
1330	141.62	90	12.36	0.510	2.37	11.98	-752	1000	0.4
1335	141.60	90	12.17	0.495	2.00	11.63	-734	1000	0.6
1340	141.62	90	11.99	0.464	1.79	11.33	-709	1000	0.8
1345	141.63	90	11.86	0.434	1.64	10.99	-690	1000	1.0
1350	141.63	90	11.76	0.420	1.55	10.80	-671	1000	1.2
1355	141.63	90	11.64	0.408	1.46	10.65	-657	1000	1.4
1400	141.63	90	11.74	0.399	1.41	10.62	-655	1000	1.6
1405	141.63	90	11.79	0.389	1.34	10.43	-642	1000	1.8
1408	141.63	90	11.81	0.384	1.32	10.35	-640	1000	1.9
1411	141.63	90	11.72	0.380	1.29	10.31	-630	1000	2.0
1414	141.63	90	11.72	0.377	1.27	10.28	-625	1000	2.1
1417	141.63	90	11.79	0.374	1.23	10.24	-624	1000	2.2

Purge Water Description: slightly cloudy, light brown color

Sample ID: CFMW-0199-GW Sample Time: 1420

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA00877
Pump: FA01081
Control Box: FA02184

Well Sampling Sheet

Well ID: CFMW-020 Date: 9/20/16

DTW: 104.05 ~~132.63~~ (A) Depth of Pump Intake: ~130

DTB: 132.63 Total Volume Purged: ~ 3.5

Purge Start:		Time:	1415	CPM:	3	psi:	70	Discharge Rate:	9
Purge End:		Time:	1509	CPM:	3	psi:	70	Discharge Rate:	9 ~~3.5~~

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1420	104.11	200	14.48	0.382	5.24	7.47	0	6.07	
1425	104.09		12.57	0.391	4.99	7.48	56	1.70	
1430	104.11		11.86	0.402	4.91	7.48	75	2.72	
1435	104.11		11.71	0.405	5.00	7.46	89	2.17	
1440	104.10		11.54	0.407	4.97	7.43	97	0.84	
1445	104.10		11.56	0.406	4.86	7.41	99	0.52	
1450	104.10		11.45	0.407	4.82	7.33	108	0.25	
1455	104.10		11.48	0.408	4.74	7.27	110	0.0	
1500	104.10		11.49	0.409	4.87	7.23	114	0.0	
1505	104.10		11.50	0.408	4.79	7.22	115	0.0	3.5

Purge Water Description:

Sample ID: CFMW-020-GW Sample Time: 1510

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01191

Pump FA01196

control FA02269

Well Sampling Sheet

Well ID: CFMW-021 Date: 9/12/16

DTW: 74.71 (toc) Depth of Pump Intake: ~86 (toc)

DTB: 89.56 (toc) Total Volume Purged: 4 gals

Purge Start:		Time:	1414	CPM:	3	psi:	70	Discharge Rate:	9
Purge End:		Time:	1545	CPM:	3	psi:	70	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1420		450							
1425	74.71	"	9.54	0.628	2.54	7.42	263	47.5	1.25
1430	74.71	"	9.18	0.636	5.30	7.35	270	39.9	
1435	74.71	"	9.13	0.636	3.78	7.29	269	28.0	
1440		"	8.99	0.636	4.44	7.16	265	28.6	2.1
1445		"	9.06	0.633	4.23	7.12	261	18.3	
1450		"	9.07	0.628	6.51	7.09	258	17.4	
1453		"	8.96	0.630	5.71	7.08	257	19.8	2.2
1456		"	9.02	0.633	7.02	7.07	258	12.5	
1459		"	9.09	0.630	6.60	7.07	258	10.7	
1502		"	9.10	0.632	7.57	7.06	257	8.01	2.3
1505		"	9.12	0.631	6.17	7.07	257	4.98	
1510		"	9.17	0.629	6.45	7.09	257	4.93	
1515		"	9.09	0.631	6.71	7.11	256	4.70	4
1545		end							

Purge Water Description: clear + colorless

Sample ID: CFMW-021-GW Sample Time: 1515

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA0191

~~Pump FA02124~~ (AH)

Control Box FA02121

Pump FA01196

Well Sampling Sheet

Well ID: CFMW-022 Date: 9/13/16

DTW: 73.61 (toc) Depth of Pump Intake: ~81

DTB: 83.26 (toc) Total Volume Purged: 1.75 gallons

Purge Start:		Time:	1311	CPM:	4	psi:	45	Discharge Rate:	8
Purge End:		Time:	1310	CPM:	4	psi:	45	Discharge Rate:	8

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1318		200			10.13				
1320	73.64	200	15.16	0.400	~~0.43~~	7.72	259	250	
1325	73.64	200	14.67	0.390	8.45	7.70	263	191	
1330	73.64	200	13.68	0.380	4.75	7.72	269	146	
1335	73.64	200	12.98	0.382	4.10	7.71	274	119	
1340		200	12.32	0.382	4.04	7.70	277	102	~1 gal
1345		200	12.13	0.390	4.46	7.67	280	83.5	
1350		200	11.97	0.391	4.94	7.68	281	73.0	
1353	73.69	200	11.90	0.393	3.69	7.66	283	65.2	
1356		200	11.82	0.392	3.21	7.67	283	62.6	
1400	73.64	200	11.68	0.393	4.45	7.63	285	54.4	~1.5 gal
1403		200	11.64	0.394	3.85	7.63	286	49.8	
1406	73.64	200	11.64	0.394	3.60	7.61	287	48.7	1.75

Purge Water Description: clear, no color

Sample ID: CFMW-022-GW Sample Time: 1410

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01191

Control Box FA02121

Pump FA01196

Well Sampling Sheet

Well ID: CFMW-023 Date: 9/21/16

DTW: 127.65 Depth of Pump Intake: ~140

DTB: 142.96 Total Volume Purged: ~4

Purge Start:		Time:	1048	CPM:	3	psi:	70	Discharge Rate:	10
Purge End:		Time:	1130	CPM:	3	psi:	70	Discharge Rate:	10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1055	127.70	200	12.21	0.451	6.87	8.61	60	52.1	
1100	127.70		11.22	0.440	6.51	8.24	74	20.1	
1105	127.71		10.36	0.445	6.25	8.01	98	8.99	
1110	127.72		10.19	0.446	6.17	7.89	111	6.03	
1115	127.73		10.14	0.447	6.19	7.79	120	~~6.81~~ 6.21	
1120	127.75		10.88	0.447	6.15	7.71	127	7.69	
1125	127.75		10.54	0.448	6.17	7.62	135	7.83	
1130	127.75		10.38	0.449	6.29	7.59	140	8.24	~4
~~1135~~									

Purge Water Description: clear & colorless

Sample ID: CFMW-023-GW Sample Time: 1135

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba FA01191
Pump FA01196
Control FA02296

Well Sampling Sheet

Well ID: CFMW-02S

Date: 9-13-16

DTW: 26.45

Depth of Pump Intake: —

DTB: 26.80

Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: —

Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

No sample collected due to insufficient volume

Well Sampling Sheet

Well ID: CFMW-025a

Date: 9-13-16

DTW: 53.25

Depth of Pump Intake: 80.0

DTB: 98.42

Total Volume Purged: 2

Purge Start:	730	Time:	730	CPM:	4	psi:	60	Discharge Rate:	190
Purge End:	840	Time:	840	CPM:	4	psi:	60	Discharge Rate:	190

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
739	53.69	190	9.35	0.327	25.74	8.60	55	1.60	0.2
744	53.70	190	9.30	0.359	2.96	7.84	39	0.00	0.4
749	53.70	190	9.23	0.374	2.13	7.62	13	0.00	0.6
754	53.70	190	9.20	0.379	1.81	7.58	-8	0.00	0.8
759	53.70	190	9.19	0.383	1.58	7.55	-22	0.00	1.0
804	53.70	190	9.18	0.383	1.51	7.56	-29	0.00	1.2
809	53.70	190	9.16	0.384	1.32	7.68	-50	0.00	1.4
812	53.70	190	9.16	0.385	1.26	7.74	-58	0.00	1.5
815	53.70	190	9.11	0.385	1.19	7.92	-72	0.00	1.6
818	53.70	190	9.12	0.385	1.16	7.92	-75	0.00	1.7
824	53.70	190	9.13	0.386	1.13	7.92	-80	0.00	1.8

Purge Water Description: clear from beginning to end.

Sample ID: CFMW-025a-GW

Sample Time: 0825

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA00877
PUMP: FA01081
control box: FA01037

Well Sampling Sheet

Well ID: CFMW-025b

Date: 9-13-16

DTW: 35.28

Depth of Pump Intake: 60.0

DTB: 67.24

Total Volume Purged: 3

Purge Start:	0905	Time:	0905	CPM:	4	psi:	60	Discharge Rate:	340
Purge End:	1000	Time:	1000	CPM:	4	psi:	60	Discharge Rate:	340

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0912	36.44	340	9.17	0.433	2.76	8.05	106	44.4	0.1
0917	36.02	340	9.37	0.431	2.89	8.08	7	49.0	0.4
0922	35.58	340	9.41	0.430	1.84	8.25	-44	43.7	0.8
0927	35.52	340	9.46	0.430	1.47	8.30	-63	44.7	1.2
0932	35.49	340	9.47	0.430	1.31	8.29	-73	45.4	1.5
0937	35.48	340	9.51	0.430	1.15	8.31	-81	45.2	1.9
0942	35.46	340	9.51	0.430	1.07	8.33	-86	42.6	2.3
0945	35.46	340	9.53	0.430	1.03	8.30	-88	41.0	2.5
0948	35.46	340	9.52	0.430	0.99	8.30	-89	39.4	2.7

Purge Water Description: clear, brown color

Sample ID: CFMW-025b

Sample Time: 0950

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

pump: FA01051

control box: FA01037

Well Sampling Sheet

Well ID: CFMW-026 Date: 9-13-16

DTW: 41.12 Depth of Pump Intake: ~~44.0~~ 44

DTB: 47.44 Total Volume Purged: 4.9

Purge Start:	1040	Time:	1040	CPM:	4	psi:	60	Discharge Rate:	420
Purge End:	1145	Time:	1145	CPM:	4	psi:	60	Discharge Rate:	420

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1048	41.25	420	9.41	0.477	6.87	7.90	233	485	0.3
1053	41.27	420	9.30	0.468	6.12	7.96	205	92.4	0.8
1058	41.29	420	9.28	0.468	5.62	7.99	177	28.5	1.3
1103	41.30	420	9.24	0.468	5.57	7.98	163	22.8	1.8
1108	41.30	420	9.25	0.468	5.16	7.98	154	22.8	2.3
1113	41.30	420	9.27	0.468	5.30	7.98	151	12.9	2.8
1118	41.30	420	9.26	0.467	5.30	7.98	149	1.73	3.3
1121	41.30	420	9.26	0.468	5.26	8.00	149	0.00	3.7
1124	41.30	420	9.23	0.469	5.50	8.00	149	0.00	4.0
1127	41.30	420	9.23	0.469	5.66	7.95	155	0.00	4.3
1130	41.30	420	9.26	0.468	5.54	7.94	155	0.00	4.7

Purge Water Description: slightly cloudy in beginning then clear

Sample ID: CFMW-026-GW Sample Time: 1135

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

pump: FA01081

control box: FA01037

Well Sampling Sheet

Well ID: CFMW-027 Date: 9/13/16

DTW: 33.89 Depth of Pump Intake: ~46'

DTB: 48.60 Total Volume Purged: 4.5 gallons

Purge Start:		Time:	1115	CPM:	3	psi:	25 85 ~~60~~	Discharge Rate:	9
Purge End:		Time:	1232	CPM:	3	psi:	25	Discharge Rate:	15

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
2m		150							
1125	33.89	150	9.23	0.607	3.49	7.76	282	990	
1130	33.89	150	9.26	0.609	3.20	7.75	282	>1000	
1135	33.90	300	9.18	0.613	2.56	7.77	282	>1000	
1140	33.90	300	9.10	0.612	2.56	7.75	283	814	~1.5
1145	33.90	300	8.97	0.610	2.11	7.75	283	635	
1150	33.90	300	8.94	0.611	2.07	7.74	282	531	
1155	33.90	300	8.93	0.611	2.25	7.73	282	418	~2.25
1200	33.90	300	8.92	0.612	2.35	7.74	282	325	
1205	33.90	300	8.92	0.612	2.31	7.72	285	273	~3
1210	33.90	300	8.90	0.612	2.45	7.72	285	246	
1215	33.90	300	8.89	0.613	2.41	7.69	288	183	
1220	33.90	300	8.88	0.613	2.60	7.71	288	143	~4
1223	33.90	300	8.89	0.612	2.21	7.70	289	132	
1226	33.90	300	8.90	0.612	2.03	7.72	289	110	
1229	33.90	300	8.90	0.612	2.19	7.72	289	96.1	~4.5
1232	33.90	300	8.90	0.612	2.34	7.70	291	89.6	

Purge Water Description: slight cloudy, no color

Sample ID: CFMW-027-GW Sample Time: 1235

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES: Horiba FA01191 Pump FA01196 Control Box FA02121
DO fluctuates between ~3.40 to 2.00 mg/L based on bladder pulses. Lowest values reviewed.

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-028 PAGE 1 Date: 9-13-16

DTW: 45.46 Depth of Pump Intake: ~60

DTB: 62.40 Total Volume Purged: 6 gallons

Purge Start:	0916	Time:	0916	CPM:	3	psi:	75 ~~90~~	Discharge Rate:	9
Purge End:	1034	Time:	1034	CPM:	3	psi:	75	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0920		250							
0922	46.42	250	8.29	0.515	5.79	6.98	227	514	
0925	46.56		8.27	0.499	7.67	7.12	230	752	
0930	46.65		8.25	0.470	5.98	7.34	236	772	2
0935	47.12		8.15	0.443	1.59	7.44	239	317	
0940	47.16		8.12	0.437	0.00	7.53	239	211	
0950	47.32		8.19	0.434	3.75	7.53	243	87.8	3
0955	47.43		8.27	0.431	0.00	7.57	242	51.7	
1000	47.52		8.34	0.428	0.00	7.61	240	34.9	
1005	47.52		8.48	0.425	0.00	7.75	233	20.8	4
1010	47.52		8.57	0.424	0.00	7.79	233	18.8	
1015	47.52		8.67	0.423	0.00	7.88	228	11.3	
1020	47.52		8.65	0.424	0.00	7.87	229	9.87	5 gal
1025	47.52		8.62	0.425	0.00	7.91	227	7.63	
1028	47.52		8.61	0.425	0.00	7.92	226	5.14	
1031	47.52		8.66	0.425	0.00	7.95	225	~~[illegible]~~ 5.12	

Purge Water Description:

Sample ID: CFMW-028-GW Sample Time: 1020

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bottle time ~~0820~~ 1020 sm

but sampled ~~0835~~ sm

1035

Horiba FA01191

Control Box FA02121 Pump FA01196

Well Sampling Sheet

Well ID: CFMW-028 PAGE 2 Date: 9/13/16

DTW: 45.46 Depth of Pump Intake: ~60'

DTB: 62.40 Total Volume Purged: 6 gallons

Purge Start:		Time:	0916	CPM:	3	psi:	75	Discharge Rate:	9
Purge End:		Time:	1034	CPM:	3	psi:	75	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1034	47.52	250	8.70	0.427	0.00	7.93	225	4.76	6 gal

Purge Water Description:

Sample ID: CFMW-028-GW Sample Time: ~~0820~~ 1020

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bottle time ~~0820~~ 8m 1020

but sampled @ ~~0835~~ 8m 1035

Well Sampling Sheet

Well ID: CFMW-028a
Date: 9/20/16
DTW: 45.92
Depth of Pump Intake: ~95
DTB: 122.62
Total Volume Purged: ~2

Purge Start:		Time:	1119	CPM:	3	psi:	60	Discharge Rate:	10
Purge End:		Time:	1155	CPM:	3	psi:	60	Discharge Rate:	10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1125	46.61	300	9.59	0.207	0.0	8.85	-321	7.42	
1130	46.68		9.44	0.204	0.0	8.84	-340	1.25	
1135	46.66		9.30	0.203	0.0	8.82	-356	0.0	
1140	46.73		9.28	0.203	0.0	8.82	-371	0.0	
1145	46.74		9.26	0.203	0.0	8.88	-381	0.0	
1150	46.78		9.30	0.203	0.0	8.98	-395	0.0	
1155	46.78		9.30	0.203	0.0	9.02	-399	0.0	~2

Purge Water Description: Clear & colorless

Sample ID: CFMW-028a-GW
Sample Time: 1155
Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba FA01191
Pump FA01196
Control FA02269

Well Sampling Sheet

Well ID: CFMW-029 Date: 9/13/16

DTW: 69.63 (toc) Depth of Pump Intake: ~76.00 (toc)

DTB: 78.12 (toc) Total Volume Purged:

Purge Start:		Time:	0734	CPM:	3	psi:	75	Discharge Rate: 9
Purge End:		Time:	0820	CPM:	3	psi:	75	Discharge Rate: 9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0740	69.63	350	9.21	0.476	23.38	7.00	253	77.6	
0745	69.63	350	8.62	0.460	16.89	7.54	266	23.2	
0750	69.63	350	8.63	0.463	10.50	7.62	262	13.3	~1.25
0755	69.63	350	8.56	0.470	13.31	7.65	256	0.0	
0800	69.63	350	8.45	0.480	10.47	7.51	264	0.0	
0805	69.63	350	8.43	0.485	11.23	7.51	265	0.0	~2.5
0810	↓	350	8.40	0.492	10.82	7.39	274	0.0	
0815	↓	↓	8.43	0.493	11.24	7.39	273	0.0	
0820	↓	↓	8.34	0.496	10.88	7.38	276	0.0	~3.5 gals

Purge Water Description:

Sample ID: CFMW-029-GW Sample Time: 0820

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba FA01191
Control Box FA02121
Pump FA01196
collected
CFMW-DUP1-GW
@ 1000
Field DO fluctuating b/w ~10 & 30,
Values are lowest of range observed

Well Sampling Sheet

Well ID: CFMW-031 Date: 9.15.16

DTW: 46.79 Depth of Pump Intake: 51.0

DTB: 52.3 Total Volume Purged: 1.2

Purge Start:	0949	Time:	0949	CPM:	4	psi:	55	Discharge Rate:	5
Purge End:	1025	Time:	1025	CPM:	4	psi:	55	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0954	46.88	360	8.42	0.485	11.26	7.99	314	41.3	0.2
0959	46.88	360	8.31	0.477	8.95	8.09	319	0.00	0.4
1004	46.79	360	8.32	0.480	8.39	8.13	322	0.00	0.6
1009	46.79	360	8.38	0.482	8.26	8.07	332	0.00	0.8
1014	46.79	360	8.40	0.482	8.22	8.12	332	0.00	1.0
~~1019~~									
~~1024~~									

Purge Water Description: Slightly cloudy in beginning then clear.

Sample ID: CFMW-031-GW Sample Time: 1015

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA00877
Pump: FA01081
control box: FA01037

Well Sampling Sheet

Well ID: CFMW-032 Date: 9.15.16

DTW: 53.17 Depth of Pump Intake: 55.0

DTB: 57.7 Total Volume Purged: 3.0

Purge Start:	0742	Time:	0742	CPM:	4	psi:	55	Discharge Rate:	5
Purge End:	0850	Time:	0850	CPM:	4	psi:	55	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
747	53.39	370	8.56	1.49	30.68	7.03	425	552	0.25
752	53.43	370	8.66	1.38	6.28	7.35	396	195	0.5
757	53.49	370	8.61	1.29	5.26	7.45	385	126	0.75
802	53.50	370	8.53	1.17	4.71	7.73	366	57.1	1.0
807	53.50	370	8.52	1.11	4.61	7.74	361	38.9	1.25
812	53.50	370	8.45	1.05	4.53	7.73	359	4.53	1.5
817	53.50	370	8.44	1.02	4.54	7.75	357	13.5	1.75
822	~~50.00~~ 53.50	370	8.42	0.986	4.26	7.78	354	0.00	2.00
825	53.50	370	8.43	0.980	4.30	7.77	354	0.00	2.25
828	53.50	370	8.43	0.965	4.33	7.77	353	0.00	2.5

Purge Water Description: Slight light brown color, cloudy throughout

Sample ID: CFMW-032-GW Sample Time: 0830

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

Pump: FA01081

Control box: FA01037

Well Sampling Sheet

Well ID: CFMW-032a

Date: 9-16-16

DTW: 113.63' btc

Depth of Pump Intake: ~~202~~ ft 162' then 196'

DTB: 206.53

Total Volume Purged: ~4

Purge Start:		Time:	0825 ~~0826~~	CPM:	3	psi:	100	Discharge Rate:	9
Purge End:		Time:	1046	CPM:	3	psi:	100	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0930	115.55	150							
0935	116.27	|	11.74	6.36	9.08	13.08	-451	78.4	
0940	116.65	|	11.32	6.38	8.82	11.32	-500	48.6	
0945	116.75	140	11.45	6.39	7.95	11.45	-509	30.6	
0950	116.83	140	11.64	6.38	7.54	13.71	-516	23.1	
0955	116.92	|	11.73	6.34	7.07	13.92	-524	17.6	
1000	117.14	|	11.89	6.31	6.45	14.00	-530	1.51	
1005	117.19	|	11.82	6.30	5.94	14.00	-532	1.01	
1010	117.29	140	11.83	6.31	5.85	14.00	-532	0.60	
1015	117.35	|	11.74	6.33	5.58	14.00	-531	0.19	~2.5 gals
1020	117.43	|	11.79	6.32	5.24	14.00	-530	0.00	
1030	—	60	—	—	—	—	—	—	
1040	116.40	70	12.12	6.51	2.63	14.00	-523	0.00	
1043	116.40	|	12.20	6.48	2.61	14.00	-522	0.00	
1046	116.45	70	12.17	6.40	2.51	14.00	-532	0.00	~4 gals

Purge Water Description: clear + colorless

Sample ID: CFMW-032a-GW

Sample Time: 1050

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

set pump 162' initially purge 140 ml/min, 1036 reset pump to 196' @ ~70 ml

Well Sampling Sheet

Well ID: CFMW-033 **Date:** 9.15.16

DTW: 48.09 **Depth of Pump Intake:** 61.0

DTB: 63.59 **Total Volume Purged:** 2

Purge Start:	1045	**Time:**	1045	**CPM:**	4	**psi:**	55	**Discharge Rate:**	5
Purge End:	1135	**Time:**	1135	**CPM:**	4	**psi:**	55	**Discharge Rate:**	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1051	48.41	290	9.05	0.567	12.94	7.99	334	134	0.25
1056	48.41	290	8.75	0.563	7.81	8.02	329	47.3	0.5
1101	48.41	290	8.67	0.564	7.72	8.02	330	16.0	0.75
1106	48.41	290	8.60	0.565	7.78	7.99	332	0.00	1.0
1111	48.41	290	8.62	0.565	7.66	8.06	333	0.00	1.25
1116	48.41	290	8.53	0.565	7.67	8.06	335	0.00	1.5
1121	48.41	290	8.54	0.565	7.54	8.08	336	0.00	1.75

Purge Water Description: clear from beginning to end.

Sample ID: CFMW-033-GW Sample Time: 1125

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

Pump: FA01081

Control box: FA01037

Well Sampling Sheet

Well ID: CFMW-034 Date: 9-14-16

DTW: 49.74 Depth of Pump Intake: 58.00

DTB: 62.48 Total Volume Purged: 3

Purge Start:	730	Time:	730	CPM:	4	psi:	45	Discharge Rate:	5
Purge End:	0830	Time:	0830	CPM:	4	psi:	45	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
737	49.85	260	8.86	0.549	10.83	6.43	252	965	0.3
742	49.85	260	8.73	0.516	14.36	6.66	275	655	0.6
747	49.85	260	8.66	0.510	29.79	6.76	280	356	0.8
752	49.85	260	8.57	0.509	26.24	6.88	281	26.24	1.0
757	49.85	260	8.57	0.508	26.16	6.92	281	26.16	1.3
802	49.85	260	8.54	0.509	33.85	6.96	280	45.2	1.5
807	49.85	260	8.56	0.508	28.08	7.10	273	21.0	1.9
810	49.85	260	8.52	0.508	29.15	7.17	270	29.15	2.2
813	49.85	260	8.52	0.508	34.08	7.18	269	0.00	2.4
816	49.85	260	8.54	0.508	34.94	7.20	268	0.00	2.6
819	49.85	260	8.53	0.509	34.64	7.20	267	0.00	2.8

Purge Water Description:

Sample ID: CFMW-034-GW Sample Time: 0820

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01191

pump: FA01081

control box FA01037

Well Sampling Sheet

Well ID: CFMW-035 Date: 9-14-16

DTW: 47.55 Depth of Pump Intake: 56.0

DTB: 70.6 Total Volume Purged: 1.2

Purge Start:	0900	Time:	0900	CPM:	4	psi:	45	Discharge Rate:	5
Purge End:	0940	Time:	0940	CPM:	4	psi:	45	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
907	49.42	270	9.19	0.694	6.94	7.11	-164	0.00	0.2
912	50.40	270	9.36	0.696	1.24	7.09	-189	0.00	0.4
917	51.38	270	9.40	0.697	1.24	7.11	-199	0.00	0.6
922	51.38	270	9.37	0.697	1.24	7.09	-202	0.00	0.8
927	51.38	270	9.34	0.700	1.24	7.10	-204	0.00	1.0

Purge Water Description:

Sample ID: CFMW-035-GW Sample Time: 0930

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01191

pump: FA01081

control box FA01037

Well Sampling Sheet

Well ID: CFMW-037 Date: 9-16-16

DTW: 80.30 Depth of Pump Intake: 98.5'

DTB: 103.27 Total Volume Purged: ~5

Purge Start:		Time:	1238	CPM:	3	psi:	60	Discharge Rate:	9
Purge End:		Time:	1408	CPM:	3	psi:	60	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1241	80.32	230							
1245	80.32		13.70	0.395	18.79	9.72	48	>1000	
1250	80.33		12.79	0.372	10.77	8.83	81	>1000	
1255	80.32		12.53	0.374	9.39	8.47	105	815	
1300	80.32		12.53	0.375	9.11	8.39	122	642	
1305			12.53	0.352	8.84	8.34	152	499	
1310	80.32		12.59	0.376	8.64	8.06	169	377	~2
1317			12.57	0.376	8.52	7.97	189	299	
1323			12.61	0.376	8.48	7.98	205	231	
1328	80.32		12.65	0.377	8.28	7.97	217	203	
1333		170	12.65	0.377	8.15	7.91	233	186	
1338			12.76	0.376	8.03	7.96	236	165	~3
1343			12.77	0.375	8.00	8.06	238	154	
1348	80.32		12.79	0.375	7.88	8.17	239	137	
1353			12.67	0.376	7.76	8.21	243	122	
1358			13.10	0.376	7.74	8.29	247	117	~4.5

Purge Water Description: slight cloudy & colorless

Sample ID: CFMW-037-GW Sample Time: 1410

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Collected CFMW-EB5-AQ prior @ 1209

Well Sampling Sheet

Well ID: CFMW-037 Date: 9-16-16

DTW: 80.30' Depth of Pump Intake: 98.5'

DTB: 103.27 Total Volume Purged: ~5

Purge Start:		Time:	1238	CPM:	3	psi:	60	Discharge Rate:	9
Purge End:		Time:	1408	CPM:	3	psi:	60	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1403	80.32	170	13.40	0.374	7.59	8.24	257	106	
1408	80.32	170	13.44	0.376	7.64	8.25	261	97	~5

Purge Water Description: slight cloudy & colorless

Sample ID: CFMW-037-GW Sample Time: 1410

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

Collected CFMW-EB5-AQ at 1209.

Well Sampling Sheet

Well ID: CFMW-038 Date: 9/14/16

DTW: 87.46 Depth of Pump Intake: ~105'

DTB: 107.14 Total Volume Purged: ~2.6

Purge Start:		Time:	1234	CPM:	3	psi:	58	Discharge Rate:	10
Purge End:		Time:	1320	CPM:	3	psi:	58	Discharge Rate:	10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1236	87.46	200	~~16.41~~	~~.573~~	~~7.82~~	~~9.25~~	~~91~~	~~172~~	~~Sm~~
1241	87.49	200	16.41	0.573	7.82	9.25	91	172	
1246	87.49	200	15.41	0.561	7.30	9.06	98	58.7	~0.5
1252	87.49	200	13.72	0.554	6.02	8.51	123	3.1	
1257	87.49	200	12.97	0.569	5.72	8.32	145	0.0	
1302	87.49	200	12.87	0.575	5.58	8.26	160	0.0	
1307	87.49	200	12.79	0.576	5.43	8.22	172	0.0	
1311	87.49	200	12.63	0.579	5.29	8.20	185	0.0	
1315	87.49	200	12.65	0.579	5.22	8.19	191	0.0	~2.5
1319	87.49	200	12.62	0.579	5.21	8.18	198	0.0	

Purge Water Description: clear & colorless

Sample ID: CFMW-038-GW Sample Time: 1320

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00877

Pump FA01196

Control Box FA02121

Well Sampling Sheet

Well ID: CFMW-040 Date: 9/14/16

DTW: 78.32 Depth of Pump Intake: ~91

DTB: 92.77 Total Volume Purged: 25

Purge Start:		Time:	1400	CPM:	3	psi:	55	Discharge Rate:	11
Purge End:		Time:	1514	CPM:	3	psi:	55	Discharge Rate:	11

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1405	78.80	275	15.93	0.520	9.08	8.40	236	162	
1410	78.82		14.20	0.516	8.97	8.30	243	189	
1415	78.82		11.68	0.523	8.02	8.08	264	242	
1420	78.82		11.02	0.542	7.74	7.84	279	219	~1.25
1425			10.57	0.554	7.45	7.66	296	147	
1430			10.64	0.554	7.35	7.64	299	102	
1435	78.82		10.58	0.554	7.28	7.61	303	63.5	~2.5
1440			10.55	0.555	7.16	7.59	307	42.9	
1445			10.46	0.555	7.05	7.58	310	23.1	
1450			10.33	0.556	6.98	7.56	314	14.7	
1455			10.36	0.558	6.88	7.55	318	3.61	
1500			10.32	0.557	6.85	7.51	323	3.00	
1503	78.82		10.29	0.558	6.84	7.51	323	0.73	
1508			10.26	0.558	6.83	7.49	325	0.00	
1511			10.32	0.557	6.83	7.47	328	0.00	
1514	78.82		10.29	0.558	6.89	7.47	329	0.00	~5

Purge Water Description: clear & colorless

Sample ID: CFMW-040 Sample Time: 1515

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00877

Pump FA01196

Control Box FA02121

Well Sampling Sheet

Well ID: CFMW-042-

Date: 9-14-16

DTW: 59.89

Depth of Pump Intake: 620

DTB: 63.02

Total Volume Purged: 2.7

Purge Start:	1005	Time:	1005	CPM:	4	psi:	45	Discharge Rate:	5
Purge End:	1105	Time:	1105	CPM:	4	psi:	45	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1011	59.96	240	8.94	0.558	26.93	7.41	182	593	0.25
1016	59.96	240	9.10	0.551	23.08	7.32	228	636	0.5
1021	59.96	240	9.15	0.550	14.67	7.32	236	392	0.75
1026	59.96	240	9.24	0.549	20.18	7.30	243	344	1.0
1031	59.96	240	9.34	0.548	12.09	7.30	247	135	1.25
1036	59.96	240	9.46	0.546	12.10	7.33	250	62.1	1.5
1041	59.96	240	9.57	0.545	12.97	7.35	251	29.8	1.75
1046	59.96	240	9.79	0.544	11.58	7.37	252	~~20~~ 0.00	2.0
1049	59.96	240	9.84	0.544	20.04	7.39	252	0.00	2.25
1052	59.96	240	9.93	0.543	13.84	7.41	252	0.00	2.5

Purge Water Description: cloudy w/ light brown color

Sample ID: CFMW-042-GW

Sample Time: 1055

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES: ~~Equipment~~

Horiba: FA01191

Pump: FA01081

control box: FA01037

Well Sampling Sheet

Well ID: CFMW-043-E

Date: 9-13-16

DTW: 49.19

Depth of Pump Intake: ~~46.00~~ 59.00

DTB: 62.00

Total Volume Purged: 2.5

Purge Start:	1405	Time:	1405	CPM:	4	psi:	45	Discharge Rate:	240
Purge End:	1515	Time:	1515	CPM:	4	psi:	45	Discharge Rate:	240

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1411	49.24	240	12.45	0.541	40.14	8.00	259	148	0.2
1416	49.24	240	10.73	0.548	9.64	7.66	281	107	0.4
1421	49.24	240	10.20	0.553	8.80	7.48	295	73.6	0.6
1426	49.24	240	9.99	0.552	8.60	7.44	301	48.2	0.8
1431	49.24	240	9.67	0.558	8.50	7.40	309	38.3	1.0
1436	49.24	240	9.53	0.559	8.30	7.38	314	23.8	1.2
1441	49.24	240	9.44	0.560	8.26	7.37	317	14.7	1.4
1446	49.24	240	9.46	0.560	8.20	7.35	320	2.43	1.6
1449	49.24	240	9.44	0.560	8.10	7.35	321	1.96	1.8
1452	49.24	240	9.38	0.561	8.07	7.34	322	1.56	2.0
1455	49.24	240	9.37	0.561	7.96	7.33	324	0.00	2.2
1458	49.24	240	9.37	0.561	7.96	7.33	325	0.00	2.4
1501	49.24	240	9.34	0.561	7.76	7.33	325	0.00	2.6

Purge Water Description:

Sample ID: CFMW-043-GW

Sample Time: 1505

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

pump: FA01051

controlbox: FA101037

Well Sampling Sheet

Well ID: CFMW-044 Date: 9-15-16

DTW: 49.30 Depth of Pump Intake: 52.0

DTB: 54.16 Total Volume Purged: 4.5

Purge Start:	1200	Time:	1200	CPM:	4	psi:	55	Discharge Rate:	5
Purge End:	1315	Time:	1315	CPM:	4	psi:	55	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1203	49.32	360	12.97	0.440	6.35	8.94	279	9.51	0.3
1208	49.34	360	12.96	0.409	1.67	8.94	146	0.00	0.6
1213	49.35	360	12.34	0.408	1.56	8.89	107	0.00	0.9
1218	49.36	360	11.41	0.419	1.22	8.87	-23	0.00	1.2
1223	49.35	360	11.30	0.420	1.18	8.89	-45	0.00	1.5
1228	49.35	360	11.14	0.419	1.04	8.86	-115	0.00	1.8
1233	49.35	360	12.34	0.414	1.57	8.37	-97	0.00	2.1
1238	49.35	360	12.43	0.423	2.63	8.14	-24	0.00	2.4
1243	49.35	360	9.89	0.456	3.96	8.12	12	0.00	2.7
1246	49.35	360	8.92	0.557	4.47	8.01	22	0.00	3.0
1249	49.35	360	8.88	0.558	4.42	8.02	34	0.00	3.3
1252	49.35	360	8.86	0.561	4.68	8.04	46	0.00	3.6
1255	49.35	360	8.89	0.563	4.87	8.09	51	0.00	3.9
1258	49.35	360	8.87	0.566	5.06	8.09	54	0.00	4.2

Purge Water Description:

Sample ID: CFMW-044-GW Sample Time: 1300

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

PUMP: FA01081

control box FA01037

Well Sampling Sheet

Well ID: CFMW-044a

Date: 9/19/16

DTW: 53.73

Depth of Pump Intake: ~108.00

DTB: 112.97

Total Volume Purged: ~5

Purge Start:		Time:	0809	CPM:	3	psi:	60	Discharge Rate:	11
Purge End:		Time:	1000	CPM:	3	psi:	60	Discharge Rate:	11

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0815	54.80	100	9.50	.885	0.00	11.00	58	78.8	
0820	55.53		9.12	0.793	0.00	11.04	36	33.4	
0825	55.72	120	9.08	0.788	0.00	11.06	31 ~~38~~	38.1	
0830	56.01		9.03	0.790	0.00	11.11	19	23.2	
0835	56.32		9.01	0.807	0.00	11.16	11	19.7	
0840	56.49	125	9.01	0.826	0.00	11.20	3	15.6	
0845	56.59		8.99	0.839	0.00	11.23	-6	15.3	
0850	56.71		9.03	0.880	0.00	11.29	-25	12.8	
0855	56.83		9.02	0.915	0.00	11.32	-39	12.0	
0859	56.88		9.02	0.973	0.00	11.35	-47	10.7	
0904	56.88		9.04	1.02	0.00	11.37	-52	8.18	
0909	56.85		9.08	1.11	0.00	11.42	-66	8.57	
0914	56.88		9.13	1.27	0.00	11.61	-104	6.30	
0919	56.85	130	9.17	1.42	0.00	11.78	-128	4.71	
0924	56.85		9.19	1.51	0.00	11.78	-139	3.24	
0929	56.85		9.25	1.59	0.00	11.90	-152	2.67	

Purge Water Description:

Sample ID: CFMW-044a-GW

Sample Time: 0955

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01191

Pump FA01196

Control FA02269

ROUX ASSOCIATES, INC.

Well Sampling Sheet

Well ID: CFMW - 044a

Date: 9-19-16

DTW: 53.73

Depth of Pump Intake: ~108

DTB: 112.97

Total Volume Purged: ~5

Purge Start:		Time:	0809	CPM:	3	psi:	60	Discharge Rate:	11
Purge End:		Time:	1000	CPM:	3	psi:	60	Discharge Rate:	11

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0934	56.83	125	9.24	1.69	0.00	12.02	-165	2.67	
0939	|	|	9.37	1.82	0.00	12.11	-176	0.62	4.5
0944	|	|	9.44	1.94	0.00	12.18	-187	0.62	
0947	56.83	|	9.42	1.97	0.00	12.21	-191	0.00	
0950	|	|	9.43	1.99	0.00	12.24	-199	0.00	
0953	|	|	9.50	2.01	0.00	12.25	-199	0.00	~5

Purge Water Description:

Sample ID: CFMW - 044a - GW

Sample Time: 0955

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01191

Pump FA01196

Control FA02269

ROUX ASSOCIATES, INC.

2476.0001x.100/SAP-AFP

Well Sampling Sheet

Well ID: ~~CFW~~ CFMW-044b

Date: 9-19-16

DTW: 65.55

Depth of Pump Intake: 2150

DTB: 241.01

Total Volume Purged: 4.25

Purge Start:		Time:	1200	CPM:	4	psi:	95	Discharge Rate:	8
Purge End:		Time:	1246	CPM:	4	psi:	95	Discharge Rate:	8

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1201	65.56	250	13.84	0.365	0.0	8.03	-184	64.2	
1206	65.80	|	11.59	0.269	0.0	8.19	-268	22.7	
1211	65.85	|	10.98	0.254	0.0	8.29	-320	8.73	
1216	65.86	|	10.77	0.253	0.0	8.24	-329	7.63	
1221	65.88	|	10.68	0.254	0.89	8.25	-336	6.57	
1226	65.88	|	10.69	0.254	1.27	8.22	-336	7.79	
1231	65.89	|	10.68	0.254	1.56	8.25	-339	7.93	
1236	65.90	225	10.67	0.254	1.74	8.24	-338	7.97	
1241	|	|	10.70	0.255	2.11	8.26	-339	7.47	
1246	|	|	10.76	0.255	2.78	8.26	-340	7.16	4.25

Purge Water Description:

Sample ID: CFMW-044b

Sample Time: 1250

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

DO reading drifting

~~+ acting suspicious~~

Horiba FA01191

Pump FA01196

Control Box FA02269

Well Sampling Sheet

Well ID: CFMW-045 Date: 9.15.16

DTW: 86.10 Depth of Pump Intake: 96

DTB: 100.08 Total Volume Purged: 1.5

Purge Start:	1329	Time:	1349	CPM:	4	psi:	75	Discharge Rate:	5
Purge End:	1335	Time:	1335	CPM:	4	psi:	75	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1359	86.16	140	16.15	0.562	8.45	8.20	243	865	0.1
1404	86.16	140	13.89	0.557	8.13	7.97	264	724	0.2
1409	86.16	140	13.71	0.553	7.89	7.92	272	618	0.3
1414	86.16	140	13.93	0.550	7.95	7.82	284	520	0.4
1419	86.16	140	13.98	0.551	7.83	7.76	294	279	0.5
1424	86.16	140	13.96	0.552	7.76	7.68	298	120	0.6
1429	86.16	140	14.02	0.552	7.35	7.59	308	56.2	0.7
1432	86.16	140	14.00	0.552	7.20	7.57	311	36.1	0.8
1435	86.16	140	14.06	0.551	7.13	7.55	313	26.8	0.9
1438	86.16	140	14.07	0.552	6.99	7.53	317	16.4	1.0
1441	86.16	140	14.00	0.552	6.86	7.52	318	0.00	1.1
1444	86.16	140	14.04	0.552	6.89	7.50	321	0.00	1.2
1447	86.16	140	14.04	0.552	6.74	7.49	322	0.00	1.3
~~1450~~									

Purge Water Description:

Sample ID: CFMW-045-GW Sample Time: 1450

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA0877

PUMP: FA01081

control box FA01037

Well Sampling Sheet

Well ID: CFMW-045a

Date: 9-19-16

DTW: 90.29

Depth of Pump Intake: 159.0

DTB: 161.28

Total Volume Purged: 3.2 gallons

Purge Start:		Time:	1050	CPM:	3	psi:	90	Discharge Rate:	9
Purge End:		Time:	1230	CPM:	3	psi:	85	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1054	90.79	210	11.28	0.355	4.66	10.21	55	133	0.2
1059	92.07	210	10.78	0.365	2.39	9.68	49	49.5	0.4
1104	92.90	210	10.67	0.354	1.87	9.68	45	29.8	0.6
1109	93.15	160	10.54	0.276	2.17	10.35	43	23.4	0.8
1114	93.40	160	10.57	0.286	2.25	10.26	48	25.3	1.0
1119	93.55	160	10.91	0.316	2.00	10.05	56	23.8	1.2
1124	93.72	160	10.97	0.337	1.72	9.91	61	21.3	1.4
1129	93.85	160	10.95	0.351	1.52	9.75	67	27.3	1.6
1134	93.94	160	11.01	0.371	1.34	9.66	68	27.8	1.8
1139	93.98	160	10.99	0.379	1.19	9.57	72	28.4	2.0
1144	94.06	160	11.00	0.389	1.06	9.61	69	27.9	2.2
1147	94.09	160	10.99	0.391	1.02	9.63	67	29.6	2.4
1150	94.12	160	10.99	0.393	0.97	9.67	65	27.1	2.6
1153	94.15	160	11.07	0.395	0.92	9.81	58	26.6	2.8
1156	94.15	160	11.03	0.395	0.86	9.82	58	24.8	3.0
1159	94.15	160	11.08	0.394	0.85	9.85	56	25.3	3.2

Purge Water Description: clear, no odor

Sample ID: CFMW-045a-GW

Sample Time: 1200

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	—

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA00877
pump: FA01081
control box: FA02184

Well Sampling Sheet

Well ID: CFMW-047 Date: 9-14-16

DTW: 100.03 Depth of Pump Intake: 115.0

DTB: 122.93 Total Volume Purged: 1.0

Purge Start:	1450	Time:	1450	CPM:	4	psi:	70	Discharge Rate:	6.5
Purge End:	1545	Time:	1545	CPM:	4	psi:	70	Discharge Rate:	6.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1458	100.12	120	22.74	0.281	11.68	9.85	66	0.00	0.1
1503	100.12	120	18.35	0.301	6.46	10.56	27	0.00	0.2
1508	100.12	120	17.37	0.304	7.88	10.73	7	0.00	0.3
1513	100.12	120	17.46	0.304	6.40	10.79	-5	0.00	0.4
1518	100.12	120	17.37	0.305	5.72	10.84	-13	0.00	0.5
1523	100.12	120	17.23	0.307	5.44	10.85	-17	0.00	0.6
1528	100.12	120	17.01	0.308	5.57	10.86	-20	0.00	0.8

Purge Water Description:

Sample ID: CFMW-047-GW Sample Time: 1530

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01191

pump: FA01081

control box: FA01037

Well Sampling Sheet

Well ID: 105.02

DTW: CFMW-049

DTB: 141.01

Date: 9/21/16

Depth of Pump Intake: ~140

Total Volume Purged: ~3

Purge Start:		Time:	0727	CPM:	3	psi:	85	Discharge Rate: 10
Purge End:		Time:	0810	CPM:	3	psi:	85	Discharge Rate: 10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0735	105.09	250	10.81	0.417	6.72	6.43	199	4.63	
0740	105.09		10.21	0.406	6.43	6.67	223	2.37	
0747	105.09		9.96	0.400	6.52	6.88	238	0.32	
0752	105.09		9.95	0.400	6.39	6.98	242	0.00	
0757	105.09		9.83	0.399	6.11	7.07	243	0.00	
0802	105.09		9.79	0.399	6.22	7.23	238	0.00	
0807	105.09		9.76	0.399	6.06	7.31	237	0.00	
0810	105.09		9.76	0.399	5.98	7.37	236	0.00	3

Purge Water Description: Clear & colorless

Sample ID: CFMW-049-GW

Sample Time: 0810

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01191

Pump FA01196

Control FA02269

Pg 1

Well Sampling Sheet

Well ID: CFMW-049a

Date: 9/16/16

DTW: 105.28

Depth of Pump Intake: ~~N/A~~ ~149.00

DTB: 151.10

Total Volume Purged: 4 gallons

Purge Start:		Time:	1315	CPM:	3	psi:	90	Discharge Rate:	12
Purge End:		Time:	1515	CPM:	3	psi:	90	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1325	105.43	130	18.08	5.85	5.34	12.38	-139	40.1	
1330	105.43	130	15.13	~~1.53~~ 8.49	1.53	13.06	-232	32.4	
1335	105.43	130	13.82	7.95	.74	13.07	-226	18.5	
1340	105.43	130	13.57	7.74	.79	13.08	-223	8.52	
1345	105.43	130	13.19	7.25	.87	13.02	-218	5.43	1 gallon
1350	105.43	130	12.93	6.79	.82	12.99	-213	6.24	
1355	105.43	130	12.95	6.21	.92	12.94	-209	5.09	
1400	105.43	130	12.79	5.63	1.12	12.89	-204	1.69	
1405	105.43	130	12.91	5.24	1.37	12.83	-200	2.10	2 gallons
1408	105.43	130	12.88	4.79	1.69	12.79	-196	3.03	
1411	105.43	130	12.93	4.49	1.90	12.76	-194	5.00	
1414	105.43	130	12.91	4.25	2.06	12.73	-192	6.64	
1417	105.43	130	12.88	4.03	2.22	12.69	-190	4.77	
1420	105.43	~~130~~	drained at Horiba.						

Purge Water Description: Clear, ~~w/ white~~ and white filmy flakes precipitate

Sample ID: CFMW-049a-GW

Sample Time: 1445

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01191

pump: FA01196

control box: FA02269

Well Sampling Sheet

Well ID: CFMW-049a
Date: 9/16/16
DTW: 105.28
Depth of Pump Intake: ~149.00
DTB: 151.10
Total Volume Purged: 4 gallons

Purge Start:		Time:	1315	CPM:	3	psi:	90	Discharge Rate:	12
Purge End:		Time:	1515	CPM:	3	psi:	90	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1427	105.43	130	13.60	3.20	5.51	12.57	-184	26.4	3gallons
1430	105.43	130	13.57	3.13	5.03	12.55	-185	22.1	
1433	105.43	130	13.53	3.01	5.01	12.53	-183	20.1	
1436	105.43	130	13.49	2.89	5.00	12.51	-181	8.98	
1439	105.43	130	13.54	2.79	5.05	12.49	-180	8.54	
1442	105.43	130	13.52	2.72	5.04	12.48	-179	8.18	
1445	105.43	130	13.57	2.63	4.95	12.46	-178	6.85	4gallons

Purge Water Description: clear w/ white filmy flakes precipitate

Sample ID: CFMW-049a-GW
Sample Time: 1445
Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Horiba: FA0191
pump: FA0196
control box: FA02269

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Note: Precipitate in water appears to alter readings heavily esp. Specific Conductivity and turbidity. With no drawdown water purged from formation. Will sample at 1445

Well Sampling Sheet

Well ID: CFMW-050-

Date: 9-19-16

DTW: 105.86

Depth of Pump Intake: 104.0

DTB: 123.37

Total Volume Purged: 1.8 gallons

Purge Start:		Time:	1318	CPM:	3	psi:	90	Discharge Rate:	9
Purge End:		Time:	1400	CPM:	3	psi:	90	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1323	105.89	335	10.84	0.403	13.79	8.51	194	38.0	0.3
1328	105.89	335	9.76	0.392	8.63	8.16	222	13.2	0.6
1333	105.89	335	9.69	0.392	7.70	8.22	229	0.00	0.9
1338	105.89	335	9.50	0.392	7.40	8.09	241	0.00	1.2
1343	105.89	335	9.50	0.391	7.17	8.06	251	0.00	1.5
1348	105.89	335	9.44	0.392	6.87	8.18	247	0.00	1.8

Purge Water Description: clear, no color

Sample ID: CFMW-050-GW

Sample Time: 1350

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00577
Pump: FA01181
Control box: FA02154
*CFMW-EB6-AQ
associated with this sample*

Well Sampling Sheet

Well ID: CFMW-053 Date: 9-14-16

DTW: 6165(PVC), 6190(steel) Depth of Pump Intake: 74.0

DTB: 7624 Total Volume Purged: 1.2

Purge Start:	1145	Time:	1145	CPM:	4	psi:	45	Discharge Rate:	6
Purge End:		Time:		CPM:	4	psi:	45	Discharge Rate:	6

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1153	61.84	150	12.40	0.544	14.52	7.63	224	19.3	0.15
1158		150	11.53	0.540	9.26	7.57	247	0.00	0.3
1203		150	11.35	0.539	8.45	7.56	249	0.00	0.45
1208		150	11.29	0.536	7.72	7.56	255	0.00	0.60
1213		150	11.14	0.536	6.32	7.55	256	0.00	0.75
1218		150	10.06	0.536	6.92	7.55	259	0.00	0.9
									~~1.05~~
									~~1.2~~
									~~1.35~~

Purge Water Description:

Sample ID: CFMW-053-GW Sample Time: 1220

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01191

pump: FA01081

control box: FA01037

* equipment blank @ CFMW-FB3-AQ associated w/*

Well Sampling Sheet

Well ID: CFMW-053a
Date: 9-19-16
DTW: 89.07
Depth of Pump Intake: 160
DTB: 162.5
Total Volume Purged: 1.6

Purge Start:		Time:	0800	CPM:	3	psi:	80	Discharge Rate:	9
Purge End:		Time:	1000	CPM:	3	psi:	70	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
814	90.20	85	10.56	8.57	2.58	14.00	-126	50.4	0.2
819	90.95	85	10.29	8.58	2.05	14.00	-161	29.8	0.4
824	91.50	85	9.99	8.66	1.76	14.00	-187	19.2	0.6
829	92.42	85	9.82	8.73	1.59	14.00	-202	13.4	0.7
834	93.00	85	9.65	8.84	1.46	14.00	-212	0.13	0.8
839	93.21	85	9.49	8.93	1.32	14.00	-223	0.00	0.9
844	93.85	85	9.38	9.04	1.25	14.00	-234	0.00	1.0
849	94.27	85	9.26	9.15	1.15	14.00	-243	0.00	1.1
854	94.45	40	9.22	9.20	1.09	14.00	-249	0.00	1.2
859	94.50	40	9.18	9.24	1.07	14.00	-255	0.00	1.3
904	94.56	40	9.16	9.30	1.01	14.00	-255	0.00	1.4

Purge Water Description: clear, no color

Sample ID: CFMW-053a-GW
Sample Time: 0910
Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Hourly: FA00877
pump: FA01081
control box: FA02184
Note purged over two days
very slow recharge while pumping
however recharge from 9/16 to 9/19
full recovery

Well Sampling Sheet

Well ID: CFMW-053a
Date: 9-16-16
DTW: 89.03' (TOC)
Depth of Pump Intake: 159'
DTB: 162.5 (TOC)
Total Volume Purged: 8 gallons

Purge Start:	1507	Time:	1507	CPM:	3	psi:	90	Discharge Rate:	9
Purge End:	1745	Time:		CPM:	3	psi:	90	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1512	88.75	180		9.96					
1516	90.90		15.74	10.1	12.39	14.00	48	672	
1521	91.05		14.07	10.6	3.39	14.00	-120	288	
1526	92.60		13.62	10.8	2.46	14.00	-181	163	
1531	93.95	300							
1536	95.02	300	12.31	10.4	2.11	14.00	-247	72.2	
1541	97.05		12.30	9.99	2.39	14.00	-222	48.2	
1549	100.19	300	11.99	9.99	2.32	14.00	-225	29.7	
1552			11.79	10.1	2.23	14.00	-236	27.1	
1558	102.75		11.83	10.2	2.17	14.00	-240	20.7	
1604	~~105.19~~ 3½		11.83	10.2	2.01	14.00	-251	~~19.2~~	19.1
1609	105.19		11.82	10.3	1.87	14.00	-251	1.45	
1614	106.32		11.70	10.4	1.74	14.00	-277	1.32	
1617	106.78		11.72	10.4	1.71	14.00	-281	0.81	
1620	107.25		11.72	10.4	1.65	14.00	-292	0.52	
~~1620~~	~~107.90~~								
1745	112.89		—	—	—	—	—	—	

Purge Water Description:

Sample ID: _____ Sample Time: _____

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

End purge. Will pump again monday 9/19

Well Sampling Sheet

Well ID: CFMW-054 Date: 9-14-16

DTW: 74.39 Depth of Pump Intake: 85.0

DTB: 87.55 Total Volume Purged: 1.4

Purge Start:	1305	Time:	1305	CPM:	4	psi:	55	Discharge Rate:	5
Purge End:	1345	Time:	1345	CPM:	4	psi:	55	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1312	74.52	180	15.04	0.534	16.20	7.51	232	80.8	0.2
1317	74.53	180	13.00	0.534	13.53	7.49	250	17.0	0.4
1322	74.52	180	13.14	0.534	13.04	7.48	256	0.00	0.6
1327	74.52	180	12.94	0.534	13.46	7.49	258	0.00	0.8
1332	74.52	180	12.84	0.534	13.51	7.50	258	0.00	1.0
1337	74.52	180	12.91	0.534	13.02	7.51	259	0.00	1.2

Purge Water Description:

Sample ID: CFMW-054-GW Sample Time: 1340

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01191

PUMP: FA01081

Control Box: FA01037

Well Sampling Sheet

Well ID: CFMW-056 Date: 9-20-16

DTW: 86.46 Depth of Pump Intake: ~178

DTB: 180.58 Total Volume Purged: 4 gallons

Purge Start:		Time:	0915	CPM:	3	psi:	90	Discharge Rate:	12
Purge End:		Time:	1020	CPM:	3	psi:	90	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0923	86.52	250	7.97	0.342	0.00	7.32	-56	74	
0930	86.56		8.05	0.373	0.00	7.06	-143	79.1	
0935	86.62		8.08	0.378	0.00	7.07	-165	80.5	
0940	86.63		8.11	0.379	0.00	7.10	-179	76.4	
0945	86.64		8.17	0.380	0.00	7.12	-187	62.7	
0950	86.68		8.27	0.380	0.00	7.15	-194	54.1	
0955	86.72		8.30	0.380	0.00	7.16	-197	46.7	~2
1000	86.76		8.35	0.379	0.00	7.18	-203	37.9	
1005	86.77		8.35	0.379	0.00	7.18	-204	34.6	
1010	86.76		8.41	0.379	0.00	7.19	-206	30.5	
1013	86.78		8.45	0.379	0.00	7.20	-209	29.3	
1016	86.77		8.49	0.379	0.00	7.21	-211	27.0	~4

Purge Water Description: Gray tint

Sample ID: CFMW-056-GW Sample Time: 1020

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

CFMW-EB07

collected prior

@ 0900

CFMW-DUP3 @ 1200

Hanbo FA01191 Pump FA01196

Control FA02269

2478.0001x.100/SAP-APR

Well Sampling Sheet

Well ID: CFMW-056a

Date: 9/20/16

DTW: 79.73

Depth of Pump Intake: ~131

DTB: 137.40

Total Volume Purged: ~20 gallons

Purge Start:		Time:	0730	CPM:	2	psi:	80	Discharge Rate:	5
Purge End:		Time:	0825	CPM:	2	psi:	80	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0738	80.49	200	9.82	0.378	0.00	7.81	-409	>1000	
0743	81.63		8.51	0.295	0.00	8.74	-453	609	
0748	82.48	150	8.48	0.283	0.00	8.78	-457	401	
0753	82.72		8.36	0.278	0.00	8.77	-450	350	
0758	82.93		8.13	0.276	0.00	8.72	-438	431	
0803	83.20		7.85	0.282	0.00	8.53	-420	507	
0808	83.42		7.64	0.287	0.00	8.41	-404	522	~1.25
0813	83.63		7.58	0.291	0.00	8.31	-395	512	
0818	83.83		7.60	0.295	0.00	8.21	-392	482	
0823	84.01		7.62	0.298	0.00	8.11	-390	452	~2

Purge Water Description: moderately turbid, light brown color

Sample ID: CFMW-056a - GW

Sample Time: 0825

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01191

Pump FA01196

Control FA02269

Well Sampling Sheet

Well ID: CFMW-0566 Date: 9-13-16

DTW: 34.31 Depth of Pump Intake: 49.00

DTB: 52.67 Total Volume Purged: 2.5

Purge Start:	1230	Time:	1230	CPM:	4	psi:	45	Discharge Rate:	300
Purge End:	1340	Time:	1340	CPM:	4	psi:	45	Discharge Rate:	300

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1238	34.40	300	9.26	0.502	9.92	7.88	253	923	0.2
1243	34.40	300	8.91	0.494	7.89	7.66	265	927	0.4
1248	34.40	300	8.80	0.493	7.88	7.64	269	374	0.6
1253	34.40	300	8.75	0.493	7.79	7.95	259	159	0.8
1258	34.40	300	8.71	0.493	7.72	7.98	261	58.3	1.0
1303	34.40	300	8.72	0.494	7.61	7.98	264	26.8	1.2
1308	34.40	300	8.72	0.494	7.42	8.02	266	12.9	1.40
1311	34.40	300	8.70	0.495	7.62	7.97	270	1.61	1.6
1314	34.40	300	8.68	0.495	7.94	7.94	272	0.41	1.8
1317	34.40	300	8.67	0.495	7.56	7.95	273	0.00	2.0
1320	34.40	300	8.69	0.495	7.58	7.96	274	0.00	2.2
1323	34.40	300	8.70	0.495	7.65	7.98	275	0.00	2.4

Purge Water Description:

Sample ID: CFMW-0566-GW Sample Time: 1325

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

HOriba: FAD0877

PUMP: FAD1081

control box: FAD1037

Well Sampling Sheet

Well ID: CFMW-057 Date: 9-19-16

DTW: 83.45 Depth of Pump Intake: ~180

DTB: 184.4 Total Volume Purged: 1.75

Purge Start:		Time:	1323	CPM:	3	psi:	85	Discharge Rate:	1
Purge End:		Time:	1405	CPM:	3	psi:	85	Discharge Rate:	1

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1335	83.51	175							
1340	83.53		15.02	0.204	3.29	8.15	-300	7.94	
1345	83.54		14.26	0.208	2.87	8.06	-309	7.94	
1350	83.58		13.84	0.209	3.56	8.00	-320	9.12	
1355	83.58		13.63	0.210	4.03	8.02	-327	9.18	~1
1400	83.58		13.52	0.211	4.39	8.02	-328	9.19	
1404	83.58		13.48	0.212	4.71	8.01	-329	9.16	1.75

Purge Water Description:

Sample ID: CFMW-057-GW Sample Time: 1405

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01191

Pump FA01196

Control FA02269

Well Sampling Sheet

Well ID: CFMW-057a

Date: 9/19/16

DTW: 78.85

Depth of Pump Intake: ~138

DTB: 140

Total Volume Purged: 1 gallon

Purge Start:		Time:	1435	CPM:	3	psi:	80	Discharge Rate:	9
Purge End:		Time:	1525	CPM:	3	psi:	80	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1438	77.64	180							
1440	78.24	|							
1445	79.24	|	11.01	8.36	0.00	12.93	-344	54.3	
1446		50	–	–	–	–	–	–	–
1452	79.95	|	12.96	8.51	0.00	12.86	-332	23.5	
1457	80.34	|	12.16	8.47	|	12.84	-324	17.6	
1500	80.58	|	12.16	8.47	|	12.84	-322	15.2	
1505	80.91	|	12.24	8.47	|	12.83	-316	9.39	
1508	81.22	|	12.32	8.44	|	12.81	-316	9.08	
1511	81.42	|	12.34	8.38	|	12.81	-302	8.69	
1514	81.71	|	12.43	8.33	|	12.80	-298	6.58	
1517	81.96	|	12.34	8.31	|	12.80	-298	6.83	
1520	82.15	|	12.31	8.32	|	12.80	-289	6.85	1 gal

Purge Water Description:

Sample ID: CFMW-057a-GW

Sample Time: 1525

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01196

Pump FA01196

Control FA02269

Well Sampling Sheet

Well ID: CFMW-059 Date: ~~8/17/14~~ 9-15-16

DTW: 70.91 Depth of Pump Intake: ~80

DTB: 92.70 Total Volume Purged: 2.25

Purge Start:		Time:	1009	CPM:	3	psi:	40	Discharge Rate:	12
Purge End:		Time:	1100	CPM:	3	psi:	40	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1015	70.96	200	9.93	0.580	24.82	7.58	117	0.0	
1020	70.95	|	9.85	0.577	22.46	7.55	98	0.0	
1025	70.92	|	9.68	0.574	16.91	7.51	71	0.0	
1033	|	|	9.62	0.574	12.76	7.49	63	0.0	
1038	|	|	9.66	0.574	18.43	7.48	71	0.0	
1043	|	|	9.69	0.572	17.24	7.48	72	0.0	
1048	70.92	200	9.67	0.563	16.90	7.48	78	0.0	2.25

Purge Water Description: clear & colorless

Sample ID: CFMW-059-GW Sample Time: 1050

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba FA01191
Control Box FA02121
Pump FA01196

Well Sampling Sheet

Well ID: CFMW-059a

Date: 9-19-16

DTW: 72.66

Depth of Pump Intake: 158.0

DTB: 162.98

Total Volume Purged: 3.2 gallons

Purge Start:		Time:	1440	CPM:	3	psi:	100	Discharge Rate:	9
Purge End:		Time:	1610	CPM:	3	psi:	100	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1445	72.98	240	12.22	8.26	10.79	14.00	-491	593	0.1
1450	73.08	240	11.55	8.49	4.40	14.00	-535	258	0.3
1455	73.18	240	11.13	8.20	3.22	14.00	-559	143	0.5
1500	73.20	220	10.91	7.63	2.88	14.00	-575	88.5	0.7
1505	73.24	220	11.36	7.10	2.85	14.00	-586	54.4	0.9
1510	73.28	220	10.99	6.75	2.54	14.00	-586	38.4	1.1
515	73.34	220	10.69	6.35	2.64	14.00	-588	26.8	1.3
1520	73.38	220	10.65	6.01	2.49	14.00	-592	17.5	1.5
1525	73.42	220	10.55	5.71	2.39	14.00	-592	0.00	1.7
1528	73.44	220	10.57	5.63	2.35	14.00	-592	0.00	1.9
1531	73.49	220	10.42	5.51	2.32	14.00	-590	0.00	2.1
1534	73.52	220	10.49	5.35	2.22	14.00	-591	0.00	2.3
1537	73.54	220	10.43	5.29	2.17	14.00	-592	0.00	2.5
1540	73.50	220	10.38	5.12	2.08	14.00	-593	0.00	2.7
1543	73.50	220	10.44	5.04	2.03	14.00	-595	0.00	2.9
1546	73.52	220	10.32	5.01	1.94	14.00	-595	0.00	3.1

Purge Water Description:

Sample ID: CFMW-059a-GW

Sample Time: 1550

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00877

pump: FA01081

control box: FA02184

Well Sampling Sheet

Well ID: CFMW-061 **Date:** 9/9/16

DTW: 13.79 (toc) **Depth of Pump Intake:** ~23 ft btoc

DTB: 26.06 (toc) **Total Volume Purged:** ~6 gallons

Purge Start:		**Time:**	1228	**CPM:**	4	**psi:**	60	**Discharge Rate:**	5
Purge End:		**Time:**	1338	**CPM:**	4	**psi:**	60	**Discharge Rate:**	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1232	13.79	350 ml/min	14.08	0.403	0.00	7.32	20	361	~.25
1237	13.79	350	13.78	0.405	0.00	7.34	-58	290	~.75
1242	13.79	350	13.75	0.406	0.00	7.42	-86	203	~1.10
1247	13.79	350	13.61	0.408	0.00	7.40	-94	120	~2
1252	13.79	350	13.55	0.408	0.00	7.41	-96	84.4	~2.75
1257	13.79	350	13.52	0.407	0.00	7.41	-95	49.6	~3
1302	13.79	350	13.47	0.407	0.00	7.40	-95	27.9	~3.5
1307	13.79	350	13.46	0.407	0.00	7.42	-95	13.9	~4
1312	13.79	350	13.48	0.407	0.00	7.42	-94	11.3	~4.25
1315	13.79	350	13.42	0.407	0.00	7.42	-95	7.01	~4.5
1318	13.79	350	13.44	0.407	0.00	7.40	-93	5.28	~5
1321	13.79	350	13.45	0.407	0.00	7.43	-95	3.24	~5.5
1324	13.79	350	13.45	0.407	0.00	7.42	-93	2.98	~5.75
1327	13.79	350	13.45	0.407	0.00	7.43	-94	2.91	~6

Purge Water Description: Cloudy, orange tint

Sample ID: CFMW-061-GW Sample Time: 1330

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Control box #FA02121

Bladder #FA01196

Horiba #FA01191

Well Sampling Sheet

Well ID: CFMW-061 Date: 9-15-16

DTW: 13.81 Depth of Pump Intake: ~22.5'

DTB: 26.04 Total Volume Purged: 4

Purge Start:		Time:	1140	CPM:	3	psi:	25	Discharge Rate:	12
Purge End:		Time:	1300	CPM:	3	psi:	25	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1145	13.82	300	15.67	0.390	1.14	7.51	57	171	
1150	13.82		14.71	0.393	0.0	7.55	-27	114	
1155			14.42	0.393	0.0	7.49	-31	66.1	
1200	13.82		14.22	0.396	3.96	7.48	-56	43.4	
1206			14.15	0.396	2.93	7.47	-62	27.5	
1211			14.07	0.397	3.85	7.51	-71	18.9	~2
1216	13.82		14.12	0.397	1.91	7.57	-79	11.9	
1222			13.98	0.398	0.0	7.59	-87	4.85	
1227			13.89	0.400	0.1	7.57	-86	4.02	
1232			13.84	0.400	0.2	7.55	-85	0.00	
1235			13.93	0.400	0.2	7.57	-91	0.00	
1238		300	13.91	0.400	0.2	7.60	-91	0.00	~4

Purge Water Description: clear & colorless

Sample ID: CFMW-061 Sample Time: 1245

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

CFMW-EB4-AQ collected prior

Horiba FA01191 Pump FA01196 Control Box FA02121

Well Sampling Sheet

Well ID: CFMW-064 Date: 9/15/16

DTW: ~~13.81~~ (A) 14.36 Depth of Pump Intake: ~25

DTB: ~~26.04~~ (A) 33.08 Total Volume Purged: 3 gallons

Purge Start:		Time:	1313	CPM:	3	psi:	28	Discharge Rate:	12
Purge End:		Time:	1415	CPM:	3	psi:	28	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1319	14.35	300	11.49	0.393	1.06	7.52	181	227	
1325	14.36		11.17	0.395	0.07	7.59	195	79.6	
1330	14.36	300	1050	0.402	0.00	7.67	217	40.7	
1335	14.36		10.35	0.404	0.00	7.64	221	30.4	1
1340	14.36	300	10.42	0.405	0.00	7.64	227	14.7	
1345			10.26	0.405	0.05	7.59	230	5.16	
1350			10.26	0.405	0.05	7.59	230	5.16	
1355	14.36		10.23	0.405	0.00	7.65	230	0.91	2
1400			10.22	0.406	0.00	7.66	232	1.09	
1405			10.20	0.405	0.00	7.65	233	0.00	
1410			10.19	0.406	0.00	7.68	235	0.00	
1415	14.36		10.21	0.406	0.00	7.66	236	0.00	3

Purge Water Description: CFMW-064-GW clear & colorless

Sample ID: CFMW-064-GW Sample Time: 1415

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

DO steady @ 0.0 until 1410
then vary widely 0-20 mg/L
Horiba - FA01191 control Box FA02121
Pump FA02121

Well Sampling Sheet

Well ID: CFMW-001 Date: 12/12/16

DTW: 98.21 Depth of Pump Intake: 149.0

DTB: 153.37 Total Volume Purged: 1.5

Purge Start:		Time:	840	CPM:	4	psi:	250	Discharge Rate: 5
Purge End:		Time:	1040	CPM:	4	psi:	250	Discharge Rate: 5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
858	98.31	100	6.58	0.431	2.07	6.48	148	1000	0.1
903	98.32	100	6.56	0.415	1.67	6.74	41	1000	0.2
908	98.34	100	6.44	0.413	1.36	6.73	22	1000	0.3
913	98.35	100	6.43	0.411	1.30	6.74	18	1000	0.4
918	98.35	100	6.56	0.411	1.18	6.77	13	1000	0.5
923	98.35	100	6.60	0.410	1.12	6.79	9	1000	0.6
928	98.35	100	6.62	0.410	1.08	6.81	5	928	0.7

Purge Water Description: turbid water, slight brown color

Sample ID: CFMW-001-GW Sample Time: 0935

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01009
bladder pump: FA00896
control box: FA02073

Well Sampling Sheet

Well ID: CFMW-002 Date: 12/15/16

DTW: DRY Depth of Pump Intake: —

DTB: 82.46 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

No sample collected due to insufficient water.

Well Sampling Sheet

Well ID: CFMW-003 **Date:** 12/9/16

DTW: 22.15 **Depth of Pump Intake:** 50 ft below TOC

DTB: 54.45 **Total Volume Purged:** ~ 22 L

Purge Start:	1100	**Time:**		**CPM:**	4	**psi:**	80	**Discharge Rate:**	5
Purge End:	1200	**Time:**		**CPM:**	4	**psi:**	80	**Discharge Rate:**	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1110	22.40	375	7.82	2.91	12.19	7.05	75	>1000	3.75 L
1115	22.40	375	8.03	2.78	10.92	6.95	84	>1000	5.625 L
1120	22.38	375	8.08	2.70	10.55	7.01	84	>1000	7.5 L
1125	22.38	375	7.99	2.64	10.66	7.08	86	>1000	9.375 L
1130	22.35	375	8.07	2.61	10.12	7.09	88	>1000	11.25 L
1140	22.35	375	7.96	2.60	1.37	7.12	98	>1000	15.0 L
1145	22.35	375	8.11	2.59	0.59	7.08	97	>1000	16.875 L
1150	22.35	375	7.99	2.57	0.53	7.07	98	>1000	18.75 L
1155	22.44	375	7.94	2.56	0.51	7.09	98	987	20.625 L

disturbed some sediment from bottom

Purge Water Description: Water appears turbid/full of sediment

Sample ID: CFMW-003-GW Sample Time: 1210

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A Field Filtered	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bladder pump #FA-01196

Control Box #FA01020

Horiba #FA01009

Well Sampling Sheet

Well ID: CFMW-003a
Date: 12/12/16
DTW: 148.90
Depth of Pump Intake: 195.0
DTB: 203.21
Total Volume Purged: 1.5

Purge Start:		Time:	1125	CPM:	3	psi:	220	Discharge Rate:	8
Purge End:		Time:	1226	CPM:	3	psi:	220	Discharge Rate:	8

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1137	149.79	130	5.87	0.338	1.32	8.28	-85	1000	0.1
1142	150.45	130	6.34	0.323	6.03	8.38	-96	1000	0.2
1147	150.97	130	7.13	0.317	3.29	8.45	-100	780	0.3
1152	151.11	130	7.07	0.315	2.11	8.49	-107	292	0.4
1157	151.44	130	7.15	0.314	1.62	8.51	-110	156	0.5
1202	151.66	130	7.76	0.314	1.35	8.50	-113	90.4	0.6
1207	151.85	130	7.62	0.314	1.22	8.52	-115	69.8	0.7
1212	152.01	130	7.65	0.313	1.03	8.54	-120	49.0	0.8
1217	152.21	130	7.85	0.313	0.96	8.55	-124	36.3	0.9
1220	152.16	130	7.91	0.313	0.90	8.56	-127	34.4	1.0
1223	152.10	130	7.92	0.313	0.88	8.57	-129	32.0	1.1
1226	152.06	130	7.99	0.312	0.85	8.58	-132	30.2	1.2

Purge Water Description: turbid then cleared up to clear water

Sample ID: CFMW-003a-GW
Sample Time: 1230
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01009
control box: FA00896
bl cooler pump: FA02073

Well Sampling Sheet

Well ID: CFMW-007-GW
Date: 12/12/16
DTW: 78.49
Depth of Pump Intake: 156.0
DTB: 159.14
Total Volume Purged: 2.4

Purge Start:		Time:	1425	CPM:	3	psi:	100	Discharge Rate:	9
Purge End:		Time:		CPM:	3	psi:	100	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1438	78.49	190	5.58	0.423	6.54	7.50	-14	547	0.2
1443	78.49	190	5.26	0.429	2.00	7.49	-61	425	0.4
1448	78.49	190	5.41	0.433	1.37	7.48	-71	346	0.6
1453	78.49	190	5.32	0.433	1.09	7.47	-75	311	0.8
1458	78.49	190	5.47	0.434	0.96	7.45	-75	286	1.0
1503	78.49	190	5.39	0.435	0.84	7.43	-76	260	1.2
1508	78.49	190	5.26	0.434	0.76	7.42	-77	241	1.4
1513	78.49	190	5.35	0.434	0.69	7.41	-77	224	1.6
1518	78.49	190	5.31	0.435	0.66	7.41	-78	215	1.8
1523	78.49	190	5.67	0.435	0.64	7.41	-78	198	2.0

Purge Water Description: clear, slight brown/copper color

Sample ID: CFMW-007-GW
Sample Time: 1530
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Hanba: FA01009
water box: FA00896
bladder pump: FA02073

Well Sampling Sheet

Well ID: CFMW-008 **Date:** 12/16/16

DTW: 73.74 **Depth of Pump Intake:** ~184

DTB: 187.81 **Total Volume Purged:** ~4 gallo

Purge Start:		**Time:**	1130	**CPM:**	35	**psi:**	100	**Discharge Rate:**	7
Purge End:		**Time:**	1300	**CPM:**	5	**psi:**	100	**Discharge Rate:**	7

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1200	74.00	150	5.23	.847	2.26	6.95	-179	18.9	
1205	74.00	150	5.44	.854	2.23	6.91	-184	16.9	1gallon
1210	74.00	150	5.76	.857	2.13	6.91	-184	15.9	
1215	74.00	150	6.51	.863	2.13	6.86	-193	36.1	2gallons
1220	74.00	150	6.72	.858	2.11	6.93	-198	47.2	
1225	74.00	150	6.84	.853	2.07	7.01	-204	43.3	3gallons
1230	74.00	150	6.90	.850	2.01	7.05	-207	39.0	
1235	74.00	150	6.99	.832	1.98	7.15	-216	36.9	4gallons

Purge Water Description: Clear w/ black particulates

Sample ID: CFMW-008-GW Sample Time: 1235

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA00725

Pump: FA00273

Control: FA00896

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-008a
Date: 12/16/16
DTW: 64.23
Depth of Pump Intake: ~97
DTB: 99.45
Total Volume Purged: 3gallon

Purge Start:		Time:	1300	CPM:	3	psi:	80	Discharge Rate:	9
Purge End:		Time:	1400	CPM:	3	psi:	80	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1339	72.20	300	5.64	5.86	3.42	12.42	-318	0.00	
1340	74.37	300	5.75	[illegible]	2.63	12.51	-327	0.00	
				5.84					
1345	76.10	300	6.12	5.77	2.09	12.76	-334	2.88	
1350	77.52	300	6.12	5.73	2.14	12.95	-332	5.63	
1355	79.29	300	5.94	5.69	2.55	13.08	-307	11.3	
1400	81.28	300	5.82	5.73	3.15	13.14	-285	15.7	3gallon

Purge Water Description: Clear

Sample ID: CFMW-008a-GW
Sample Time: 1310
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Horiba: FA00725 Pump FA ~~00025~~ 03077 control FA00896

NOTES:
Pumped dry 12/14. Sample collected initially due to slow recharge. Parameters taken after sample collected

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-010 Date: 12/15/16

DTW: 83.70 Depth of Pump Intake: ~85

DTB: 86.40 Total Volume Purged: 3 gallons

Purge Start:	0820	Time:		CPM:	3	psi:	40	Discharge Rate:	10
Purge End:	930	Time:		CPM:	3	psi:	40	Discharge Rate:	10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0820	83.88	250	6.49	.946	4.13	8.99	195	>1000	
0825	83.86	250	7.06	.926	2.45	9.10	207	>1000	
0830	83.82	250	7.23	.923	1.81	9.11	220	>1000	
0835	83.82	250	7.17	.920	1.64	9.13	225	>1000	1 gallon
0840	83.82	250	7.33	.942	2.24	9.11	231	>1000	
0845	83.83	250	7.53	.983	2.98	9.11	234	>1000	
0850	83.84	250	Cleanout Horiba						
0855	83.85	250	7.75	.979	2.80	9.03	238	>1000	2 gallons
0900	83.85	250	7.91	1.04	3.36	9.28	226	~~>1000~~ 774	
0905	83.85	250	8.01	1.05	3.52	9.31	224	1000	
0910	83.82	250	8.09	1.05	3.39	9.24	226	907	
0915	83.82	250	8.12	1.06	3.18	9.25	225	899	3 gallons

Purge Water Description: Light brown silty turbid

Sample ID: CFMW-010-GW Sample Time: 0915

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba FA00725

Control FA00620

Pump FA02073

*Associated w/ EB-17

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300. 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-011 **Date:** 12/8/16

DTW: 40.34 **Depth of Pump Intake:** 49.0 below TOC

DTB: 52 **Total Volume Purged:** ~ 23 L

Purge Start:	1050	**Time:**		**CPM:**	3	**psi:**	70	**Discharge Rate:**	9
Purge End:	1200	**Time:**		**CPM:**	3	**psi:**	70	**Discharge Rate:**	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1100	40.33	350	5.72	0.478	11.81	6.90	234	101	3.5 L
1105	40.33	350	5.96	0.472	11.47	7.11	242	34.8	5.25 L
1110	40.33	350	6.07	0.454	10.58	7.53	260	5.76	7.0 L
1115	40.33	350	6.04	0.452	10.55	7.58	260	0.37	8.75 L
1120	40.35	350	5.82	0.452	10.51	7.66	264	0.0	10.5 L
1125	40.35	350	5.53	0.459	10.57	7.64	270	3.69	12.25
1130	40.35	350	4.47	0.466	10.89	7.71	269	6.06	14.0 L
1135	40.33	250	4.35	0.468	10.97	7.72	272	0.0	15.75 L
1145	40.33	250	5.27	0.469	10.33	7.65	276	0.0	19.25 L
1150	40.33	250	5.97	0.450	9.90	7.67	278	0.0	21.75 L
1155	40.33	250	5.86	0.451	9.98	7.70	279	0.0	23 L

Purge Water Description: Lifted pump off bottom w/ [illegible]

Sample ID: CFMW-011-GW Sample Time: 1200

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

NOTES:

Horiba # FA 00725

Control Box # FA 00620

Bladder Pump # FA 02073

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-C119 Date: 12-14-16

DTW: 99.36 Depth of Pump Intake: 164.0

DTB: 168.58 Total Volume Purged: 23 gallon

Purge Start:		Time:	0800	CPM:	3	psi:	240	Discharge Rate:	9
Purge End:		Time:	0930	CPM:	3	psi:	240	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
814	99.51	170	8.24	0.424	4.06	7.80	124	1000	0.15
819	99.53	170	7.33	0.390	2.25	7.99	44	1000	0.3
824	99.55	170	6.84	0.396	1.98	7.94	16	1000	0.45
829	99.57	170	6.49	0.400	1.90	7.82	4	1000	0.6
834	99.59	170	6.24	0.402	1.71	7.74	-4	1000	0.75
839	99.60	170	6.07	0.405	1.46	7.71	-16	1000	0.90
844	99.62	170	5.97	0.407	1.32	7.69	-26	823	1.05
849	99.63	170	5.87	0.406	1.26	7.68	-36	984	1.2
854	99.64	170	5.84	0.403	1.25	7.68	-40	893	1.35
859	99.64	170	5.77	0.401	1.19	7.67	-45	801	1.50
902	99.64	170	5.72	0.398	1.20	7.67	-48	685	1.60
905	99.64	170	5.68	0.398	1.25	7.67	-50	633	1.70
908	99.64	170	5.64	0.398	1.26	7.67	-52	603	1.80
911	99.64	170	5.64	0.392	1.21	7.67	-53	584	1.90

Purge Water Description: turbid, light brown color, decreased mostly by end

Sample ID: CFMW-C119-GW Sample Time: 915

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	X
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01009
control box: FA00896
bladder pump: FA ~~00173~~ 00196
previously high pH well
redeveloped by Hydrowatters and Laycide

Well Sampling Sheet

Well ID: CFMW-012 Date: 12/14/16

DTW: 77.80 Depth of Pump Intake: ~80'

DTB: 81.89 Total Volume Purged: 2.5 gallon

Purge Start:	1350	Time:		CPM:	3	psi:	60	Discharge Rate:	9
Purge End:	1455	Time:		CPM:	3	psi:	60	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1400	77.90	200	6.74	1.14	13.80	9.06	271	41.1	
1405	78.10	200	6.89	1.14	13.41	9.06	275	16.5	
1410	78.20	200	6.87	1.14	13.16	9.11	273	8.05	
1415	78.30	200	6.77	1.13	12.85	9.16	271	5.37	1.5 gallon
1420	78.40	200	6.68	1.13	12.21	9.20	269	2.58	
1425	78.44	200	6.50	1.14	12.23	9.21	268	0.00	
1430	78.45	200	6.51	1.14	11.35	9.22	268	0.00	
1435	78.45	200	6.56	1.14	11.33	9.20	269	0.00	2.5 gall

Purge Water Description: Slight yellow tint

Sample ID: CFMW-012-GW Sample Time: 1435

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00725

Control FA00620

Pump FA020 73

Well Sampling Sheet

Well ID: CFMW-0129 Date: 12/13/16

DTW: 143.29 Depth of Pump Intake: 208.0

DTB: 213.40 Total Volume Purged:

Purge Start:		Time:	0850	CPM:	3	psi:	240	Discharge Rate:	10
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
919	143.33	80	5.60	0.425	4.54	5.96	233	748	0.1
924	143.33	80	5.83	0.425	3.63	6.64	116	603	0.2
929	143.33	80	6.09	0.414	2.94	6.81	40	395	0.3
934		80	6.16	0.412	2.50	6.84	14	280	0.4
939		80	6.25	0.412	2.45	6.86	-4	191	0.5
944		80	6.28	0.405	2.20	7.02	-16	152	0.6
949		80	6.33	0.402	1.98	7.18	-26	124	0.7
954		80	6.40	0.401	1.91	7.31	-35	112	0.8
959		80	6.44	0.399	1.81	7.41	-41	95.6	0.9
1004		80	6.42	0.400	1.71	7.46	-44	88.5	1.0
1009		80	6.39	0.400	1.70	7.46	-45	76.1	1.1
1013		80	6.34	0.399	1.58	7.48	-46	69.9	1.2
1016		80	6.33	0.398	1.63	7.52	-49	65.5	1.3
1019		80	6.22	0.398	1.57	7.49	-48	64.1	1.4

Purge Water Description: Clear no odor

Sample ID: CFMW-0129-GW Sample Time: 1025

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA00093
control box: FA00396
bladder pump: FA01196
*associated with
CFMW-EBS-AQ*

Well Sampling Sheet

Well ID: CFMW-014 Date: 12/15/16

DTW: 79.55 Depth of Pump Intake: ~90

DTB: 93.41 Total Volume Purged: 1 gallon

Purge Start:		Time:	1155	CPM:	3	psi:	80	Discharge Rate:	9
Purge End:		Time:	1300	CPM:	2	psi:	60	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1205	79.50	250	7.63	1.38	3.56	7.95	302	4.57	
1210	79.50	250	7.57	1.39	2.10	7.75	321	0.00	
1215	79.50	250	7.52	1.38	1.82	7.71	328	0.00	
1220	79.50	250	7.56	1.38	1.76	7.70	332	0.00	
1225	79.50	250	7.63	1.38	1.67	7.70	336	0.00	1 gal

Purge Water Description: Yellow tint

Sample ID: CFMW-014-GW Sample Time: 1225

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:

Horiba: FA00725

Control: FA00620

Pump: FA02073

Well Sampling Sheet

Well ID: CFMW-015 Date: 12/15/16

DTW: 77.30 Depth of Pump Intake: 692

DTB: 94.54 Total Volume Purged: ~2 gallons

Purge Start:	0955	Time:		CPM:	3	psi:	80	Discharge Rate:	9
Purge End:	1130	Time:		CPM:	3	psi:	80	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1010	77.25	250	7.81	1.75	1.50	9.88	131	8.45	
1015	77.25	250	7.70	1.76	1.18	9.85	125	7.26	
1020	77.26	250	7.64	1.76	.99	9.82	118	0.86	
1025	77.26	250	7.50	1.76	1.09	9.83	114	7.67	1gallon
1030	77.26	250	7.61	1.76	0.92	9.83	112	0.00	
1035	77.26	250	7.66	1.76	0.91	9.83	112	0.00	
1040	77.26	250	7.71	1.76	0.87	9.83	111	0.00	2gallon

Purge Water Description: Orange tint

Sample ID: CFMW-015-GW Sample Time: 1040

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

NOTES:

Horiba FA00725

Control FA00620

Pump FA02073

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	/
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-016 **Date:** 12/15/16

DTW: 96.60 **Depth of Pump Intake:** —

DTB: 97.83 **Total Volume Purged:** —

Purge Start:		**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	
Purge End:		**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

No sample collected due to insufficient water level

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Well Sampling Sheet

Well ID: CFMW-0168 Date: 12/14/16

DTW: 96.84 Depth of Pump Intake: 124.0

DTB: 128.35 Total Volume Purged: 3.8 gallon

Purge Start:		Time:	945	CPM:	3	psi:	240	Discharge Rate:	9
Purge End:		Time:	1115	CPM:	3	psi:	240	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
958	97.02	300	6.16	0.291	13.68	9.16	102	538	0.25
1003	97.02	300	6.87	0.299	10.28	9.27	87	219	0.5
1008	97.02	300	6.97	0.314	9.97	9.13	86	146	0.75
1013	97.02	300	7.08	0.320	10.44	9.02	88	115	1.0
1018	97.03	300	7.05	0.327	9.65	8.94	90	110	1.25
1023	97.03	300	7.10	0.338	8.99	8.79	95	62.4	1.5
1028	97.03	300	7.07	0.341	8.92	8.76	98	48.9	1.75
1033		300	6.98	0.342	8.97	8.74	100	31.3	2.0
1038		300	6.87	0.330	8.68	8.88	99	35.8	2.25
1043		300	6.94	0.336	8.64	8.75	102	70.9	2.50
1046		300	6.87	0.330	8.63	8.79	102	57.2	2.7
1049		300	6.87	0.326	8.65	8.81	102	37.3	2.9
1052		300	6.90	0.322	8.76	8.84	102	32.3	3.1
1055		300	6.97	0.319	8.86	8.84	105	30.7	3.3

Purge Water Description: slightly cloudy at beginning then clear

Sample ID: CFMW-0168-GW Sample Time: 1100

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01009

Control box FA00896

Bladder pump: FA01196

Previously purged well

Well Sampling Sheet

Well ID: CFMW-017 Date: 12/15/16

DTW: 140.06 Depth of Pump Intake: —

DTB: 140.92 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

No sample collected due to insufficient water level

Well Sampling Sheet

Well ID: CFMW-018 Date: 12/5/16

DTW: — Depth of Pump Intake: —

DTB: 127.54 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:
No sample taken due to dry well

Well Sampling Sheet

Well ID: CFMW-019 Date: 12/15/16

DTW: 75.80 Depth of Pump Intake: ~94'

DTB: 96.49 Total Volume Purged: 3 gallon

Purge Start:	1330	Time:		CPM:	3	psi:	80	Discharge Rate:	9
Purge End:	1500	Time:		CPM:	3	psi:	80	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1345	75.58	150	5.76	.921	8.19	7.83	259	28.4	
1350	75.58	150	6.44	.967	2.65	7.64	261	53.0	
1355	75.58	150	6.55	.976	2.33	7.57	263	52.6	1 gal
1400	75.58	150	6.73	.975	2.21	7.54	263	45.4	
1405	75.58	150	6.84	.972	1.69	7.54	266	40.6	
1410	75.58	150	6.88	.970	1.55	7.55	266	40.9	2 gal
1415	75.58	150	7.01	.969	1.53	7.62	262	35.9	
1420	75.58	150	7.00	.966	1.34	7.77	255	33.6	
1423	75.58	150	7.00	.963	1.26	7.85	252	33.4	
1426	75.58	150	7.09	.962	1.20	7.86	251	34.0	3 gal

Purge Water Description: Very light orange/red tint

Sample ID: CFMW-019-GW Sample Time: 1430

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA01725

Control FA00620

Pump FA02073

Well Sampling Sheet

Well ID: CFMW-019G

Date: 12-14-16

DTW: 139.60

Depth of Pump Intake: 220.0

DTB: 223.25

Total Volume Purged: 1.5 gallons

Purge Start:		Time:	1140	CPM:	3	psi:	250	Discharge Rate:	12
Purge End:		Time:	1340	CPM:	3	psi:	250	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1205	139.60	70	4.19	0.340	6.12	9.41	-156	1000	0.1
1210		70	4.97	0.342	4.75	8.94	-140	1000	0.2
1215		70	5.67	0.343	4.47	8.67	-132	1000	0.3
1220		70	6.42	0.343	4.62	8.56	-127	1000	0.4
1225		70	6.69	0.343	3.87	8.52	-128	1000	0.5
1230		70	6.73	0.341	3.35	8.49	-128	861	0.6
1235		70	6.69	0.340	3.10	8.47	-130	738	0.7
1240		70	6.68	0.340	2.97	8.46	-130	608	0.8
1245		70	6.71	0.339	2.53	8.44	-134	522	0.9
1250		70	6.83	0.339	2.37	8.42	-135	461	1.0
1255		70	7.03	0.339	2.46	8.41	-136	393	1.1
1300		70	7.12	0.341	2.22	8.40	-137	358	1.2
1303		70	7.18	0.342	2.11	8.40	-137	328	1.3
1306		70	7.17	0.342	2.07	8.39	-137	317	1.4
1309		70	7.25	0.342	1.97	8.38	-137	301	1.5

Purge Water Description: slightly cloudy tree door

Sample ID: CFMW-019G-GW

Sample Time: 1310

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01009

bladder pump: FA01196

control box: FA00596

High pH well in round 1

Well Sampling Sheet

Well ID: CFMW-020 Date: 12/13/16

DTW: 98.47 Depth of Pump Intake: 129.0

DTB: 132.42 Total Volume Purged: 2.0

Purge Start:		Time:	1440	CPM:	4	psi:	240	Discharge Rate:	S
Purge End:		Time:		CPM:	4	psi:	240	Discharge Rate:	S

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1458	98.47	240	7.14	0.481	10.57	7.54	146	17	0.20
1503	98.47	240	7.36	0.488	10.08	7.41	140	39.7	0.40
1508	98.47	240	7.53	0.489	10.07	7.53	128	12.6	0.60
1513	98.47	240	7.57	0.490	9.93	7.53	126	6.0	0.8
1518	98.47	240	7.50	0.491	9.90	7.54	125	0.82	1.0
1523	98.47	240	7.48	0.490	9.83	7.53	124	0.48	1.2
1528	98.47	240	7.55	0.491	9.87	7.54	123	0.00	1.4
1531	98.47	240	7.59	0.491	9.82	7.54	123	0.00	1.5
1534	98.47	240	7.73	0.491	9.82	7.54	123	0.00	1.6

Purge Water Description:

Sample ID: [illegible] Sample Time: 1540

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Hanna: FA01009

control box: FA00896

bladder pump: FA01196

Well Sampling Sheet

Well ID: CFmw-021 Date: 12/14/16

DTW: 75.83 Depth of Pump Intake: ~87

DTB: 89.59 Total Volume Purged: 5 gallons

Purge Start:	0900	Time:		CPM:	3	psi:	60	Discharge Rate:	9
Purge End:	1015	Time:		CPM:	3	psi:	60	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0910	75.80	250	9.69	.925	6.49	7.02	281	180	
0915	75.80	250	9.42	.926	5.06	7.30	291	115	1 gal
0920	75.80	250	9.07	.937	4.37	7.41	300	50.6	"
0925	75.80	250	8.96	.941	3.96	7.47	302	27.1	
0930	75.80	250	8.95	.938	3.85	7.51	304	21.8	2 gal
0935	75.80	250	8.99	.939	3.80	7.57	303	15.4	
0940	75.80	250	9.10	.936	3.54	7.71	297	12.1	
0945	75.80	250	9.26	.926	3.37	7.80	297	5.71	3 gal
0950	75.80	250	9.46	.927	4.25	7.84	297	2.21	"
0955	75.80	250	9.52	.920	4.52	7.84	301	0.00	4 gal
1000	75.80	250	9.54	.923	4.53	7.84	301	0.00	
1005	75.80	250	9.60	.927	4.49	7.84	302	0.00	5 gal

Purge Water Description: clear, slight rusty particulate and yellow tint

Sample ID: CFmw-021-GW Sample Time: 1005

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00775

Control Box: FA00620

Pump: FA02073

Well Sampling Sheet

Well ID: CFMW-022 **Date:** 12/9/16

DTW: 74.37 **Depth of Pump Intake:** 81 ft below TOC

DTB: 83.2 **Total Volume Purged:** ~17 L

Purge Start:	1430	**Time:**		**CPM:**	3	**psi:**	90	**Discharge Rate:**	>9
Purge End:	1530	**Time:**		**CPM:**	3	**psi:**	90	**Discharge Rate:**	>9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1445	73.84	350	5.11	0.519	14.93	7.31	285	15.8	3.5 L
1450	73.83	350	5.20	0.516	12.87	7.27	290	0.0	5.25 L
1455	73.84	350	5.45	0.514	11.21	7.24	296	0.0	7.0 L
1500	73.84	350	5.72	0.510	10.54	7.22	302	0.0	8.75 L
1505	73.84	350	5.52	0.515	10.53	7.23	304	0.0	10.5 L
1510	73.84	350	5.45	0.515	10.50	7.24	305	0.0	12.25 L
1515	73.65	350	5.18	0.514	10.62	7.24	308	0.0	14.0 L
1520	73.67	350	5.16	0.514	10.65	7.24	310	0.0	15.75 L

Purge Water Description:

Sample ID: CFMW-022-GW Sample Time: 1530

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A field filtered	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bladder pump: # FA01196

Control Box: # FA 00620

Horiba: # FA 00725

Well Sampling Sheet

Well ID: CFMW-023 Date: 12/19/16

DTW: 118.46 Depth of Pump Intake: ~ 140

DTB: 143.23 Total Volume Purged: ~ 2.5 gallon

Purge Start:		Time:	1135	CPM:	3	psi:	110	Discharge Rate:	9
Purge End:		Time:	1220	CPM:	3	psi:	110	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1140	118.50	300	6.71	.385	9.20	7.02	96	0.00	
1145	118.50	300	7.09	.384	9.39	6.86	103	0.00	1 gallon
1150	118.50	300	7.34	.384	9.39	6.76	111	0.00	
1155	118.50	300	7.22	.384	9.44	6.79	113	0.00	
1200	118.50	300	7.26	.385	9.38	6.72	119	0.00	2.5 gallon

Purge Water Description: Clear

Sample ID: CFMW-023-GW Sample Time: 1200

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00725

Pump FA01196

Control FA00896

Well Sampling Sheet

Well ID: CFMW-025 Date: 12/5/16

DTW: — Depth of Pump Intake: —

DTB: 26.78 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES: No sample taken due to dry well

Well Sampling Sheet

Well ID: CFMW-02Sg

Date: 12-5-16

DTW: 56.54

Depth of Pump Intake: 96

DTB: 98.43

Total Volume Purged: 1.2

Purge Start:	1200	Time:		CPM:	4	psi:	120	Discharge Rate:	5
Purge End:	1335	Time:		CPM:	4	psi:	120	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1219	57.02	120	7.27	1.63	4.85	5.68	-63	—	0.1
1224	57.01	120	7.64	1.61	4.22	5.69	-89	—	0.2
1229	57.00	120	7.62	1.60	3.79	5.77	-105	—	0.3
1234	57.00	120	7.74	1.54	3.78	5.83	-117	—	0.4
1239	57.00	120	7.75	1.48	3.43	5.90	-127	—	0.5
1244	57.00	120	7.92	1.40	4.09	6.01	-138	—	0.6
1249	57.00	120	8.17	1.33	4.19	6.06	-145	—	0.7
1254	57.00	120	8.13	1.22	4.30	6.13	-151	—	0.8
1259	57.00	120	8.15	1.15	4.25	6.16	-153	—	0.9

Purge Water Description:

Sample ID: CFMW-02Sg-GW

Sample Time: 1310

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA0~~573~~ 725 (MBL)

control box: FA02269

bladder pump: FA01196

Well Sampling Sheet

Well ID: CFMW-025b **Date:** 12/6/16

DTW: 33.80 **Depth of Pump Intake:** 62.0' below TOC

DTB: 64.0 **Total Volume Purged:**

Purge Start:	1400	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	7.0
Purge End:	1030 (12/7)	**Time:**		**CPM:**	4	**psi:**	60	**Discharge Rate:**	10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1425	33.85	200	8.48	0.455	10.52	7.69	41	0 turbidity	
1430	33.85	200	9.02	0.447	10.58	7.72	43	0 meter	
1435	33.82	200	10.52	0.427	10.47	7.79	47	0 not function-	
1445	33.95	200	10.50	0.412	10.71	7.83	50	0 in a property	
1450	33.85	200	9.27	0.423	11.76	7.88	54	0	
Had to	Stop-water frozen	in tubing. Use	new tubing but	unable to	pump 12/6/16				
Resume	on 12/7/16 -		~~13.55~~	~~0.420~~	~~3.92~~	~~7.49~~	~~[illegible]~~	~~>1000~~	
12/7 1021	33.61	<100	13.55	0.420	3.92	7.49	58	>1000	
1024	33.60	<100	12.29	0.405	4.10	7.64	63	814	
1027	33.61	<100	10.06	0.411	5.01	7.73	67	0 likely not accurate	
1030	33.60	<100	10.10	0.402	4.98	7.77	73	0 *SAA	

Purge Water Description: 12/7/16 Resume purging @ ~10:00

Sample ID: CFMW-025b-GW Sample Time: 1030 @ 12/7/16

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba #FA 01009

Bladder Pump: FA # 00620

Control Box: # FA 02073

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-026 (v.1) Date: 12/05/16

DTW: 42.53 Depth of Pump Intake: 45.0' below ~~bgs~~ TOC (SW)

DTB: 47.43 Total Volume Purged: 17.475 L

Purge Start:	0915	Time:		CPM:	4	psi:	40	Discharge Rate:	5.0
Purge End:	1040	Time:		CPM:	4	psi:	40	Discharge Rate:	3.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged ~~(gallons)~~ L
0917	43.73	300 ml/min	8.15	0.528	8.62	7.56	177	>1000	0.60 L
0922	43.15	300	8.15	0.527	8.06	7.56	176	839	2.1 L
0927	43.15	300	8.10	0.525	6.12	7.57	160	839	3.6 L
0932	43.33	300	8.06	0.524	5.65	7.59	132	755	5.1 L
0937	43.30	300	7.77	0.524	6.87	7.62	112	80	6.6 L
0942	43.30	300	7.75	0.524	6.71	7.62	113	0	8.1 L
0947	*	300	7.47	0.528	10.70	7.64	97	0	9.6 L
0952	*	300	7.37	0.529	10.84	7.64	93	1000	11.1 L
0957	*	200	7.32	0.528	11.06	7.64	94	810	~~12.6 L~~ 12.1 L
~~09~~ 1002	43.45	125	7.27	0.526	10.85	7.64	96	510	~~14.1 L~~ 12.725
1005	43.45	125	7.35	0.522	10.51	7.65	97	391	13.100 L
1008	43.45	125	7.22	0.520	10.20	7.64	99	260	13.475 L
1011	43.24	125	7.09	0.520	10.15	7.64	106	114	13.850 L
1016	43.24	125	7.06	0.520	10.29	7.64	113	65.1	14.475 L
1019	43.24	125	7.05	0.520	10.26	7.60	118	59.0	14.850 L
1022	43.19	125	7.09	0.522	10.23	7.64	121	68.0	15.225 L

Purge Water Description: Slightly turbid, ~~WLM not functioning~~ (SW)

Sample ID: CFMW-026-GW Sample Time:

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

* WLM having trouble reading due to cold weather

HORIBA # FA 01009

Control Box # FA 00620

Bladder Pump # FA 02073

Well Sampling Sheet

Well ID: CFMW-026 (P 2) **Date:** 12/05/16

DTW: **Depth of Pump Intake:**

DTB: **Total Volume Purged:**

Purge Start:		**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	
Purge End:		**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1027	43.19	125	7.09	0.522	10.23	7.64	121	68.0	15.850
1032	43.08	125	7.05	0.522	10.32	7.65	128	59.6	16.475
1037	43.10	125	7.00	0.523	10.35	7.65	132	46.7	17.100
1040	43.10	125	7.03	0.523	10.03	7.64	135	36.8	17.475

Purge Water Description:

Sample ID: CFMW-026 Sample Time: 1040

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

Well Sampling Sheet

Well ID: CFMW-027 **Date:** 12/14/16

DTW: 35.20 **Depth of Pump Intake:** ~46'

DTB: 48.59 **Total Volume Purged:** 4 gallons

Purge Start:	1215	**Time:**		**CPM:**	3	**psi:**	40	**Discharge Rate:**	9
Purge End:	1325	**Time:**		**CPM:**	3	**psi:**	40	**Discharge Rate:**	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1225	35.20	300	5.77	.605	9.39	7.61	319	476	
1230	35.20	300	5.96	.611	7.61	7.57	322	947	
1235	35.20	300	5.99	.613	7.21	7.55	323	>1000	1 gal
1240	35.20	300	5.87	.625	7.17	7.54	323	931	
1245	35.20	300	6.04	.619	6.99	7.54	323	776	2 gal
1250	35.20	300	5.86	.622	7.22	7.71	316	485	
1255	35.20	300	5.56	.622	7.23	7.76	315	371	3 gal
1300	35.20	300	5.40	.621	7.27	7.77	315	341	
1305	35.20	300	5.55	.626	7.08	7.78	315	312	4 gal

Purge Water Description: Slightly brown cloudy.

Sample ID: CFMW-027-GW Sample Time: 1305

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA00725

Control: FA00620

Pump: FA02073

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-028 Date: 12/5/16

DTW: 46.48 Depth of Pump Intake: 44' below TOC

DTB: 62.39 Total Volume Purged: 13.5 L

Purge Start:	1230	Time:	1400	CPM:	4	psi:	40	Discharge Rate:	5.0
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1235	46.70	150	7.12	0.478	5.39	7.98	251	0*	750 mL
1245	47.40	150	7.00	0.480	5.18	7.97	261	0*	2.25 L
1255	47.41	150	6.74	0.484	5.04	7.97	279	557	3.75 L
1305	47.45	150	6.56	0.489	4.71	7.96	285	276	5.25 L
1315	47.41	150	6.52	0.490	4.30	7.96	286	190	6.75 L
1320	47.41	150	6.54	0.492	3.85	7.96	286	157	7.50 L
1325	47.41	150	6.56	0.492	3.75	7.96	286	139	8.25 L
1330	47.41	150	6.57	0.492	3.63	7.96	287	124	9.0 L
1335	47.45	150	6.58	0.494	3.37	7.96	282	107	9.75 L
1340	47.45	150	6.55	0.494	3.31	7.96	286	92.7	10.5 L
1345	47.43	150	6.51	0.494	3.23	7.96	288	78.6	11.25 L
1350	47.43	150	6.40	0.496	3.17	7.96	291	70.1	12.0 L
1355	47.45	150	6.33	0.495	3.08	7.96	290	70.1	12.750 L
1400	47.45	150	6.33	0.496	3.07	7.96	285	63.7	13.5 L

Purge Water Description:

Sample ID: CFMW-028 Sample Time: 1400

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba #FA01009

Control box # FA 00620

Bladder Pump # FA 02073

Well Sampling Sheet

Well ID: CFMW-028a

Date: 12/9/16

DTW: 46.48

Depth of Pump Intake: 118.0

DTB: 122.63

Total Volume Purged: 3.0

Purge Start:		Time:	1145	CPM:	4	psi:	200	Discharge Rate:	5
Purge End:		Time:		CPM:	4	psi:	200	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	* pH (SU) * [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1200	46.50	240	6.71	0.485	0.44	11.34	24	608	0.2
1211	46.70	240	6.74	0.483	1.72	11.48	-8	455	0.4
1216	46.85	150	6.56	0.487	1.56	11.44	-23	444	0.6
12:21	46.96	150	6.14	0.487	1.34	11.39	-37	312	0.8
1226		150	5.60	0.485	1.26	11.33	-49	315	1.0
1231		150	5.41	0.491	1.16	11.28	-57	257	1.2
1236		150	5.30	0.492	1.17	11.24	-63	263	1.4
1307 ~~1239~~		100	4.42	0.482	4.11	11.87	29	267	1.5
1330		100	5.10	0.463	2.14	11.87	-13	425	1.6
1333		100	5.36	0.467	1.63	11.89	-69	410	1.7
1336			5.47	0.466	1.49	11.88	-96	363	1.8
1339			5.56	0.466	1.40	11.87	-122	321	1.9
1342			5.63	0.465	1.35	11.85	-138	271	2.0
1345			5.72	0.464	1.28	11.81	-157	219	2.1
1348			5.71	0.465	1.24	11.76	-161	192	2.2
1351			5.71	0.464	1.22	11.72	-162	167	2.3

Purge Water Description: Water slightly turbid.

Sample ID: CFMW-028a-GW

Sample Time: 1355

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba FA00725
control box:
bladder pump FA02073
*pH checked w/ independant meter to be 9.44

Well Sampling Sheet

Well ID: RFMW-029 Date: 12/14/16

DTW: 70.70 Depth of Pump Intake: ~77'

DTB: 78.31 Total Volume Purged: 3gallon

Purge Start:	1045	Time:		CPM:	3	psi:	60	Discharge Rate:	9
Purge End:	1200	Time:		CPM:	3	psi:	60	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1050	70.70	280	8.01	.476	10.14	7.86	277	269	
1055	70.70	280	7.97	.469	7.90	7.72	285	209	
1100	70.70	280	7.95	.472	7.72	7.63	290	64.5	1gallon
1105	70.70	280	8.04	.474	7.68	7.59	292	41.4	
1110	70.70	280	8.09	.479	7.63	7.54	294	24.7	
1115	70.70	280	8.02	.478	7.68	7.53	295	7.59	
1120	70.70	280	7.92	.479	7.60	7.51	296	4.81	2gallon
1125	70.70	280	8.00	.482	7.98	7.53	295	1.00	
1130	70.70	280	8.14	.465	8.34	7.67	289	0.00	
1135	70.70	280	8.15	.473	8.62	7.68	289	0.00	
1140	70.70	280	8.20	.476	8.71	7.66	289	0.00	3gallon

Purge Water Description: Clear no odor

Sample ID: CFMW-029-GW Sample Time: 1140

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00725

Control: FA00620

Pump FA02073

Well Sampling Sheet

Well ID: CFMW - 031

Date: 12/9/16

DTW: 48.12

Depth of Pump Intake: ~~4~~ 50.0 ft below TOC

DTB: 52.29

Total Volume Purged: 12.5L

Purge Start:	1300	Time:		CPM:	3	psi:	80	Discharge Rate:	>9
Purge End:	1350	Time:		CPM:	3	psi:	80	Discharge Rate:	>9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1310	48.00	250	5.46	0.657	27.48	7.53	276	543	2.5L
1315	47.99	250	6.06	0.634	16.43	7.58	281	204	3.75L
1320	47.99	250	6.56	0.595	6.54	7.72	303	299	5.0L
1325	48.00	250	6.79	0.595	7.06	7.71	302	87.0	6.25L
1330	48.00	250	6.83	0.593	6.39	7.70	305	21.7	7.5L
1335	47.99	250	6.96	0.592	6.72	7.57	318	0.0	8.75L
1340	48.00	250	7.07	0.591	6.14	7.63	317	0.0	10.0L
1345	47.99	250	7.07	0.591	6.12	7.56	324	0.0	11.25L
1350	47.99	250	7.05	0.595	6.11	7.67	318	0.0	12.5L

Purge Water Description:

Sample ID: CFMW-031-GW

Sample Time: 1400

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A field filtered	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bladder Pump # FA 011916

Control Box # FA000620

Horiba # FA01009

Well Sampling Sheet

Well ID: CFMW-032 Date: 12/13/16

DTW: 54.29 Depth of Pump Intake: ~55

DTB: 57.65 Total Volume Purged: 4 gallons

Purge Start:	0810	Time:		CPM:	3	psi:	60	Discharge Rate:	7
Purge End:	0930	Time:		CPM:	3	psi:	60	Discharge Rate:	7

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0820	54.35	150	7.10	1.31	3.68	6.61	478	283	
0825	54.41	150	7.17	1.29	2.93	6.66	297	187	
0830	54.50	150	7.21	1.29	2.80	6.65	298	792	
0835	54.36	150	7.22	1.28	2.97	6.69	302	515	1 gallon
0840	54.40	150	7.21	1.26	3.06	6.69	301	242	
0845	54.38	150	7.06	1.25	3.19	6.73	299	119	
0850	54.41	150	7.11	1.24	3.30	6.74	297	86.3	2 gallon
0855	54.40	150	7.16	1.24	3.49	6.77	294	55.2	
0900	54.38	150	7.15	1.24	3.60	6.79	293	36.8	
0905	54.40	150	7.11	1.24	3.47	6.82	292	32.7	
0910	54.40	150	7.19	1.24	3.68	6.83	291	22.6	3 gallon
0915	54.38	150	7.13	1.24	3.71	6.84	291	23.5	
0920	54.40	150	7.18	1.23	3.79	6.86	290	507	
0925	54.38	150	7.26	1.23	3.73	6.87	291	0.00	
0926	54.40	150	7.20	1.23	3.78	6.88	290	0.00	
0929	54.38	150	7.18	1.22	3.71	6.90	290	0.00	4 gallons

Purge Water Description: Slightly reddish to clear

Sample ID: CFMW-032-GW Sample Time: 0930

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00725

Control FA00620

Bladder FA02073

Well Sampling Sheet

Well ID: CFMW 032a

Date: 12-16-16

DTW: 111.95

Depth of Pump Intake: 203.0

DTB: 206.43

Total Volume Purged: 1.3 gal

Purge Start:		Time:	1040	CPM:	3	psi:	110	Discharge Rate:	8
Purge End:		Time:	1230	CPM:	3	psi:	110	Discharge Rate:	8

average of 13.78 on pH meter

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
~~1051~~		~~170~~	~~7.15~~	~~4.35~~	~~883~~				
1100	113.35	90	6.04	4.43	257	12.85	-90	25.1	0.1
1105	113.57	90	5.79	4.41	2.23	12.81	-94	6.04	0.2
1110	113.74	90	5.81	4.41	2.08	12.80	-94	0.00	0.3
1115	113.75	90	5.86	4.48	1.87	12.84	-98	0.00	0.4
1130	113.31	90	4.99	4.60	2.50	12.84	-85	14.2	0.5
1135	113.63	90	4.59	4.51	2.57	12.83	-88	28.2	0.6
1140	113.92	90	4.81	4.45	2.38	12.81	-90	72.5	0.7
1145	114.15	90	4.81	4.62	2.26	12.83	-94	97.1	0.8
1150	114.38	90	4.87	4.33	2.25	12.79	-95	91.2	0.9
1155	114.57	90	5.18	4.09	2.41	12.76	-92	103	1.0
1158	114.65	90	5.28	3.99	2.44	12.76	-92	94.5	1.1
1201	114.71	90	5.22	3.94	2.48	12.94	-90	108	1.2
1204	114.82	90	5.23	3.91	2.51	12.74	-89	80.1	1.3

Change tube

Purge Water Description: clear no odor, no sediment in sample bottles

Sample ID: CFMW-032a-GW

Sample Time: 1210

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

HDPE: FA01009

Normal Box: FA02184

Vladdump: FA01196

X high pH well

Well Sampling Sheet

Well ID: CFMW-033 **Date:** 12/06/16

DTW: 49.28 **Depth of Pump Intake:** 47.0' below TOC

DTB: 63.58 **Total Volume Purged:** 12.75L

Purge Start:	0940	**Time:**		**CPM:**	4	**psi:**	40	**Discharge Rate:**	5.0
Purge End:	1130	**Time:**		**CPM:**	4	**psi:**	40	**Discharge Rate:**	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1015	49.00	150	5.20	0.587	7.53	6.27	308	14.3	5.25 L
1018	49.00	150	4.70	0.586	6.90	5.63	314	12.4	5.70 L
1021	49.22	150	4.53	0.593	7.23	5.86	320	7.71	6.15 L
1024	49.22	150	4.53	0.592	6.88	5.68	321	4.40	6.60 L
1027	49.23	150	4.24	0.595	7.03	5.86	323	1.23	7.050 L
1035	49.22	150	4.43	0.594	7.18	5.23	325	0.61	8.25 L
1040	49.25	150	4.24	0.593	7.12	5.38	326	0.0	9.0 L
1045	49.22	150	4.36	0.594	6.54	4.99	327	0.0	9.75 L
1050	49.25	150	4.42	0.596	7.01	4.52	330	0.0	10.5 L
1055	49.	150	4.40	0.596	6.76	4.94	331	0.0	11.25 L
1100	49.	150	4.32	0.601	7.39	4.66	333	0.0	12.0 L
1105	49.	150	4.48	0.599	6.84	4.49	332	0.0	12.75 L

Purge Water Description:

Sample ID: CFMW-033 GW Sample Time: 1110

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

- Setting up horiba and other equipment during purging did not immediately collect readings.

Horiba: FA # 01009 Control Box #FA

PH not accurate. Checked w/ independant meter to be 7.40 pH

Well Sampling Sheet

Well ID: CFMW-034 Date: 12/13/16

DTW: 53.75 Depth of Pump Intake: ~60

DTB: 62.48 Total Volume Purged: 5 gallons

Purge Start:	1015	Time:		CPM:	3	psi:	60	Discharge Rate:	9
Purge End:	1125	Time:		CPM:	3	psi:	60	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1025	53.80	300	6.22	.715	6.61	7.18	232	MAX	
1030	53.80	300	6.55	.709	4.09	7.05	257	MAX	
1035	53.80	300	7.19	.701	3.96	7.07	273	965	1 gallon
1040	53.80	300	7.14	.707	3.42	7.09	281	308	
1045	53.80	300	7.26	.702	3.35	7.16	278	98.8	
1050	53.80	300	7.00	.701	3.30	7.23	275	63.7	2 gallon
1055	53.80	300	6.91	.699	3.29	7.29	270	50.2	
1100	53.80	300	6.53	.707	3.39	7.34	269	36.3	
1105	53.80	300	6.73	.702	3.28	7.35	269	13.4	3 gallon
1110	53.80	300	7.08	.690	3.18	7.39	266	6.42	
1115	53.80	300	7.50	.680	3.08	7.39	264	0.00	4 gallon
1120	53.80	300	7.77	.672	2.97	7.30	269	0.00	
1125	53.80	300	7.83	.676	2.88	7.32	270	0.00	5 gallons

Purge Water Description: Reddish brown cloudy to clear

Sample ID: CFMW-034-GW Sample Time: 1125

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00725

Control FA00620

Bladder FA02072

Well Sampling Sheet

Well ID: CFMW-035 Date: 12/13/16

DTW: 48.24 Depth of Pump Intake: ~67

DTB: 70.53 Total Volume Purged: 3.5 gallons

Purge Start:	1200	Time:		CPM:	3	psi:	60	Discharge Rate:	9
Purge End:	1300	Time:		CPM:	3	psi:	60	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1205	49.22	300	6.52	.720	5.31	7.27	-94	MAX	
1210	50.80	200	6.89	.744	3.06	7.11	-121	741	
1215	51.20	200	7.24	.744	2.67	7.13	-133	391	
1220	51.45	100	6.97	.750	2.37	7.13	-138	293	1.5 gallon
1225	51.25	100	7.13	.744	2.33	7.15	-125	194	
1230	51.35	150	7.32	.735	1.76	7.15	-123	189	
1235	51.37	150	8.30	.731	1.12	7.15	-138	141	
1240	51.41	150	8.85	.733	1.13	7.34	-157	157	2.5 gallon
1245	51.47	150	8.36	.747	1.15	7.43	-164	160	
1250	51.51	150	8.46	.738	1.11	7.45	-169	183	
1255	51.50	150	8.32	.746	1.10	7.45	-171	194	
1300	51.43	150	8.38	.745	1.08	7.44	-172	220	3.5 gallon

Purge Water Description: Grey cloudy to clear; slight sulfur smell

Sample ID: CFMW-035-GW Sample Time: 1300

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba FA00725

Control FA00620

Bladder FA02073

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

Well Sampling Sheet

Well ID: CFMW-037 Date: 12-8-16

DTW: 83.15 Depth of Pump Intake: 100.00

DTB: 103.25 Total Volume Purged: 2.0

Purge Start:		Time:	1325	CPM:	4	psi:	150	Discharge Rate:	5
Purge End:		Time:	1440	CPM:	4	psi:	150	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1336	86.60	200	7.43	0.398	10.99	7.18	245	385	0.2
1341	86.68		7.61	0.400	8.95	7.76	228	560	0.4
1346	86.72		7.62	0.400	8.56	7.78	232	268	0.6
1351	86.73		7.73	0.401	8.37	7.78	235	7.07	0.8
1356	86.73		7.74	0.401	8.35	7.77	239	388	1.0
1401	86.73		7.73	0.401	8.27	7.77	240	0.00	1.2
1406	86.73		7.75	0.401	8.24	7.76	243	0.00	1.4
1411	86.73		7.76	0.401	8.16	7.74	245	0.00	1.6

Purge Water Description: clear throughout purging to end

Sample ID: CFMW-037-GW Sample Time: 1415

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA00725
control box: FA00896
Waterlevel meter: FA01196

Well Sampling Sheet

Well ID:	CFMW-03S	Date:	12/8/16
DTW:	89.90	Depth of Pump Intake:	104.0
DTB:	106.71	Total Volume Purged:	3.4

Purge Start:	12/8	Time:	1445	CPM:	4	psi:	180	Discharge Rate:	5
Purge End:	12/9	Time:	~~1040~~ 1055	CPM:	4	psi:	200	Discharge Rate:	~~8~~ 5

	Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
12/8	1503	89.90	230	5.87	0.577	9.83	6.18	259	173	0.25
	1508	89.80	230	6.60	0.576	6.94	5.53	302	59.5	0.5
	1513	89.78	230	6.80	0.577	6.24	5.84	286	21.3	0.75
	1518	89.75	230	6.84	0.578	5.94	5.80	289	9.89	1.0
	1523	89.80	230	6.76	0.577	5.77	5.75	292	8.43	1.25
	1528		230	6.76	0.578	5.72	5.70	295	0.00	1.5
	1533		230	6.68	0.580	5.47	5.73	295	0.00	1.75
	1538		230	6.61	0.581	5.47	5.78	294	0.00	1.95
12/9	942	89.85	260	6.66	0.580	1.68	6.49	270	44.0	~~2.15~~ 0.2
	947		260	7.59	0.569	6.85	6.45	295	0.00	0.4
	952		260	7.96	0.568	6.73	6.48	302	0.00	0.6
	957		260	8.07	0.568	6.62	6.49	307	0.00	0.8
	1002		260	8.15	0.568	6.46	6.44	310	0.00	1.0

Purge Water Description: Water clear from beginning to end

Sample ID: CFMW-03S-GW Sample Time: 1045

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Honda: FA00725
control box: FA00896
bladder pump: FA02073

Well Sampling Sheet

Well ID: CFMW-040 Date: 12/13/16

DTW: 82.20 Depth of Pump Intake: ~90

DTB: 92.88 Total Volume Purged: 4 gallons

Purge Start:	1420	Time:		CPM:	3	psi:	60	Discharge Rate:	9
Purge End:	1540	Time:		CPM:	3	psi:	60	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1435	82.60	320	7.69	.520	12.02	7.69	193	286	
1440	82.60	320	7.88	.523	11.76	7.58	215	541	
1445	82.60	320	7.91	.520	11.48	7.59	216	362	1 gal
1450	82.68	320	7.90	.521	11.35	7.58	220	262	
1455	82.77	320	7.90	.520	11.12	7.58	227	188	
1500	82.60	320	7.83	.519	11.03	7.58	231	85.5	2 gal
1505	82.63	320	7.77	.516	10.04	7.62	240	60.9	
1510	82.60	320	7.77	.518	9.39	7.61	243	48.3	
1515	82.60	320	7.83	.520	9.01	7.62	248	28.4	
1520	82.60	320	7.85	.521	9.50	7.61	250	27.5	3 gal
1525	82.60	320	8.04	.520	7.29	7.59	252	5.49	
1530	82.60	320	7.92	.521	7.31	7.59	252	0.00	
1535	82.60	320	7.80	.521	7.08	7.61	254	0.00	
1540	82.60	320	7.81	.522	7.08	7.61	255	0.00	4 gallons

Purge Water Description:

Sample ID: CFMW-040-GW Sample Time: 1540

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00725

Control Box FA00620

Bladder ~~FA02073~~

~~FA00616~~

FA02073

Well Sampling Sheet

Well ID: CFMW-042 Date: 12/5/16

DTW: — Depth of Pump Intake: —

DTB: 63.03 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

No sample taken due to dry well.

Well Sampling Sheet

Well ID: CFMW-043 Date: 12/14/16

DTW: 52.85 Depth of Pump Intake: ~ 60

DTB: 62.00 Total Volume Purged: ~ 3 gallons

Purge Start:	1513	Time:		CPM:	3	psi:	40	Discharge Rate:	~~300~~ 9
Purge End:	1620	Time:		CPM:	3	psi:	40	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1518	52.60	300	5.51	0.562	10.25	7.62	236	196	
1523	52.60	300	5.52	0.575	10.55	7.45	245	170	
1528	52.60	300	5.57	.580	10.68	7.43	252	153	1 gal
1533	52.60	300	5.60	.580	10.75	7.46	252	155	
1538	52.60	300	-	-	-	-	-	-	missed
1543	52.60	300	5.75	.570	10.41	7.62	248	142	2 gal
1548	52.60	300	5.83	.571	10.47	7.66	248	119	
1553	52.60	300	5.92	.563	10.80	7.68	250	109	
1558	52.60	300	5.98	.562	10.96	7.65	253	102	3 gal

Purge Water Description: Clear

Sample ID: CFMW-043-GW Sample Time: 1600

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA00725

Controll FA00620

Pump FA02073

Well Sampling Sheet

Well ID: CFMW-044 **Date:** 12/9/16

DTW: 51.75 **Depth of Pump Intake:** 52.5 ft below TOC

DTB: 54.21 **Total Volume Purged:** 18 L

Purge Start:	0850	**Time:**		**CPM:**	4	**psi:**	80	**Discharge Rate:**	5
Purge End:	0950	**Time:**		**CPM:**	4	**psi:**	80	**Discharge Rate:**	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
900	51.90	300	7.43	0.773	2.58	6.97	-139	34.3	3 L
905	51.85	300	7.40	0.760	2.35	7.15	-150	25.5	4.5 L
910	51.85	300	7.37	0.722	2.41	7.47	-159	22.8	6.0 L
915	51.85	300	7.27	0.702	2.06	7.43	-148	21.0	7.5 L
920	51.85	300	7.25	0.698	2.31	7.43	-145	12.9	9.0 L
0925	51.85	300	7.23	0.690	2.28	7.43	-141	10.5	10.5 L
0930	51.86	300	7.07	0.677	2.19	7.45	-135	0.0	12.0 L
0935	51.85	300	7.03	0.669	2.42	7.48	-132	0.64	13.5 L
0940	51.85	300	7.01	0.664	2.50	7.49	-128	0.0	15.0 L

Purge Water Description: Odor - gray color

Sample ID: CFMW-044-GW Sample Time: 0950

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A field filtered	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bladder # FA 01196

Control Box # FA 00620

Horiba #. FA 01009

Well Sampling Sheet

Well ID: CFMW-044a

Date: 12/19/16

DTW: 56.30

Depth of Pump Intake: ~215

DTB: 223.95

Total Volume Purged: 5 gallons

Purge Start:		Time:	0940	CPM:	3	psi:	110	Discharge Rate:	9
Purge End:		Time:	1115	CPM:	3	psi:	110	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0950	57.15	300	7.41	.356	2.46	10.90	-197	181	
0955	59.35	300	7.54	.332	1.64	10.72	-164	117	1 gallon
1000	60.40	300	7.58	.279	1.37	9.69	-132	90.7	
1005	61.10	300	7.74	.291	1.22	9.37	-114	89.1	
1010	61.25	300	7.67	.297	1.21	9.21	-107	70.7	2 gallon
1015	61.50	300	7.63	.303	1.16	9.18	-106	63.3	
1020	62.05	300	7.79	.305	1.10	9.06	-97	40.7	
1025	62.20	300	7.79	.303	1.05	8.96	-94	28.6	3 gallon
1030	62.40	300	7.90	.303	1.04	9.00	-93	24.2	
1035	62.45	300	7.88	.303	1.05	8.99	-91	8.91	
1040	62.60	300	7.95	.309	0.99	9.02	-94	2.73	4 gallon
1045	62.81	300	7.80	.305	0.96	9.04	-92	4.38	
1050	62.95	300	7.81	.308	0.97	9.07	-94	4.23	
1055	63.01	300	7.75	.312	0.94	9.10	-95	4.17	5 gallon

Purge Water Description: Cloudy slightly brown white particulate

Sample ID: CFMW-044a-GW

Sample Time: ~~0850~~ 1100

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00725

Pump: FA02073

Control: FA00896

Well Sampling Sheet

Well ID: CFMW-044b

Date: 12/19/16

DTW: 66.48

Depth of Pump Intake: ~~238~~ ~200

DTB: 241.09

Total Volume Purged: 1.4 gallons

Purge Start:		Time:	0820	CPM:	3	psi:	110	Discharge Rate:	12
Purge End:		Time:	0930	CPM:	3	psi:	110	Discharge Rate:	12

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0844	66.94	200	4.60	0.336	4.34	6.38	-67	6.52	0.2
0849	66.96	200	5.69	0.311	2.15	7.08	-245	2.15	0.4
0854	66.98	200	5.91	0.307	1.98	7.33	-271	0.00	0.6
0859	67.00	200	6.00	0.304	1.96	7.38	-273	0.00	0.8
0904	67.02	200	6.22	0.304	1.89	7.48	-278	0.00	1.0
0909	67.04	200	5.98	0.306	1.89	7.50	-280	0.00	1.2
0914	67.06	200	6.10	0.305	1.82	7.54	-282	0.00	1.4

Purge Water Description: Clear no odor

Sample ID: CFMW-044b-GW

Sample Time: 0915

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00725

control box: FA00896

bladder pump: FA01196

Well Sampling Sheet

Well ID: CFMW-045 Date: 12-14-16

DTW: 89.11 Depth of Pump Intake: 97.0

DTB: 99.16 Total Volume Purged: 3.50 gallon

Purge Start:		Time:	1445	CPM:	4	psi:	250	Discharge Rate:	5
Purge End:		Time:	1600	CPM:	4	psi:	250	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1457	89.30	200	6.68	0.589	12.60	7.48	256	1000	0.25
1502	89.32	200	7.76	0.594	8.31	7.30	301	1000	0.5
1507	89.34	200	7.97	0.594	8.14	7.34	310	566	0.75
1512	89.35	200	8.22	0.594	8.01	7.47	307	321	1.0
1517	89.37	200	8.29	0.594	7.75	7.59	302	265	1.25
1522	89.39	200	8.39	0.593	7.86	7.61	303	191	1.5
1527	89.40	200	8.15	0.594	8.38	7.64	305	146	1.75
1532		200	8.26	0.594	8.27	7.62	306	94.8	2.00
1537		200	8.14	0.617	8.28	7.59	308	81.0	2.25
1540		200	8.31	0.597	8.29	7.59	309	70.0	2.5
1543		200	8.35	0.595	8.14	7.59	310	64.5	2.75
1546		200	8.39	0.595	8.04	7.58	309	58.9	3.00

Purge Water Description: clear

Sample ID: CFMW-045-GW Sample Time: 1550

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Honda: FA01009
control box: FA00896
bladder pump: FA 01196

Well Sampling Sheet

Well ID: CFMW-45A **Date:** 12/9/2016

DTW: 91.05 **Depth of Pump Intake:** 1580

DTB: 161.27 **Total Volume Purged:** 1.2

Purge Start:	15:00	**Time:**		**CPM:**	5	**psi:**	200	**Discharge Rate:**	4
Purge End:	1720	**Time:**		**CPM:**	5	**psi:**	200	**Discharge Rate:**	4

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
15:39	91.02	50	5.29	.304	11.07	9.60	123	104	0.05
15:44		50	9.70	.287	10.98	9.42	~~[illegible]~~ 105	74.2	0.1
15:49			9.78	.318	10.89	9.34	104	65.2	0.15
15:54			9.61	.416	10.69	9.12	104	52.7	0.2
15:59			9.02	.396	10.70	9.12	102	39.4	0.25
16:04			8.83	.326	10.44	9.26	96	30.9	0.3
16:09			8.74	.295	10.08	9.37	86	25.7	0.35
1614			9.05	.286	9.86	9.47	82	20.8	0.4
~~1624~~			~~9.12~~						
1624	91.02	150	9.12	0.286	9.29	9.55	72	17.2	0.5
1627			9.18	0.287	9.27	9.57	72	16.9	0.6
1630			8.15	0.288	9.65	9.56	73	42.1	0.7
1633			7.34	0.265	9.61	9.63	68	38.7	0.8
1636			7.42	0.250	9.24	9.63	63	37.0	0.9

no reading changed our canister

Purge Water Description: clear, slow purge

Sample ID: CFMW-45A-GW Sample Time: 1640

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00725

control box: FA00896

bladder pump: FA02073

Well Sampling Sheet

Well ID: CFMW-047 Date: 12-15-16

DTW: 100.57 Depth of Pump Intake: 120.0

DTB: 122.95 Total Volume Purged: 2.1 gallons

Purge Start:	1320	Time:		CPM:	3	psi:	240	Discharge Rate:	9
Purge End:	1415	Time:		CPM:	3	psi:	240	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1331	100.88	360	7.83	0.514	9.36	7.76	286	264	0.3
1336	100.88	360	8.32	0.525	8.22	8.09	284	115	0.6
1341	100.88	360	8.61	0.532	8.08	7.96	295	31.7	0.9
1346	100.88	360	8.42	0.533	7.96	7.95	298	8.40	1.2
1351	100.89	360	8.58	0.533	7.95	7.87	302	0.00	1.5
1356	100.89	360	8.55	0.532	7.91	7.83	304	0.00	1.8
1401	100.89	360	8.56	0.532	7.76	7.81	305	0.00	2.1

Purge Water Description: clear, no color

Sample ID: CFMW-047-GW Sample Time: 1405

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01009
control box: FA00896
bladder pump: FA01196
** previously high pH well *

Well Sampling Sheet

Well ID: EFMW-044 Date: 12-15-16

DTW: 104.46 Depth of Pump Intake: 111.00

DTB: 113.99 Total Volume Purged: 2.2

Purge Start:		Time:	0825	CPM:	4	psi:	240	Discharge Rate:	5
Purge End:		Time:	0930	CPM:	4	psi:	240	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
08:37	104.46	260	8.77	0.412	10.68	7.29	229	0.00	0.25
0839		260	8.30	0.414	10.93	7.61	246	0.00	0.5
0844		260	8.30	0.413	10.50	7.68	255	0.00	0.75
0849		260	8.31	0.414	10.34	7.71	263	0.00	1.0
0854		260	8.34	0.415	10.33	7.72	270	0.00	1.25
0859		260	8.40	0.415	10.31	7.72	275	0.00	1.5
0904		260	8.41	0.415	10.31	7.73	280	0.00	1.75

Purge Water Description: clear, no odor

Sample ID: EFMW-044-GW Sample Time: 910

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01009
Control Box: FA00916
bladder pump: FA01196

Well Sampling Sheet

Well ID: CFMW-049a page 1/2 Date: 12-15-16

DTW: 104.51 Depth of Pump Intake: 140

DTB: ~~[illegible]~~ 151.10 Total Volume Purged: 6.5 gallons

Purge Start:		Time:	1000	CPM:	4	psi:	240	Discharge Rate:	5
Purge End:		Time:	1230	CPM:	4	psi:	240	Discharge Rate:	5

Restored pH meter, 12.63

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1022	104.83	300	6.54	2.41	9.94	12.58	-48	156	0.25
1027	104.83	300	7.41	1.90	10.29	12.51	-44	111	0.5
1032	104.84	300	7.46	1.23	9.56	12.29	-29	79.4	0.75
1037	104.84	300	7.65	0.964	9.43	12.12	1	80.9	1.0
1042		300	7.88	1.36	8.70	12.20	32	131	1.25
1047		300	8.06	0.776	8.77	12.02	33	86.7	1.5
1052		300	8.06	0.614	8.80	11.84	72	111	1.75
1057		300	8.16	0.584	8.74	11.79	98	100	2.00
1102		300	8.28	0.587	8.76	11.78	114	114	2.25
1107		300	8.31	0.477	8.88	11.62	129	121	2.50
1110		300	8.14	0.454	8.89	11.61	135	113	2.70
1113		300	8.12	0.431	8.79	11.53	143	111	2.9
1116		300	8.19	0.411	8.76	11.63	143	108	3.1
1119		300	8.07	0.451	8.72	11.65	141	123	3.3
1122		300	7.99	0.423	8.69	11.63	139	119	3.5
1125		300	8.15	0.404	8.01	11.62	131	107	3.7
1128		~~300~~	~~[illegible]~~	change tank					3.9

see page 2/2

Purge Water Description:

Sample ID: CFMW-049a-GW Sample Time: 1230

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01009
control box: FA00896
bladder pump: FA01196
high pH well

Well Sampling Sheet

Well ID: CFMW-0499 page 2/2 **Date:** 12-15-14

DTW: 104.51 **Depth of Pump Intake:** 148.0

DTB: 151.10 **Total Volume Purged:** 6.5 gallons

Purge Start:		**Time:**	1000	**CPM:**	4	**psi:**	240	**Discharge Rate:**	5
Purge End:		**Time:**	1230	**CPM:**	4	**psi:**	240	**Discharge Rate:**	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1131	104.84	300	6.43	0.402	9.81	11.21	160	107	3.9
1134		300	8.15	0.944	8.97	11.41	173	168	4.1
1137		300	8.22	0.473	8.86	11.32	156	131	4.3
1140		300	8.31	0.390	8.75	11.33	162	120	4.5
1143		300	8.37	0.346	8.77	11.16	180	138	4.7
1146		300	8.40	0.331	8.81	11.05	186	162	4.9
1149		300	8.30	0.312	8.89	10.91	194	187	5.1
1152		300	7.71	0.317	9.03	10.86	198	180	5.3
1155		300	7.83	0.296	8.99	10.24	213	273	5.5
1158		300	8.13	0.630	8.61	11.84	157	149	5.7
1203			8.24	0.317	9.24	10.73	196	125	5.9
1208			8.22	0.312	8.92	10.57	209	120	6.1
1213			8.22	0.308	8.96	10.49	213	123	6.3
1218			8.15	0.302	8.83	10.49	212	126	6.5
~~1223~~									~~6.7~~

Purge Water Description: clear water. white substance in bladder pump

Sample ID: CFMW-0 Sample Time: 1230

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

See page 1/2

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-050 Date: 12-15-16

DTW: 105.26 Depth of Pump Intake: 120.0

DTB: 123.37 Total Volume Purged: 2.4 gallons

Purge Start:		Time:	1435	CPM:	3	psi:	240	Discharge Rate:	9
Purge End:		Time:	1600	CPM:	3	psi:	240	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1448	105.36	330	7.77	0.417	12.79	7.77	207	111	0.3
1453	105.36	330	7.78	0.416	10.80	7.84	206	89.1	0.6
1458	105.36	330	7.96	0.416	10.71	7.86	217	74.2	0.9
1503	105.37	330	7.99	0.416	10.68	7.82	230	53.3	1.2
1508	105.37	330	7.94	0.417	10.72	7.82	237	41.0	1.5
1513	105.37	330	7.91	0.416	10.31	7.81	243	29.0	1.8
1518	105.37	330	7.97	0.415	10.27	7.83	246	27.8	2.1
1523	105.37	330	7.97	0.415	10.30	7.79	252	25.2	2.4

Purge Water Description:

Sample ID: CFMW-050-GW Sample Time: 1530

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01004

Control box: FA00846

Bladder pump: FA01196

Well Sampling Sheet

Well ID: CFMW-053 Date: 12/12/16

DTW: 73.19 Depth of Pump Intake: ~77

DTB: 78.24 Total Volume Purged: 2 gallons

Purge Start:	1215	Time:		CPM:	3	psi:	130	Discharge Rate:	9
Purge End:	1315	Time:		CPM:	3	psi:	130	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1230	73.70	200	7.41	0.574	10.41	7.76	281	923	
1235	~~74.34~~	200	7.43	0.574	9.40	7.76	283	MAX	
1240	74.34	200	7.41	0.574	8.87	7.76	286	766	
1245	74.60	200	6.98	0.578	8.53	7.76	289	773	
1250	74.60	100	6.73	0.579	8.29	7.76	289	829	1 gallon
1255	74.60	100	6.31	0.578	8.50	7.74	291	948	
1300	74.63	100	6.23	0.576	8.03	7.72	292	818	
1305	74.65	100	6.18	0.576	8.39	7.69	294	710	
1310	74.66	100	6.08	0.576	8.67	7.66	296	660	2 gallon
1315	74.66	100	6.06	0.577	8.94	7.64	297	612	

Purge Water Description: orange/red cloudy

Sample ID: CFMW-053-GW Sample Time: 1315

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00725

Control box: FA00620

bladder: FA01196

Well Sampling Sheet

Well ID: CFMW-053a **Date:** 12/19/16

DTW: 89.10 **Depth of Pump Intake:** ~160

DTB: 162.48 **Total Volume Purged:** ~4 gallons

Purge Start:		**Time:**	1245	**CPM:**	3	**psi:**	110	**Discharge Rate:**	9
Purge End:		**Time:**	1330	**CPM:**	3	**psi:**	110	**Discharge Rate:**	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1302	95.56	250	7.74	5.66	10.47	12.43	-91	7.08	
1307	97.80	250	8.05	5.42	7.57	12.42	-109	7.06	3 gallons
1312	99.20	250	8.29	5.40	7.11	12.44	-122	6.37	
1317	101.00	250	8.33	5.43	6.84	12.45	-126	6.84	
1322	102.10	250	8.20	5.47	6.54	12.46	-128	5.40	
1327	103.30	250	8.38	5.52	6.35	12.46	-129	0.17	4 gallons

Purge Water Description: Clear w/ white particulate

Sample ID: CFMW-053a-GW Sample Time: 1245

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Samples collected prior to recording water quality due to slow recharge

Well previously pumped dry on 12/9, 12/10, 12/12, & 12/14

Honda - FA00725 Pump FA01196 Control FA00816

Well Sampling Sheet

Well ID: CFMW-054 Date: 12/12/16

DTW: 77.80 Depth of Pump Intake: ~85

DTB: 87.47 Total Volume Purged: 2 gallons

Purge Start:	1430	Time:		CPM:	3	psi:	120	Discharge Rate:	9
Purge End:	1510	Time:		CPM:	3	psi:	120	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1435	77.94	300	9.14	.560	12.46	7.75	276	147	
1440	77.50	300	8.90	.560	9.11	7.70	289	55.6	
1445	77.88	300	8.98	.558	9.12	7.72	290	36.2	
1450	77.76	300	8.91	.559	9.07	7.68	295	7.75	1 gallon
1455	77.76	300	8.89	.558	9.02	7.68	296	7.97	
1500	77.76	300	8.80	.558	8.84	7.68	299	0.00	
1505	77.76	300	8.79	.558	8.39	7.66	302	0.00	
1510	77.76	300	8.79	.558	8.51	7.67	303	0.00	2 gallon

Purge Water Description:

Sample ID: CFMW-054-GW Sample Time: 1510

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA00725

Control box: FA00620

Bladder: FA00196

Well Sampling Sheet

Well ID: CFMW-056 **Date:** 12/6/2016

DTW: 85.07 / 84.96 **Depth of Pump Intake:** 175.0

DTB: 180.61 **Total Volume Purged:** 2.4 gallons

Purge Start:	15:10	**Time:**	12/6/16	**CPM:**	4	**psi:**	250	**Discharge Rate:**	5
Purge End:		**Time:**	12/13/16	**CPM:**	3	**psi:**	250	**Discharge Rate:**	9

	Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
12/6	15:20	85.07	90	5.90	.358	4.86	7.79	-169	74.9	0.1
	15:25		90	5.65	0.358	3.22	7.85	-196	70.7	0.2
	15:30		90	5.39	0.359	2.94	7.94	-209	62.4	0.3
	15:35		90	5.06	0.362	2.83	8.01	-217	57.8	0.4
	15:40	Hard to start due to leak in compressed air line Resume 12/13/16								
12/13	1254	85.02	250	4.69	0.130	8.74	88.8	108	80.6	0.6
	1259	85.04	250	5.97	0.123	1.50	8.92	65	0.00	0.8
	1304	85.07		6.34	0.122	1.13	8.91	24	0.00	1.0
	1309	85.09		6.55	0.121	0.98	8.92	-12	0.00	1.2
	1314	85.10		6.73	0.120	0.77	8.93	-58	0.00	1.4
	1319	85.11		6.99	0.120	0.71	8.98	-84	0.00	1.6
	1324	85.13		7.14	0.120	0.69	9.14	-119	0.00	1.8
	1329			7.16	0.120	0.62	9.44	-149	0.00	2.0
	1334			7.23	0.120	0.59	9.65	-170	0.00	2.2
	1337			7.26	0.120	0.55	9.63	-176	0.00	2.3
	1340			7.28	0.120	0.52	9.57	-174	0.00	2.4

Purge Water Description: clear

Sample ID: CFMW-056-GW Sample Time: 1345

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01009
Controlbox: FA00896
bladder pump: FA01196

Well Sampling Sheet

Well ID: CFMW-0564 Date: 12-6-16

DTW: 78.26 Depth of Pump Intake: 134.0

DTB: 137.41 Total Volume Purged: (MB) ~~35~~

Purge Start:		Time:	1130	CPM:	4	psi:	200	Discharge Rate:	5
Purge End:		Time:	1320	CPM:	4	psi:	200	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1151	78.25	160	5.84	0.346	2.55	8.58	-247	~~[illegible]~~	0.2
1156			5.93	0.336	2.21	8.70	-313	—	0.4
1201			5.97	0.298	2.11	9.40	-403	996	0.6
1206			5.92	0.288	2.02	9.70	-438	869	0.8
1211			5.74	0.288	1.93	9.75	-452	610	1.0
1216			5.85	0.289	1.83	9.76	-458	548	1.2
1221			5.78	0.291	1.81	9.71	-459	492	1.4
1226			5.74	0.294	1.75	9.69	-461	439	1.6
1231			5.76	0.298	1.70	9.63	-460	409	1.8

Purge Water Description: slightly turbid ~~then clear~~ (MB)

Sample ID: CFMW-0564-GW Sample Time: 1240

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA 00725
Controlbox: FA00896
bladder pump: FA02269
~~DUP4~~ CFMW-DUP4-GW
taken at location @ 1200

Well Sampling Sheet

Well ID: CFMW-056b

Date: 12/12/16

DTW: 34.76

Depth of Pump Intake: ~50

DTB: 52.62

Total Volume Purged: 5gallons

Purge Start:	1015	Time:		CPM:	3	psi:	120	Discharge Rate:	9
Purge End:	1135	Time:		CPM:	3	psi:	120	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1030	34.78	300	6.95	.473	12.83	7.24	218	940	
1035	34.80	300	7.20	.471	9.20	1.24	220	587	
1040	34.80	300	7.15	.471	8.84	7.39	214	311	
1045	34.80	300	7.13	.467	8.75	7.48	212	125	
1050	34.80	300	7.25	.471	8.74	7.51	211	68.6	2gallons
1055	34.80	300	7.20	.471	8.70	7.52	209	55.4	
1100	34.80	300	7.20	.471	8.63	7.51	207	31.4	
1105	34.80	300	7.08	.471	8.69	7.52	205	18.1	3gallons
1110	34.80	300	7.14	.470	8.65	7.52	205	8.90	
1115	34.80	300	7.13	.470	8.67	7.51	204	5.37	
1120	34.80	300	7.14	.471	8.68	7.50	205	0.54	4gallons
1125	34.80	300	7.16	.470	8.68	7.51	205	0.00	
1130	34.80	300	7.16	.470	8.92	7.51	205	0.00	
1135	34.80	300	7.18	.470	8.89	7.52	205	0.00	5gallons

Purge Water Description: Slight tan cloudy to clear, no odor

Sample ID: CFMW-056b-GW

Sample Time: 1135

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Hiriba: FA00725
controlbox: FA00620
bladder pump: FA01196

Well Sampling Sheet

Well ID: CFMW-057 Date: 12-5-16

DTW: 81.78 Depth of Pump Intake: 181

DTB: 183.84 Total Volume Purged: 2.8

Purge Start:	1445	Time:		CPM:	4	psi:	200	Discharge Rate:	6.5
Purge End:	1640	Time:		CPM:	4	psi:	230	Discharge Rate:	6.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1520	81.78	200	6.56	0.263	1.56	8.34	-159	57.4	0.3
1525		200	6.08	0.259	1.49	8.46	-207	38.1	0.4
1530		200	6.61	0.259	1.47	8.53	-253	31.4	0.6
1535		200	6.54	0.259	1.50	8.55	-267	28.7	0.8
1540		200	6.41	0.259	1.42	8.55	-267	24.9	1.0
1545		200	6.35	0.260	1.46	8.55	-270	22.6	1.2
1550		200	5.92	0.262	1.46	8.51	-253	20.3	1.4
1555		200	5.48	0.263	2.63	8.47	-243	18.3	1.6
1600		200	5.60	0.261	3.08	8.42	-237	15.5	1.8
1603		200	5.57	0.259	3.14	8.40	-234	14.6	2.0
1606		200	5.49	0.259	3.18	8.38	-234	14.0	2.2
1609		200	5.34	0.260	3.32	8.36	-235	14.1	2.4

Purge Water Description:

Sample ID: CFMW-057-GW Sample Time: 1615

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01009

Control box: FA02269

bladder pump: FA01196

Well Sampling Sheet

Well ID: CFMW-057a **Date:** 12/16/16

DTW: 77.33 **Depth of Pump Intake:** ~138

DTB: 140.36 **Total Volume Purged:** 2.5 gallons

Purge Start:		**Time:**	0915	**CPM:**	3	**psi:**	100	**Discharge Rate:**	9
Purge End:		**Time:**	1000	**CPM:**	3	**psi:**	100	**Discharge Rate:**	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0940	83.30	300	4.71	3.32	7.20	12.00	-10	54.6	|
0945	87.49	300	4.74	3.02	6.37	12.24	-110	49.0	|
0950	90.80	300	4.62	2.97	6.40	12.73	-136	44.2	|
0955	92.93	300	4.60	2.91	6.29	12.88	-144	40.7	
1000	94.40	300	4.77	2.89	6.03	12.91	-146	45.0	2.5 gallons

Purge Water Description: Clear, ~~[illegible]~~; white percipitate; soil smell

Sample ID: CFMW-057a-GW Sample Time: 0915

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES: Horiba FA00725 control
Pump FA00873 FA00896
Well pumped dry on 12/12 and 12/14. Sampled initial water due to slow recharge. Parameters taken post sample

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-059 Date: 12/12/16

DTW: 70.10 Depth of Pump Intake: ~90

DTB: 92.71 Total Volume Purged: 7.25 gallons

Purge Start:	0810	Time:		CPM:	3	psi:	100	Discharge Rate:	9
Purge End:	0940	Time:		CPM:	3	psi:	100	Discharge Rate:	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0825	70.25	200	6.91	0.577	11.02	6.47	202	410	
0830	70.25	200	6.69	0.553	9.99	6.88	211	559	
0845	70.25	200	7.37	0.555	10.24	6.87	219	332	2 gal
0850	70.25	200	7.35	0.555	10.30	6.89	222	257	
0855	70.25	200	7.30	0.555	10.41	6.92	224	186	
0900	70.25	200	7.18	0.556	10.38	6.96	226	135	4 gal
0905	70.25	200	7.13	0.556	10.23	6.98	227	103	
0910	70.25	200	7.16	0.557	10.11	6.98	228	37.1	
0915	70.25	200	7.14	0.557	10.05	7.00	231	24.0	5 gal
0920	70.25	200	7.14	0.556	9.68	7.02	232	13.8	
0925	70.25	200	7.07	0.557	10.09	7.03	233	8.20	
0930	70.25	200	7.02	0.558	10.19	7.05	234	1.78	6 gal
0933	70.25	200	7.03	0.558	10.09	7.06	234	1.06	
0936	70.25	200	7.01	0.557	10.09	7.06	235	0.00	
0939	70.25	200	7.04	0.558	10.11	7.07	235	0.00	7 gal
0942	70.25	200	7.01	0.558	10.14	7.08	235	0.00	

Purge Water Description: Slightly tan cloudy; no odor

Sample ID: CFMW-059-GW Sample Time: 0940

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Hibal FA0725

control box FA00620

bladder pump FA01196

Well Sampling Sheet

Well ID: CFMW-059a **Date:** 12-15-16

DTW: 69.60 **Depth of Pump Intake:** 160.0

DTB: 163.86 **Total Volume Purged:** 2.65 gallons

Purge Start:		**Time:**	815	**CPM:**	3	**psi:**	110	**Discharge Rate:**	9
Purge End:		**Time:**	940	**CPM:**	3	**psi:**	10	**Discharge Rate:**	9

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
827	69.99	280	6.52	0.250	7.20	8.31	52	252	0.25
832	70.08		6.94	0.200	1.59	9.01	-71	320	0.5
837	70.15		1.32	0.197	1.09	9.31	-116	316	0.75
842	70.21		7.34	0.213	0.85	9.25	-131	205	1.0
847	70.29		7.44	0.230	0.77	9.08	-132	148	1.25
852	70.32		7.44	0.237	0.69	8.98	-139	116	1.5
857	70.37		7.51	0.247	0.62	8.93	-145	89.5	1.75
902	70.40		7.45	0.252	0.58	8.89	-149	73.7	2.0
907			7.50	0.252	0.55	8.91	-150	67.8	2.25
910			7.48	0.255	0.53	8.92	-162	60.2	2.45
913			7.38	0.258	0.52	8.80	-159	58.1	2.65

Continued w/ pH meter

Purge Water Description: clear, no color

Sample ID: CFMW-059a-GW Sample Time: 0915

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01009
control box: FA02184
bladder pump: FA01196
previously high pH well
Associated w/ EB13

Well Sampling Sheet

Well ID: CFMW-OW1 **Date:** 12/7/16

DTW: 13.09 **Depth of Pump Intake:** 24'

DTB: 26.5 **Total Volume Purged:** 18.9 L (~4.9 gallons)

Purge Start:	1300	**Time:**		**CPM:**	4	**psi:**	40	**Discharge Rate:**	10
Purge End:	1345	**Time:**		**CPM:**	4	**psi:**	40	**Discharge Rate:**	10

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1310	13.09	450	12.26	0.511	2.35	7.54	99	416	4.5 L
1315	13.09	450	11.31	0.537	0.87	7.46	93	217	6.75 L
1318	13.09	450	11.26	0.534	0.79	7.33	100	160	8.1 L
1321	13.09	450	11.12	0.527	0.53	7.36	86	82.8	9.45 L
1324	13.09	450	10.98	0.526	0.47	7.30	84	72.9	10.8 L
1327	13.10	450	10.85	0.522	0.41	7.35	75	50.2	12.15 L
1330	13.10	450	10.75	0.524	0.38	7.29	74	41.7	13.5 L
1333	13.09	450	10.68	0.525	0.34	7.23	71	26.9	14.85 L
1336	13.09	450	10.71	0.526	0.31	7.22	68	22.6	16.2 L
1339	13.09	450	10.61	0.523	0.32	7.35	59	22.3	17.55 L
1342	13.09	450	10.59	0.526	0.30	7.21	65	23.2	18.9 L

Purge Water Description: turbid, steady flow rate

Sample ID: CFMW-OW1-GW Sample Time: 1345

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	X (SW)
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba # FA

Bladder Pump # FA 00620 (SW)

Control Box # FA 02073

CFMW-DUP 5-GW collected @

Well Sampling Sheet

Well ID: CFMW-064 **Date:** 12/7/16

DTW: 13.38 **Depth of Pump Intake:** 31' below TOC

DTB: 33.2 **Total Volume Purged:** 15 L

Purge Start:	1440	**Time:**		**CPM:**	4	**psi:**		**Discharge Rate:**	10
Purge End:	1530	**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1455	13.38	300	7.94	0.434	4.74	7.77	208	>1000	
1500	13.38	300	7.94	0.434	4.75	7.79	208	>1000	
1505	13.38	300	8.12	0.434	4.66	7.78	213	962	
1510	13.38	300	8.09	0.434	4.69	7.80	214	720	
1513	13.38	300	8.10	0.434	4.70	7.79	216	645	
1516	13.39	300	8.09	0.434	4.72	7.80	220	504	
1519	13.38	300	8.10	0.434	4.72	7.79	221	433	
1522	13.39	300	8.08	0.434	4.69	7.80	223	409	
1525	13.38	300	8.05	0.434	4.72	7.80	223	377	15 L
1530	13.38	300	8.05	0.434	4.72	7.80	223	370	15.0 L

Purge Water Description: Water fairly turbid

Sample ID: CFMW-064-GW Sample Time: 1530

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA 00725

bladder pump: FA 02073

control box: FA 00620

Well Sampling Sheet

Well ID: CFMW-001 Date: 3/20/17

DTW: 98.22' Depth of Pump Intake: 150'

DTB: 153.05' Total Volume Purged: 4.0 gal

Purge Start:	11:18	Purge Time:	1:37	CPM:	3	psi:	85	Discharge Rate:	180 ml/min
Purge End:	12:55	~~Time:~~		CPM:	3	psi:	90	Discharge Rate:	190 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:22	98.49	180	8.17	0.359	2.85	7.42	-31	0.00	0.0
11:27	98.57	180	8.15	0.363	2.33	7.42	-38	0.00	
11:32	98.47	180	8.04	0.365	1.63	7.48	-45	0.00	
11:37	98.55	180	8.11	0.364	1.23	7.60	-59	0.00	
11:42	98.51	180	8.12	0.364	1.04	7.67	-70	0.00	
11:47	98.53	180	8.09	0.364	0.89	7.70	-83	0.00	
11:50	Stop	Horiba	and	clean	out.				
11:57	98.5	180	7.82	0.359	1.54	7.61	-32	1,000	
12:02	98.52	190	8.19	0.362	0.97	7.67	-94	1,000	
12:07	98.49	190	8.27	0.360	0.83	7.65	-110	1,000	
12:12	98.5	190	8.35	0.362	0.79	7.64	-128	554	
12:17	98.5	190	8.39	0.362	0.75	7.62	-136	425	
12:22	98.5	190	8.42	0.361	0.70	7.68	-148	439	
12:25	98.5	190	8.46	0.361	0.66	7.66	-155	429	
12:28	98.5	190	8.47	0.361	0.64	7.67	-156	411	3.5

Blinking - means over maximum

Blinking

Purge Water Description: Cloudy, yellowish color. No particulates

Sample ID: CFMW-001-GW Sample Time: 12:30

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Horiba - FA00627
Bladder - FA02073

NOTES:
- Doug F. / Greg D.
* Turbidity readings are 0.0 NTU and flashing - possibly over maximum?
- DF calls Josh (Test America) - no answer.

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

- DF calls MBL (Roux), informed 0.00 NTU flashing means values over maximum. Stop Horiba and clean out @ 11:50

Well Sampling Sheet

Well ID: CFMW - 002 **Date:** 3/24/17

DTW: 69.29 **Depth of Pump Intake:** 77.0

DTB: 82.49 **Total Volume Purged:**

Purge Start:	1230	**Time:**		**CPM:**	4	**psi:**	70	**Discharge Rate:**	6.0
Purge End:	1315	**Time:**		**CPM:**	4	**psi:**	70	**Discharge Rate:**	6.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1250	69.35	300	7.78	1.06	18.45	7.77	282	209	6.0L
1255	69.24	300	7.73	1.06	16.22	7.75	291	161	7.5L
1300	69.24	300	7.57	1.07	13.16	7.69	311	103	9.0L
1305	69.25	300	7.45	1.08	12.52	7.69	326	55.3	10.5L
1310	69.25	300	7.48	1.07	12.19	7.71	327	36.1	12.0L
1315	69.25	300	7.48	1.07	11.63	7.72	331	15.3	13.5L

Purge Water Description: Slightly turbid when first purging, brown hue. Sample slight yellow hue.

Sample ID: CFMW-002-GW **Sample Time:** 1315

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Well Sampling Sheet

Well ID: CFMW-003 (p.1 of 3) **Date:** 3/22/17

DTW: 17.56 **Depth of Pump Intake:** 50.0

DTB: 54.18 **Total Volume Purged:**

Purge Start:	0800	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	3.5
Purge End:		**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0805	17.80	~~300~~ 250	9.53	3.00	3.44	6.89	160	32.2* (not rdg)	1.25L
0810	17.80	250	8.97	3.09	2.24	6.91	157	0* (not rdg)	2.5L
0815	17.75	250	8.84	3.05	1.95	6.91	157	0* not rdg	3.75L
0820	17.74	250	8.83	3.01	1.88	6.91	156	>1000	5.0L
0825	17.56	250	8.70	2.89	1.70	6.90	155	out of range	6.25L
0830	17.76	250	8.67	2.81	2.61	6.87	172	out of range	7.5L
0835	17.77	250	8.64	2.81	1.80	6.88	169	out of range	8.75L
0845	17.70	250	8.62	2.79	1.56	6.89	166	out of range	11.25L
0850	17.70	250	8.59	2.74	1.45	6.88	162	992	12.5L
0855	17.70	250	8.53	2.72	2.00	6.91	167	873	13.75L
0900	17.70	250	8.51	2.70	1.44	6.92	167	752	15.0L
0905	17.70	250	8.54	2.69	1.37	6.90	167	526	16.25L
0910	17.70	250	8.54	2.69	1.34	6.90	165	417	17.5L
0912	17.80	250	8.54	2.68	1.31	6.90	163	344	18.0L
0915	17.73	250	8.54	2.68	1.29	6.90	163	288	18.75L
0920	17.75	250	8.51	2.68	1.29	6.89	163	268	20L

Purge Water Description: turbid, brown hue

Sample ID: CFMW-003 Sample Time: ~~0830~~ 1050 (SW)

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
AQ Free Cyanide (9016)	X

89
3732

NOTES:

Horiba: FA01008

Bladder FA00803

Turbidity readings flashing 0.0, still turbid, likely out of range. Drain Horiba of water + sediment and refill. Pull up pump ~2 feet higher.

Well Sampling Sheet

Well ID: CFMW-003 (continued p2) **Date:** 3/22/17

DTW: 17.56 (start) **Depth of Pump Intake:** moved up to ~47'

DTB: 54.18 **Total Volume Purged:**

Purge Start:	0800	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	3.5
Purge End:		**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0925	17.75	250	8.54	2.67	1.25	6.90	162	220	21.25 L
0930	17.75	250	8.49	2.72	1.24	6.90	163	out of range	22.5 L
0935	17.75	250	8.52	2.73	1.66	6.90	171	540	23.75 L
0940	17.73	250	8.54	2.68	1.20	6.91	169	312	25 L
0945	17.75	250	8.54	2.67	1.18	6.94	165	273	26.25 L
0950	17.75	250	8.54	2.67	1.18	6.94	165	219	27.5 L
0955	17.72	250	8.58	2.64	1.12	6.93	161	191	28.75 L
1000	17.75	250	8.61	2.64	1.10	6.97	158	154	30 L
1005	17.72	250	8.61	2.64	1.09	6.96	157	127	31.25 L
1010	17.77	250	8.63	2.64	1.08	6.97	156	104	32.5 L
1015	17.78	250	8.65	2.64	1.06	6.97	155	87.3	33.75 L
1020	17.77	250	8.66	2.64	1.06	6.95	155	76.1	35 L
1025	17.73	250	8.66	2.64	1.05	6.96	155	69.8	36.25 L
1030	17.75	250	8.67	2.63	1.04	6.95	154	70.9	37.5 L
1035	17.73	250	8.65	2.63	1.03	6.96	153	59.3	38.75 L
1040	17.70	250	8.67	2.63	1.03	6.96	152	58.0	40.0 L

Purge Water Description: Water appears clear despite turbidity readings

Sample ID: CFMW-003-GW Sample Time: 1050

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Analysis (See p1 of Sampleshed)	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	
AQ Free Cyanide (9016)	

Well Sampling Sheet

Well ID: CFMW-003 (p 3 of 3) **Date:** 3/22/17

DTW: _____ **Depth of Pump Intake:** 47.0'

DTB: _____ **Total Volume Purged:** 42.5 Liters

Purge Start:		**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	
Purge End:		**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1045	17.75	250	8.68	2.63	1.02	6.95	152	55.2	41.25
1050	17.	250	8.69	2.63	1.01	6.94	152	55.6	42.5L

Purge Water Description:

Sample ID: CFMW-003-GW Sample Time: 1050

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

AQ Free cyanide (9016)

Well Sampling Sheet

Well ID: CFMW-003a
Date: 3/20/17
DTW: 147.96'
Depth of Pump Intake: 200'
DTB: 203.31'
Total Volume Purged: 2.5 gal.

Purge Start:	13:15	Purge Time:	2:05	CPM:	3	psi:	110	Discharge Rate:	130 ml/min
Purge End:	15:20	Time:	~~X~~	CPM:	3	psi:	100	Discharge Rate:	90 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
13:23	148.67	130	9.27	0.247	3.65	8.95	-129	0.00	0.0
13:28	149.43	130	8.67	0.250	1.94	8.90	-199	0.00	
13:33	150.25	130	8.75	0.250	1.30	8.94	-210	0.00	
13:38	150.90	130	8.77	0.250	1.92	8.91	-213	0.00	
13:43	151.25	130	8.68	0.249	1.16	8.96	-218	0.00	
13:45	Stop	purge	and	clean	out	Horiba			
13:58	150.72	100	9.09	0.242	3.25	8.89	-174	0.00	
14:03	150.85	90	9.04	0.242	1.39	8.91	-123	0.00	
14:08	151.13	90	8.97	0.242	1.04	8.94	-209	0.00	
14:13	151.31	90	8.93	0.240	0.78	8.94	-216	0.00	
14:18	151.50	90	8.77	0.241	0.62	8.96	-220	0.00	
14:23	151.62	90	8.79	0.243	0.61	8.95	-222	0.00	
14:28	151.73	90	8.78	0.244	0.59	8.94	-223	0.00	2.0

Blinking water turbid @ first purge.

Purge Water Description: Cloudy, turbid. Brownish-grey in color, Sulfur odor

Sample ID: CFMW-003a-GW
Sample Time: 14:30
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
Horiba - FA00627
Bladder - FA02073
- Doug F. + Greg D.
@ 13:45 - Stop purge to clean out Horiba.
- Turbidity did not change from blinking 0.00 NTU, purged until visibly clear in tubing + sampled.

Well Sampling Sheet

Well ID: CFMW-007 Date: 3/28/17

DTW: 13.24' Depth of Pump Intake: 155.00'

DTB: 159.30' Total Volume Purged: 4.0 gal

Purge Start:	14:12	Purge Time:	01:28	CPM:	3	psi:	85	Discharge Rate:	10 sec.
Purge End:	15:30	~~Time:~~		CPM:	3	psi:	85	Discharge Rate:	10 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
14:14	13.24	250	6.80	0.383	15.34	7.74	80	50.1	0.0
14:19	13.26	250	6.55	0.403	9.63	7.92	-61	332	
14:24	13.26	250	6.53	0.412	2.67	8.04	-128	305	
14:29	13.26	250	6.51	0.414	1.73	8.01	-130	260	
14:34	13.26	250	6.49	0.416	0.92	7.97	-131	237	
14:39	13.26	250	6.44	0.416	0.67	8.01	-137	206	
14:44	13.26	250	6.36	0.417	0.52	7.96	-129	180	
14:49	13.26	250	6.36	0.417	0.40	7.96	-131	174	
14:54	13.26	250	6.39	0.417	0.33	7.96	-130	162	
14:59	13.26	250	6.45	0.417	0.29	7.98	-130	169	
15:02	13.26	250	6.45	0.417	0.28	7.96	-129	162	
15:05	13.26	250	6.47	0.417	0.29	8.03	-134	155	3.5 gal

Purge Water Description: Cloudy w/ yellowish-orange tint.

Sample ID: CFMW-007-GW Sample Time: 15:15

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug E. + Greg D.
- Horiba: FA00627
- Bladder: FA02073
- ☆ Transducer in well - not paused, not Roux property

Well Sampling Sheet

Well ID: CFMW-008 Date: 3/28/17

DTW: 5.68' Depth of Pump Intake: 185.00

DTB: 187.35' Total Volume Purged: 4.25 gal.

Purge Start:	11:25	Purge Time:	02:10	CPM:	3	psi:	90	Discharge Rate:	12 sec.
Purge End:	13:35	~~Time~~		CPM:	3	psi:	90	Discharge Rate:	12.5 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:28	5.32	150	5.88	0.437	36.51	6.78	-117	115	0.0
11:33	5.44	150	5.63	0.669	4.45	6.95	-174	655	
11:38	5.56	150	5.69	0.715	3.28	6.98	-185	575	
11:43	5.74	325	6.30	0.776	2.89	6.98	-193	612	
11:48	6.05	325	6.48	0.792	2.83	6.99	-201	487	
11:53	6.39	325	6.37	0.797	2.74	7.01	-205	391	
11:58	6.45	100	5.96	0.807	2.70	7.04	-207	352	
12:03	6.56	200	5.40	0.815	2.66	7.04	-205	350	
12:08	6.70	200	5.44	0.810	2.56	7.03	-202	299	
12:13	6.85	200	5.61	0.802	2.34	7.03	-202	272	
12:18	7.01	200	5.75	0.800	2.20	7.03	-206	251	
12:23	7.14	200	5.78	0.801	2.15	7.04	-209	241	
12:28	7.27	200	5.81	0.802	2.13	7.04	-210	233	
12:31	7.36	200	5.85	0.802	2.11	7.06	-213	221	
12:34	7.45	200	5.78	0.803	2.09	7.05	-212	213	
12:37	7.55	200	5.88	0.802	2.07	7.06	-214	207	3.5

Purge Water Description: Cloudy, dark brown - grey color.

Sample ID: CFMW-008-GW Sample Time: 12:45

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	✓
Matrix Spike Duplicate	✓

NOTES:
- Doug F + Greg D.
- Horiba: FA00627
- Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

Well Sampling Sheet

Well ID: CFMW-008a
Date: 3/28/17
DTW: 53.50
Depth of Pump Intake: 92'
DTB: 95.01
Total Volume Purged: 2.0 gallons

Purge Start:	0940	Time:		CPM:	4	psi:	65	Discharge Rate:	7
Purge End:	1145	Time:		CPM:	4	psi:	60	Discharge Rate:	3

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0951	53.90	250	8.30	5.85	13.29	12.73	-135	5.38	0.25
0956	55.70	160	8.01	6.08	2.84	12.65	-240	4.56	0.5
1001	57.24	160	7.79	6.13	2.16	12.62	-252	4.59	0.75
1006	58.16	110	7.65	6.15	2.01	12.58	-252	4.28	1.0
1011	58.80	110	7.60	6.15	1.81	12.55	-250	3.90	~~1.25~~ 1.10
1016	59.70	100	7.56	6.14	1.97	12.54	-252	3.89	1.2
1021	60.13	80	7.36	6.15	1.74	12.68	-258	3.62	1.3
1026	60.50	80	7.21	6.15	1.66	12.71	-257	3.43	1.4
1031	60.60	80	7.14	6.13	1.60	12.71	-256	2.97	1.5
1036	61.41	80	7.13	6.10	1.72	12.72	-257	2.93	1.6
1041	61.73	80	7.10	6.08	1.70	12.73	-258	2.84	1.7

Purge Water Description: clear, slight yellow/brown color

Sample ID: CFMW-008a-GW
Sample Time: 1045
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01008
bladder: FA00803

~~pH taken from Myron 6P~~ CMB

Well Sampling Sheet

Well ID: CFMW-010 **Date:** 3/24/17

DTW: 65.38 **Depth of Pump Intake:** 82.0'

DTB: 86.31 **Total Volume Purged:** 8.75 L

Purge Start:	1345	**Time:**		**CPM:**	4	**psi:**		**Discharge Rate:**	6.0
Purge End:	1420	**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	8.75

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1400	65.45	250	8.58	0.954	10.60	8.52	272	117	3.75 L
1405	65.49	250	7.90	0.961	5.02	8.42	291	51.9	5.0 L
1410	65.45	250	7.84	0.961	5.42	8.41	292	34.9	6.25 L
1415	65.44	250	7.76	0.962	5.02	8.37	295	24.0	7.5 L
1420	65.40	250	7.70	0.964	4.79	8.38	294	16.2	8.75 L

Purge Water Description: Slight yellow hue, turbidity cleared quickly

Sample ID: CFMW-010 Sample Time: 1430

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Well Sampling Sheet

Well ID: CFMW-011 Date: 3-27-17

DTW: 29.32 Depth of Pump Intake: 48'

DTB: 52.77 Total Volume Purged: 6 gallons

Purge Start:	0955	Time:		CPM:	4	psi:	60	Discharge Rate:	5
Purge End:	1005	Time:		CPM:	4	psi:	60	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0959	29.35	410	7.31	0.510	15.25	7.42	325	7.68	0.5
1004	29.35	410	7.15	0.504	9.47	7.23	348	0.68	1.0
1009	29.34	410	7.11	0.504	8.83	7.14	359	0.00	1.5
1014	29.32	410	7.06	0.504	8.95	7.11	365	0.00	2.0
1019	29.31	410	7.06	0.504	8.60	7.08	369	0.00	2.5
1024	29.30	410	7.06	0.504	8.42	7.19	365	0.00	3.0
1029	29.30	410	7.03	0.505	8.58	7.28	361	0.00	3.5
1034	29.30	410	7.03	0.505	8.39	7.46	358	0.00	4.0
1039	29.30	410	7.02	0.506	8.57	7.60	346	0.00	4.5
1044	29.30	410	7.02	0.508	8.37	7.57	348	0.00	5.0
1049	29.30	410	7.01	0.509	8.31	7.60	347	0.00	5.5

Purge Water Description: clear from beginning to end

Sample ID: CFMW-011-GW Sample Time: 1055

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Honba: FA01008

bladder: FA00803

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-011a
Date: 3/21/17
DTW: 97.75'
Depth of Pump Intake: 165'
DTB: 168.97'
Total Volume Purged: 3.0 gal

Purge Start:	12:50	Purge Time:	1:28	CPM:	3	psi:	85	Discharge Rate:	90 ml/min
Purge End:	14:18	Time:	~~X~~	CPM:	3	psi:	85	Discharge Rate:	200 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
12:57	97.75	90	9.44	0.257	2.56	8.96	-136	0.00	0.0
13:02	97.79	200	7.70	0.369	2.11	8.38	-239	0.00	
13:07	97.85	200	7.52	0.391	1.30	8.26	-174	0.00	
13:12	97.85	200	7.48	0.393	1.13	8.21	-147	0.00	
13:~~X~~20	97.85	200	7.79	0.386	2.42	8.06	-28	0.00	
13:~~X~~25	97.85	200	7.39	0.375	0.97	8.07	-109	762	
13:~~X~~30	97.85	200	7.39	0.372	0.80	8.07	-145	596	
13:35	97.85	200	7.35	0.373	0.76	8.01	-144	457	
13:40	97.90	200	7.34	0.371	0.73	8.05	-150	381	
13:45	97.90	200	7.43	0.367	0.71	8.03	-152	289	
13:48	97.92	200	7.41	0.364	0.73	8.00	-149	274	
13:51	97.93	200	7.44	0.361	0.71	8.01	-149	268	
13:54	97.93	200	7.43	0.362	0.69	7.97	-151	259	2.5 gal

Blinking - very turbid

-13:15 ↳ Stop purge + clean Horiba

Purge Water Description: Cloudy, yellowish in color

Sample ID: CFMW-011a - GW
Sample Time: 14:00
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Greg D
- Horiba: FA00627
- Bladder: FA02073
- ★13:15 - Stop purge + clean Horiba

Well Sampling Sheet

Well ID: CFMW-012 Date: 3/22/17

DTW: 71.00 Depth of Pump Intake: 77.0'

DTB: 81.95 Total Volume Purged: 9.5L

Purge Start:	1130	Time:		CPM:	4	psi:	50	Discharge Rate:	7.0
Purge End:	1210	Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1135	71.00	150	7.54	1.26	8.62	8.21	318	0.61	750 mL
1140	71.00	250	7.34	1.28	7.45	8.13	330	0.21	2.0L
1145	71.00	250	7.34	1.29	7.32	8.13	331	0.00	3.25L
1150	71.00	250	7.21	1.30	6.85	8.08	338	0.0	4.5L
1155	71.00	250	7.16	1.30	6.81	8.05	341	0.0	5.75L
1200	71.00	250	7.11	1.30	6.81	8.04	341	0.0	7.0L
1205	71.00	250	7.13	1.30	6.75	8.06	341	0.0	8.25L

Purge Water Description: Slight yellow hue

Sample ID: CFMW-012-GW Sample Time: 1215

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Well Sampling Sheet

Well ID: CFMW-012a
Date: 3/20/17
DTW: 142.21'
Depth of Pump Intake: 210'
DTB: 213.57'
Total Volume Purged: 2.5 gal

Purge Start:	08:40	Purge Time:	1:40	CPM:	3	psi:	110	Discharge Rate:	9~~1~~0 DF ml/min
Purge End:	10:20	~~Time~~		CPM:	3	psi:	117	Discharge Rate:	150 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
08:48	142.22	90	5.58	0.290	5.09	8.69	152	----	0.0
08:53	142.22	90	4.63	0.345	3.70	7.98	85	----	
08:58	142.22	150	5.43	0.365	2.27	7.31	50	----	
09:03	142.22	150	5.55	0.369	2.14	7.22	38	----	
09:08	142.22	150	5.52	0.370	1.95	7.20	29	----	
09:13	142.22	150	5.40	0.372	2.07	7.18	25	----	
09:18	142.22	150	5.44	0.372	1.86	7.14	19	----	
09:23	142.22	150	5.50	0.373	1.75	7.09	14	----	
09:28	142.22	150	5.53	0.373	1.65	7.08	5	----	
09:33	142.22	150	5.55	0.373	1.62	7.06	3	----	
09:38	142.22	150	5.62	0.373	1.55	7.06	-3	----	
09:43	142.22	150	5.65	0.373	1.54	7.05	-7	----	
09:48	142.22	150	5.73	0.374	1.50	7.06	-10	----	2.0

Purge Water Description: Clear, no signs of particulates.

Sample ID: CFMW-012a-GW
Sample Time: 09:50
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
Horiba - FA00627
Bladder - FA02073
- Doug F. / Greg D.
☆ Turbidity problems: Reading 4 dashed lines - do not have calibration equipment, will run for extra time to ensure turbidity is okay + water is clear.

ROUX ASSOCIATES, INC.

2476.0001y.100/SAP-AP

☆ Autocal. @ 10:45. Turbidity @ 34.3 NTU - below 50.0 while sampling.

Well Sampling Sheet

Well ID: CFMW-014

Date: 3-29-17

DTW: ~~52.62~~ 62.52

Depth of Pump Intake: 90.00

DTB: 93.45

Total Volume Purged: 2.4

Purge Start:		Time:	0800	CPM:	4	psi:	60	Discharge Rate:	5
Purge End:		Time:	0920	CPM:	4	psi:	60	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0809	62.50	200	10.22	1.33	9.82	6.97	282	0.37	0.2
0814	62.50	200	9.08	1.30	8.78	7.66	325	0.00	0.4
0819	62.50	200	8.37	1.27	8.64	7.68	339	0.31	0.6
0824	62.50	200	8.00	1.25	8.49	7.63	348	2.21	0.8
0829	62.50	200	7.83	1.22	8.49	7.57	353	1.60	1.0
0834	62.50	200	7.68	1.22	8.47	7.46	361	0.31	1.2
0839	62.50	200	7.62	1.25	8.26	7.43	365	0.00	1.4
0844	62.50	200	7.52	1.24	8.25	7.40	370	0.00	1.6
0849	62.50	200	7.45	1.25	8.19	7.38	373	0.00	1.8
0854	62.50	200	7.36	1.25	8.01	7.36	374	0.00	2.0

Purge Water Description: slight yellow color

Sample ID: CFMW-014-GW

Sample Time: 0900

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01008

bladder: FA00803

Well Sampling Sheet

Well ID: CFMW-015 Date: 3/29/17

DTW: 59.00 Depth of Pump Intake: 90'

DTB: 94.64 Total Volume Purged:

Purge Start:		Time:	0940	CPM:	4	psi:	60	Discharge Rate:	7
Purge End:		Time:	1050	CPM:	4	psi:	60	Discharge Rate:	7

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0947	59.00	260	7.72	2.57	5.11	9.26	206	0.00	0.2
0952	59.00	260	7.50	2.61	2.54	9.27	203	0.00	0.4
0957	58.96	260	7.49	2.62	2.12	9.27	203	0.00	0.6
1002	58.91	260	7.49	2.62	2.03	9.27	203	0.00	0.8
1007	58.92	260	7.42	2.62	1.78	9.28	202	0.00	1.0
1012	58.93	260	7.40	2.63	1.69	9.29	202	0.00	1.2
1017	58.94	260	7.39	2.63	1.60	9.29	202	0.00	1.4
1022	58.92	260	7.34	2.63	1.55	9.29	202	0.00	1.6
1027	58.92	260	7.34	2.63	1.52	9.29	202	0.00	1.8

Purge Water Description: clear, wst colored, no odor

Sample ID: CFMW-015-GW Sample Time: 1035

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Horiba: FA01008
bladder: FA00803

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-016 Date: 3/28/17

DTW: 38.75 Depth of Pump Intake: 95'

DTB: 97.83 Total Volume Purged: 3.2 gallons

Purge Start:	1210	Time:		CPM:	4	psi:	60	Discharge Rate:	7
Purge End:	1350	Time:		CPM:	4	psi:	60	Discharge Rate:	7

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1220	38.80	250	8.23	0.396	20.81	7.85	136	290	0.25
1225	38.80	250	8.10	0.387	11.62	7.62	149	113	0.5
1230	38.80	250	8.01	0.386	11.13	7.53	157	30.8	0.75
1235	38.80	250	7.97	0.385	11.05	7.46	167	14.1	1.0
1240	38.80	250	7.90	0.384	10.68	7.39	174	5.99	1.25
1245		250	7.89	0.384	10.27	7.35	183	4.18	1.5
1250		250	7.89	0.384	10.11	7.31	189	2.44	1.75
1255		250	7.87	0.384	10.11	7.25	195	1.86	2.0
1300		250	7.83	0.384	10.00	7.22	200	1.68	2.25
1305		250	7.83	0.385	10.01	7.16	205	0.00	2.50
1308		250	7.82	0.385	9.96	7.14	208	0.00	2.7
1311		250	7.82	0.385	10.02	7.13	209	0.00	2.9

Purge Water Description: clear, no color or odor

Sample ID: CFMW-016-GW Sample Time: 1320

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01008
bladder: FA00803

CFMW-DUP10-GW taken at this well @1200

ROUX ASSOCIATES, INC.

2476.0001y.100/SAP-AP

Well Sampling Sheet

Well ID: CFMW-016a
Date: 3/27/17
DTW: 39.52'
Depth of Pump Intake: 125.00'
DTB: 128.40'
Total Volume Purged: 5.0 gal

Purge Start:	11:45	Purge Time:	01:40	CPM:	3	psi:	70	Discharge Rate:	200 ml/min
Purge End:	13:25	Time:	~~X~~	CPM:	3	psi:	70	Discharge Rate:	300 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:49	39.62	200	9.62	0.259	9.60	10.12	49	108	0.0
11:54	39.61	200	8.51	0.393	9.20	7.91	90	463	
11:59	39.62	270	8.42	0.410	8.93	7.62	105	326	
12:04	39.62	270	8.27	0.414	8.81	7.59	115	147	
12:09	39.65	300	8.21	0.424	8.53	7.61	130	103	
12:14	39.65	300	8.13	0.430	8.94	7.55	140	84.1	
12:19	39.65	300	8.12	0.434	8.88	7.41	156	65.0	
12:24	39.65	300	8.13	0.437	9.07	7.41	160	45.3	
12:29	39.65	300	8.15	0.438	9.09	7.40	167	39.7	
12:34	39.65	300	8.19	0.439	8.92	7.33	176	24.7	
12:37	39.65	300	8.18	0.439	9.44	7.33	179	20.3	
12:40	39.65	300	8.17	0.439	9.78	7.27	184	19.4	
12:45	39.65	300	8.20	0.440	9.50	7.34	183	18.7	4.0

Purge Water Description: Clear, no particulates

Sample ID: CFMW-016a-GW
Sample Time: 12:45
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	✓
Matrix Spike Duplicate	✓

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Greg D.
- Horiba: FA00627
- Bladder: FA02073
- ★11:35 - Transducer paused + pulled out of well.
- ★DTW previously 94.44' on 3/14-3/15.
- ★13:25 - Transducer readings resume.

ROUX ASSOCIATES, INC.

2476.0001y.100/SAP-AP

Well Sampling Sheet

Well ID: CFMW-017 Date: 3/28/17

DTW: 83.20' Depth of Pump Intake: 138.00'

DTB: 140.92' Total Volume Purged: 2.5 gal.

Purge Start:	09:46	Purge Time:	01:04	CPM:	3	psi:	80	Discharge Rate:	10 sec.
Purge End:	10:50	Time:	~~X~~	CPM:	3	psi:	80	Discharge Rate:	12 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
09:50	83.23	170	7.74	1.07	10.74	8.51	284	16.0	0.0
09:55	83.23	200	7.67	1.00	8.77	8.52	291	7.48	↓
10:00	83.23	200	7.73	0.964	8.24	8.50	295	7.97	↓
10:05	83.23	200	7.78	0.955	8.09	8.51	295	6.90	↓
10:10	83.23	200	7.77	0.945	7.91	8.51	295	6.63	↓
10:15	83.23	200	7.78	0.929	8.01	8.50	295	7.81	↓
10:20	83.23	200	7.83	0.927	7.79	8.53	294	6.96	↓
10:23	83.23	200	7.88	0.908	7.92	8.51	294	6.50	↓
10:26	83.23	200	7.99	0.892	7.92	8.52	292	6.72	2.0

Purge Water Description: Clear w/ yellowish tint, little fine particulates

Sample ID: CFMW-017-GW Sample Time: 10:30

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F + Greg D
- Horiba: FA00827
- Bladder: FA02073

Well Sampling Sheet

Well ID: CFMW - 018 Date: 3/28/17

DTW: 94.86' Depth of Pump Intake: 125.00'

DTB: 127.10' Total Volume Purged: 4.0 gal

Purge Start:	08:03	Purge Time:	01:17	CPM:	3	psi:	75	Discharge Rate:	10 sec.
Purge End:	09:20	Time:	~~X~~	CPM:	3	psi:	75	Discharge Rate:	10 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
08:08	94.87	220	9.62	0.438	15.99	6.90	274	438	0.0
08:13	94.87	220	8.11	0.405	11.94	7.57	264	612	↓
08:18	94.87	220	7.83	0.400	11.58	7.53	270	162	↓
08:23	94.87	220	7.69	0.399	11.15	7.37	280	94.0	↓
08:28	94.87	220	7.64	0.399	11.24	7.45	275	113	↓
08:33	94.87	220	7.62	0.398	10.93	7.40	279	53.6	↓
08:38	94.87	220	7.62	0.398	12.52	7.48	275	59.2	↓
08:43	94.87	220	7.62	0.397	11.09	7.43	276	42.0	↓
08:48	94.87	220	7.63	0.398	11.03	7.52	271	48.4	↓
08:53	94.87	220	7.61	0.397	10.99	7.44	276	36.0	↓
08:56	94.87	220	7.61	0.397	10.98	7.46	275	33.9	↓
08:59	94.87	220	7.64	0.396	10.93	7.46	275	35.7	3.5

Purge Water Description: Clear during sampling

Sample ID: CFMW - 018 - GW Sample Time: 09:00

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + Greg D
- Horiba: FA00627
- Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

Well Sampling Sheet

Well ID: CFMW-019 Date: 3/29/17

DTW: 63.00 Depth of Pump Intake: 94'

DTB: 96.43 Total Volume Purged: 3 gallons

Purge Start:		Time:	1140	CPM:	4	psi:	60	Discharge Rate:	4
Purge End:		Time:		CPM:	4	psi:	60	Discharge Rate:	7

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1147	63.02	250	9.47	1.18	9.38	7.82	270	6.41	0.2
1152	63.00	250	8.25	1.16	3.78	7.60	316	5.42	0.4
1157	63.00	250	8.06	1.17	3.62	7.58	323	3.71	0.6
1202	63.00	250	7.84	1.17	3.42	7.56	330	4.33	0.8
1207	63.00	250	7.71	1.17	3.29	7.53	325	3.58	1.0
1212	63.00	250	7.60	1.17	3.21	7.49	319	2.73	1.2
1217	63.00	250	7.51	1.17	3.13	7.43	327	2.64	1.4
1222	63.00	250	7.46	1.18	3.08	7.40	332	1.77	1.6
1227	63.00	250	7.41	1.18	3.05	7.34	339	0.00	1.8
1232	63.00	250	7.36	1.18	3.03	7.30	344	0.00	2.0
1237	63.00	250	7.37	1.18	2.99	7.27	347	0.00	2.2

Purge Water Description:

Sample ID: CFMW-019-GW Sample Time: 1245

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA00104
bladder: FA00803

Well Sampling Sheet

Well ID: CFMW-019a
Date: 3/27/17
DTW: 137.32'
Depth of Pump Intake: 220.00'
DTB: 223.19'
Total Volume Purged: 3.5 gal

Purge Start:	08:28	Purge Time:	02:47	CPM:	3	psi:	110	Discharge Rate:	130 ml/min
Purge End:	11:15	Time:	~~X~~	CPM:	3	psi:	115	Discharge Rate:	130 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
08:36	137.31	130	10.10	0.290	2.81	10.18	-166	0.00	0.0
08:41	137.32	130	7.83	0.310	0.54	8.90	-219	0.00	
08:46	137.34	130	7.73	0.312	0.24	8.83	-227	0.00	
08:51	137.34	130	7.66	0.308	0.10	8.92	-224	0.00	
08:56	137.34	130	7.68	0.306	0.05	8.97	-256	0.00	
09:01	137.32	130	7.56	0.298	0.44	8.70	-119	1000	
09:10	137.32	130	7.55	0.303	0.31	8.91	-219	749	
09:15	137.32	130	7.56	0.305	0.13	8.96	-249	586	
09:20	137.32	130	7.51	0.305	0.13	8.91	-255	462	
09:25	137.32	130	7.42	0.306	0.14	8.84	-253	535	
09:30	137.32	130	7.42	0.308	0.24	8.79	-251	449	
09:33	137.32	130	7.37	0.310	0.31	8.79	-249	386	
09:38	137.32	130	7.46	0.312	0.35	8.73	-246	376	
09:43	137.32	130	7.37	0.316	0.32	8.69	-243	341	
09:46	137.32	130	7.56	0.309	0.48	8.71	-240	411	
09:49	137.32	130	7.06	0.314	0.53	8.74	-239	378	
09:53	137.32	130	7.46	0.312	0.47	8.77	-243	320	
09:55	137.32	130	7.41	0.319	0.45	8.68	-242	212	
09:58	137.32	130	7.40	0.317	0.43	8.63	-243	203	
10:01	137.32	130	7.51	0.317	0.41	8.62	-249	199	3.0

Blinking - over max

Blinking - over max

09:00 pause to clean Horiba

Purge Water Description: Slightly cloudy, no particulates

Sample ID: CFMW-019a-GW
Sample Time: 10:05
Laboratory Name: Test America

Sample time noted as 12:00

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Greg D.
- Horiba: FA00627
- Bladder: FA02073
- ☆ Transducer paused + pulled out of well @ 08:15
- ☆ Pause purge @ 09:00 to clean out Horiba, resume @ 09:05

☆ ~~DX~~ CFMW-DUP9-AQ taken - noted as 12:00 sample time.
☆ 11:30 - Transducer resumed, reading 1.2 PSI, -1.32' depth to water.

Well Sampling Sheet

Well ID: CFMW-020 Date: 3/21/17

DTW: 60.77' Depth of Pump Intake: 130'

DTB: 134.80' Total Volume Purged: 3.5 gal

Purge Start:	09:36	Purge Time:	1:04	CPM:	3	psi:	85	Discharge Rate:	300 ml/min
Purge End:	10:40	Time:		CPM:	3	psi:	85	Discharge Rate:	300 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
09:40	60.67	300	7.82	0.522	10.80	7.15	73	0.00	0.0
09:45	60.67	300	7.85	0.532	10.37	7.15	61	0.00	
09:50	60.67	300	7.88	0.534	10.05	7.09	68	0.00	
09:55	60.67	300	7.88	0.533	9.99	7.22	60	0.00	
10:00	60.55	300	7.90	0.531	16.87	7.23	59	24.7	
10:05	60.52	300	7.92	0.530	9.66	7.14	65	26.5	
10:10	60.50	300	7.89	0.530	9.62	7.05	70	24.0	
10:13	60.57	300	7.92	0.529	9.69	7.13	68	23.9	
10:16	60.45	300	7.94	0.529	9.56	7.14	69	21.9	
10:19	60.43	300	7.94	0.528	9.50	7.14	69	21.7	3.0 gal

Saying batteries are low, replace between 9:55-10:00 Both sets of batteries new out of Horiba case.

Purge Water Description: Clear, trace fine particulates

Sample ID: CFMW-020-GW Sample Time: 10:20

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Greg D.
- Horiba: FA00627
- Bladder: FA02073
- Previous Gauging Data:
  - DTW - 96.38'
  - DTB - 136'

Well Sampling Sheet

Well ID: CFMW-021 Date: 3/29/17

DTW: 63.11 Depth of Pump Intake: 86'

DTB: 89.72 Total Volume Purged:

Purge Start:		Time:	1330	CPM:	4	psi:	60	Discharge Rate:	5
Purge End:		Time:	1445	CPM:	4	psi:	60	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1342	63.11	330	8.32	1.16	7.41	7.70	282	2.28	0.25
1347	63.10	330	7.99	1.16	6.14	7.61	321	0.00	0.5
1352	63.09	330	7.94	1.16	6.06	7.62	326	0.00	0.75
1357	63.10	330	7.89	1.17	6.00	7.63	328	0.00	1.0
1402		330	7.88	1.17	5.91	7.67	327	0.00	1.25
1407		330	7.87	1.17	5.75	7.68	326	0.00	1.5
1412		330	7.85	1.17	5.73	7.68	326	0.00	1.75
1417		330	7.84	1.17	5.68	7.69	326	0.00	2.0

Purge Water Description:

Sample ID: CFMW-021-GW Sample Time: 1420

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01009

bladder: FA00803

Well Sampling Sheet

Well ID: CFMW-022 Date: 3-28-17

DTW: 55.01 Depth of Pump Intake: 80.00

DTB: 84.00 Total Volume Purged: 2.0 gallons

Purge Start:		Time:	1405	CPM:	4	psi:	60	Discharge Rate:	5
Purge End:		Time:	1515	CPM:	4	psi:	60	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1413	54.95	250	8.46	0.498	18.09	7.61	266	3.19	0.2
1418	54.95	250	8.36	0.498	11.53	7.57	289	0.08	0.4
1423	54.95	250	8.28	0.499	10.85	7.55	298	0.00	0.6
1428	54.95	250	8.25	0.498	10.39	7.55	303	0.00	0.8
1433	54.94	250	8.18	0.498	10.39	7.52	307	0.00	1.0
1438	54.94	250	8.15	0.498	10.00	7.51	310	0.00	1.2
1443	54.95	250	8.09	0.499	9.97	7.49	314	0.00	1.4
1448	54.95	250	8.09	0.498	9.63	7.48	316	0.00	1.6
~~1453~~	~~54.98~~	~~250~~						0.00	1.8 MB

Purge Water Description: clear, no color or odor

Sample ID: CFMW-022-GW Sample Time: 1445

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Horiba: FA01008
bladder: FA00803

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-023 Date: 3/21/17

DTW: 108.88' Depth of Pump Intake: 140'

DTB: 143.01' Total Volume Purged: 2.5 gal

Purge Start:	08:07	Purge Time:	0:53	CPM:	3	psi:	80	Discharge Rate:	230 ml/min
Purge End:	09:00	Time:	~~X~~	CPM:	3	psi:	80	Discharge Rate:	230 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
08:11	108.88	230	9.31	0.434	11.45	7.20	198	73.6	0.0
08:16	108.88	230	8.23	0.447	11.12	7.31	113	53.1	↓
08:21	108.88	230	7.82	0.456	10.51	7.34	75	41.2	↓
08:26	108.88	230	7.69	0.458	9.94	7.34	73	32.1	↓
08:31	108.88	230	7.64	0.458	9.72	7.35	74	28.9	↓
08:34	108.88	230	7.65	0.458	9.59	7.35	75	25.5	↓
08:37	108.88	230	7.64	0.458	9.70	7.37	75	23.3	↓
08:40	108.88	230	7.60	0.458	9.64	7.35	77	23.1	2.0 gal

Purge Water Description: Clear, no particulates

Sample ID: CFMW-023-GW Sample Time: 08:45

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-Doug F + Greg D.

-Horiba: FA00627

-Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

Well Sampling Sheet

Well ID: CFMW-025 (DF) Date: 3/30/17

DTW: — Depth of Pump Intake: —

DTB: — Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: Sample Time:

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:
Not sampled due to being destroyed by plow

Well Sampling Sheet

Well ID: CFMW-025a (p.1) Date: 3/24/17

DTW: 45.09 Depth of Pump Intake: 94.0'

DTB: 98.31 Total Volume Purged:

Purge Start:	0815	Time:		CPM:	5.0	psi:	60	Discharge Rate:	7.0
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0835	45.50	175	8.96	0.466	7.17	5.14	105	>1000	3.5 L
0840	45.50	175	8.21	0.419	3.24	6.73	-102	>1000	4.375 L
0845	45.50	175	8.17	0.383	2.61	7.08	-135	>1000	5.25 L
0850	45.49	175	8.14	0.382	2.55	7.10	-138	>1000	6.125 L
0855	45.50	175	7.96	0.382	2.28	7.11	-145	>1000	7.0 L
0900	45.50	175	7.81	0.384	2.09	7.10	-149	>1000	7.875 L
0905	45.50	175	7.77	0.385	2.05	7.10	-151	>1000	8.75 L
0910	45.50	175	7.75	0.385	1.98	7.11	-152	>1000	9.625 L
0930	45.52	175	7.31	0.383	2.81	7.14	-95	>1000	13.125 L (SW)
0935	45.50	200	7.41	0.385	2.42	7.20	-108	620	14.125 L
0940	45.50	200	7.67	0.386	1.79	7.46	-147	>1000	15.125 L
0950	45.47	200	7.72	0.386	2.82	7.67	-137	736	17.125 L
0955	45.50	200	7.75	0.386	2.51	7.69	-150	812	18.125 L
1000	45.50	200	7.74	0.387	2.00	7.69	-165	804	19.125 L
1005	45.50	200	7.76	0.387	1.74	7.67	-168	720	20.125 L
1010	45.50	200	7.80	0.386	1.62	7.63	-159	445	21.125 L

Purge Water Description: Water coming out turbid, slight gray hue. Clean out Horiba multiple times.

Sample ID: CFMW-025a-GW Sample Time: 1130

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba FA 01008

Bladder FA 00803

See p. 2 for additional readings

Well Sampling Sheet

Well ID: CFmw-025a (p.2) **Date:** 3/24/17

DTW: 45.09 **Depth of Pump Intake:** moved to ~89.0'

DTB: 98.31 **Total Volume Purged:** ~35 L

Purge Start:	0815	**Time:**		**CPM:**	5	**psi:**	60	**Discharge Rate:**	7.0
Purge End:	1115	**Time:**		**CPM:**	5	**psi:**	60	**Discharge Rate:**	7.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1015	45.50	200	7.84	0.386	1.56	7.65	-163	425	22.125 L
1020	45.50	200	7.83	0.387	1.45	7.67	-172	456	23.125 L
1025	45.50	200	7.87	0.387	1.43	7.69	-174	435	24.125 L
1030	45.46	200	7.98	0.387	1.38	7.69	-177	380	25.125 L
1035	45.50	200	8.01	0.387	1.36	7.71	-178	322	26.125 L
1040	45.47	200	8.08	0.387	1.34	7.70	-178	274	27.125 L
1045	45.50	200	8.14	0.386	1.31	7.71	-180	239	28.125 L
1050	45.50	200	8.19	0.386	1.29	7.71	-181	212	29.125 L
1055	45.46	200	8.26	0.385	1.27	7.70	-181	180	30.125 L
1100	45.47	200	8.31	0.386	1.27	7.71	-182	157	31.125 L
1105	45.46	200	8.41	0.385	1.24	7.71	-183	134	32.125 L
1110	45.47	200	8.45	0.385	1.24	7.76	-185	122	33.125 L
1115	45.44	200	8.45	0.385	1.22	7.71	-183	99.3	34.125 L

Purge Water Description: Purge water cleared /less visibly turbid

Sample ID: CFmw-025a Sample Time: 1130

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: #FA 01008

Bladder: #FA 00803

See p.1 for additional readings

Well Sampling Sheet

Well ID: CFMW-025b

Date: 3/20/17

DTW: 32.15

Depth of Pump Intake: 62.0'

DTB: 64.46

Total Volume Purged: 10.5 L

Purge Start:	0830	Time:		CPM:	4	psi:	50	Discharge Rate:	5.0
Purge End:	0910	Time:		CPM:	4	psi:	50	Discharge Rate:	5.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0835	32.20	300	8.44	0.430	4.02	7.15	-6	31.7	1500mL
0840	32.25	300	8.43	0.430	3.01	7.16	-17	30.3	3.0L
0845	32.24	300	8.35	0.432	2.28	7.17	-34	30.2	4.5L
0850	32.29	300	8.14	0.434	3.17	7.28	-38	29.7	6.0L
0855	32.29	300	8.51	0.430	2.04	7.47	-45	29.7	7.5L
0900	32.25	300	8.49	0.430	2.20	7.60	-42	29.4	9.0L
0905	32.25	300	8.55	0.431	2.11	7.72	-55	29.4	10.5L

Purge Water Description:

Sample ID: CFMW-025b-GW

Sample Time: 0910

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bladder FA00803

Horiba: FA01000

Well Sampling Sheet

Well ID: CFMW - 026 **Date:** 3/20/17

DTW: 41.43 **Depth of Pump Intake:** 46.0'

DTB: 47.43 **Total Volume Purged:** 8.0L

Purge Start:	1015	**Time:**		**CPM:**	3	**psi:**	45	**Discharge Rate:**	4.0
Purge End:	1055	**Time:**		**CPM:**	3	**psi:**		**Discharge Rate:**	3.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1025	40.65	200	8.03	0.428	10.44	7.49	120	49.2	2.0L
1030	40.55	200	8.15	0.434	10.30	7.50	127	20.1	3.0L
1035	40.51	200	8.23	0.431	10.12	7.48	133	4.17	4.0L
1040	40.51	200	8.35	0.426	10.01	7.48	139	3.91	5.0L
1045	40.51	200	8.45	0.425	9.95	7.44	144	1.15	6.0
1050	40.	200	8.49	0.425	9.96	7.49	142	1.30	7.0L

Purge Water Description:

Sample ID: CFMW-026-GW Sample Time: 1100

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bladder: FA 00803

Horiba: FA 01008

Well Sampling Sheet

Well ID: CFMW-027 Date: 3/27/17

DTW: 26.64 Depth of Pump Intake: 46'

DTB: 48.59 Total Volume Purged: 3 gallons

Purge Start:	0815	Time:		CPM:	4	psi:	70	Discharge Rate:	5
Purge End:	0925	Time:		CPM:	4	psi:	70	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0826	28.63	440	7.92	0.688	10.94	6.97	336	173	0.25
0831	26.63	440	7.76	0.678	10.02	7.01	355	138	0.5
0836	28.64	440	7.68	0.674	9.41	7.01	365	63.5	0.75
0841	28.62	440	7.64	0.674	9.18	6.99	372	17.1	1.0
0846	28.61	440	7.57	0.674	9.05	7.00	375	4.84	1.25
0851	28.60	440	7.55	0.674	9.09	6.99	378	1.63	1.5
0856	28.60	440	7.53	0.674	8.92	7.00	379	0.25	2.0
0901	28.59	440	7.54	0.674	8.92	7.02	380	0.00	2.25
0906	28.59	440	7.51	0.674	8.83	7.02	382	0.00	2.5
0911	28.59	440	7.50	0.674	8.96	7.03	383	0.00	2.75

Purge Water Description: slightly turbid at first w/ particulates then clear

Sample ID: CFMW-027-GW Sample Time: 0915

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA0008
bladder: FA0003

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Page 1 of 1 Free Cyanide X

2476.0001y.100/SAP-AP

Well Sampling Sheet

Well ID: CFMW - 028 **Date:** 3/20/17

DTW: 47.70 **Depth of Pump Intake:** 58.0'

DTB: 62.35 **Total Volume Purged:**

Purge Start:	1150	**Time:**		**CPM:**	4	**psi:**	40	**Discharge Rate:**	5.0
Purge End:	1250	**Time:**		**CPM:**	4	**psi:**	40	**Discharge Rate:**	3.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:55	48.54	300	8.44	0.427	36.49	7.67	242	209	1.5 L
1200	49.00	200	7.96	0.434	9.43	7.71	268	469	2.5 L (SW)
1205	48.97	200	7.81	0.434	8.92	7.67	276	661	3.5 L
1210	48.94	200	7.74	0.434	8.47	7.66	280	429	4.5 L
1215	48.91	200	7.75	0.434	8.32	7.67	281	340	5.5 L
1220	48.88	200	7.73	0.433	8.12	7.65	284	233	6.5 L
1225	48.90	200	7.68	0.433	7.81	7.66	286	158	7.5 L
1230	48.91	200	7.70	0.433	7.64	7.65	288	102	8.5 L
1235	48.99	200	7.71	0.434	7.39	7.66	290	65.7	9.5 L
1240	48.97	200	7.72	0.433	7.36	7.65	291	53.1	10.5 L
1245	48.98	200	7.68	0.434	7.18	7.65	293	36.6	11.5 L
1250	49.00	200	7.72	0.434	6.91	7.65	295	22.1	12.5 L

Purge Water Description:

Sample ID: CFMW-028-GW Sample Time: 1300

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Bladder: FA00803

Horiba: FA01008

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-028a
Date: 3/21/17
DTW: 46.99'
Depth of Pump Intake: 120'
DTB: 122.00'
Total Volume Purged: 4.0 gal

Purge Start:	11:00	Purge Time:	1:20	CPM:	3	psi:	85	Discharge Rate:	300 ml/min
Purge End:	12:20	Time:	~~X~~	CPM:	3	psi:	75	Discharge Rate:	220 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:02	47.55	300	8.13	0.202	5.65	9.09	138	0.00	0.0
11:07	47.57	220	7.89	0.328	1.92	10.46	73	0.00	
11:12	47.54	220	7.86	0.353	1.18	11.24	8	865	
11:17	47.51	220	7.85	0.358	1.04	11.29	-1	818	
11:22	47.50	220	7.83	0.368	1.02	11.38	-27	951	
11:27	47.48	220	7.86	0.363	0.71	11.37	-31	600	
11:32	47.48	220	7.85	0.356	0.67	11.34	-36	0.00	
11:37	47.48	220	7.85	0.337	0.59	11.26	-49	980	
11:42	47.48	220	7.83	0.316	0.56	11.19	-64	851	
11:47	47.48	220	7.88	0.293	0.53	11.07	-71	731	
11:50	47.48	220	7.98	0.272	0.55	10.90	-81	558	
11:53	47.48	220	7.91	0.265	0.51	10.82	-82	539	
11:56	47.48	220	8.01	0.258	0.48	10.75	-86	467	
11:59	47.48	220	8.03	0.251	0.46	10.60	-88	411	
12:02	47.48	220	8.04	0.249	0.45	10.57	-89	394	
12:05	47.48	220	7.99	0.245	0.44	10.54	-92	374	3.5 gal

Blinking

Blinking

Purge Water Description: Slightly turbid, yellowish in color

Sample ID: CFMW-028a-GW
Sample Time: 12:10
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Greg D.
- Horiba: FA00827
- Bladder: FA02073

Well Sampling Sheet

Well ID: CFMW-029 Date: 3/24/17

DTW: 65.40 Depth of Pump Intake: 75.0'

DTB: 78.30 Total Volume Purged: 6.25 L

Purge Start:	1450	Time:		CPM:	4	psi:	70	Discharge Rate:	5.0
Purge End:	1515	Time:		CPM:	4	psi:	70	Discharge Rate:	5.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1455	65.43	250	9.48	0.557	14.30	8.07	245	20.2	1.25 L
1500	65.43	250	8.23	0.558	9.52	7.35	297	13.2	2.5 L
1505	65.40	250	8.12	0.550	8.99	7.38	302	5.21	3.75 L
1510	65.41	250	8.07	0.546	8.78	7.40	302	4.93	5.0 L
1515	65.40	250	8.06	0.545	9.11	7.39	303	3.13	6.25 L

Purge Water Description: Very clear

Sample ID: CFMW-029-GW Sample Time: 1520

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well ID: CFMW-031 Date: 3/21/17

DTW: 48.95 Depth of Pump Intake: 51.0'

DTB: 52.32 Total Volume Purged: 8.0 L

Purge Start:	1415	Time:		CPM:	3	psi:	50	Discharge Rate:	3.5
Purge End:	1455	Time:		CPM:	3	psi:	50	Discharge Rate:	3.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1420	49.00	200	9.20	0.571	7.87	7.57	291	143	1.0 L
1425	49.00	200	8.98	0.569	7.72	7.56	295	65.9	2.0 L
1430	49.00	200	8.75	0.569	7.24	7.56	301	27.7	3.0 L
1435	48.98	200	8.61	0.571	6.92	7.53	306	13.6	4.0 L
1440	48.97	200	8.52	0.572	6.88	7.49	311	0.95	5.0 L
1445	48.97	200	8.41	0.574	6.84	7.52	310	0.54	6.0 L
1450	48.95	200	8.36	0.576	6.71	7.52	312	0.07	7.0 L

Purge Water Description: Slightly turbid, brown hue

Sample ID: CFMW-031-GW Sample Time: 1500

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-032 Date: 3/27/17

DTW: 47.95 Depth of Pump Intake: 45'

DTB: 57.63 Total Volume Purged:

Purge Start:		Time:	1125	CPM:	3	psi:	60	Discharge Rate:	3
Purge End:		Time:	1330	CPM:	3	psi:	60	Discharge Rate:	3

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1134	48.22	210	8.22	1.27	7.05	7.11	304	331	0.25
1139	48.22	210	8.14	1.24	5.77	6.96	318	215	0.5
1144	48.22	210	8.13	1.22	5.81	7.10	313	122	0.75
1149	48.21	210	8.09	1.21	6.07	7.15	312	91.2	1.0
1154	48.20	210	8.08	1.20	5.89	7.16	312	66.9	1.25
1159	48.18 48.17	210	8.09	1.20	6.10	7.15	315	58.0	1.5
1204	~~[illegible]~~	210	8.10	1.19	6.05	7.14	317	49.4	1.75
1209	48.16	210	8.12	1.17	5.86	7.18	316	42.6	2.00
1214	48.16	210	8.12	1.16	6.09	7.17	317	35.5	2.25
1219	48.16	210	8.16	1.16	6.07	7.18	316	26.8	2.5
1224	48.17	210	8.18	1.15	6.05	7.17	316	18.6	2.75
1229	48.18	210	8.22	1.15	6.18	7.09	321	18.0	3.0
1234	48.17	210	8.22	1.14	6.07	7.15	319	12.1	3.25
1239	48.16	210	8.26	1.14	5.87	7.16	319	11.2	3.5
1244	48.14	210	8.27	1.14	6.15	7.13	321	11.0	3.75
1249	48.12	210	8.27	1.13	6.16	7.18	318	7.12	4.00

Purge Water Description: Clear from beginning point

Sample ID: CFMW-032-GW Sample Time: 1300

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Honda: FA01008
bladder: FA008D3

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-032 (continued) Date: 3/27/17

DTW: 47.95 Depth of Pump Intake: 45'

DTB: 57.63 Total Volume Purged:

Purge Start:		Time:	1125	CPM:	3	psi:	60	Discharge Rate:	3
Purge End:		Time:	1330	CPM:	3	psi:	60	Discharge Rate:	3

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1254	48.11	210	8.25	1.13	5.87	7.14	321	7.41	4.25
1259	48.11	210	8.28	1.13	6.05	7.13	322	7.27	4.5
~~1304~~		210							4.75

Purge Water Description:

Sample ID: CFMW-032-GW Sample Time: 1300

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Hanks: FA01008

bladder: FA00803

Well Sampling Sheet

Well ID: CFMW-032a
Date: 3/29/17
DTW: 110.56'
Depth of Pump Intake: 204.00'
DTB: 206.62'
Total Volume Purged: 2.5 gal

Purge Start:	08:09	Purge Time:	01:46	CPM:	3	psi:	90	Discharge Rate:	10 sec
Purge End:	09:55	Time:	~~X~~	CPM:	3	psi:	90	Discharge Rate:	9 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
08:15	110.35	120	9.84	3.65	5.37	12.70	-144	37.1	0.0
08:20	111.40	220	8.06	8.59	1.32	13.12	-255	532	
08:25	112.60	170	8.03	9.79	0.51	13.25	-254	322	
08:30	112.95	150	7.99	9.58	0.30	13.24	-253	116	
08:35	113.69	150	7.76	8.65	0.21	13.21	-240	57.8	
08:40	114.22	110	7.78	7.73	0.12	13.18	-233	41.9	
08:45	114.52	110	7.46	7.40	0.14	13.15	-236	37.8	
08:50	114.82	110	7.37	6.99	0.14	13.14	-238	33.4	
08:55	115.15	110	7.39	6.85	0.14	13.14	-245	31.4	
09:00	115.13	110	7.36	6.69	0.12	13.12	-253	33.6	
09:03	115.11	110	7.39	6.58	0.12	13.12	-260	35.9	
09:06	115.09	110	7.40	6.51	0.10	13.12	-263	25.3	
09:09	115.07	110	7.45	6.50	0.09	13.12	-264	23.7	
09:12	115.07	110	7.61	6.44	0.09	13.11	-264	23.9	2.0

Myron: pH = 11.89

Purge Water Description: Clear, no particulates

Sample ID: CFMW-032a-GW
Sample Time: 09:15
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + ~~Steve~~ Scott M
- Hardba: FA00627
- Bladder: FA02073

Well Sampling Sheet

Well ID: CFMW-033 Date: 3/21/17

DTW: 50.53 Depth of Pump Intake: 60.0

DTB: 63.61 Total Volume Purged: 9.0 L

Purge Start:	0945	Time:		CPM:	4	psi:	50	Discharge Rate:	5.0
Purge End:	1015	Time:		CPM:	4	psi:	50	Discharge Rate:	5.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0950	50.56	300	7.45	0.578	11.09	7.62	293	1.71	~~300~~ 15 L
0955	50.55	300	7.40	0.580	7.04	7.61	317	0.0	3.0 L
1000	50.54	300	7.37	0.580	6.99	7.59	320	0.0	4.5 L
1005	50.54	300	7.37	0.580	6.82	7.60	326	0.0	6.0 L
1010	50.54	300	7.36	0.580	6.77	7.60	327	0.0	7.5 L
1015	50.54	300	7.35	0.580	6.99	7.57	332	0.0	9.0 L

Purge Water Description:

Sample ID: CFMW-033-GW Sample Time: 1020

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Well Sampling Sheet

Well ID: CFMW-034 **Date:** 3/21/17

DTW: 56.85 **Depth of Pump Intake:** 60.0'

DTB: 62.49 **Total Volume Purged:** 12 L

Purge Start:	1300	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	5.0
Purge End:	1340	**Time:**		**CPM:**		**psi:**		**Discharge Rate:**	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1305	57.00	300	9.48	0.640	4.16	7.26	41	447	1.5 L
1310	57.00	300	9.41	0.642	4.01	7.23	115	121	3.0 L
1315	57.00	300	9.30	0.646	4.27	7.18	222	44.4	4.5 L
1320	57.00	300	9.35	0.647	4.73	7.21	231	14.9	6.0 L
1325	57.00	300	9.37	0.645	6.74	7.20	241	0.11	7.5 L
1330	57.00	300	9.41	0.645	6.41	7.18	243	0.10	9.0 L
1335	57.00	300	9.46	0.645	6.17	7.19	243	0.0	10.5 L

Purge Water Description: Slightly turbid - brown hue

Sample ID: CFMW-034-GW Sample Time: 1400

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Well Sampling Sheet

Well ID: CFMW-035 Date: 5/21/17

DTW: 48.83 Depth of Pump Intake: 68.5

DTB: 70.55 Total Volume Purged: 8.55 L

Purge Start:	1100	Time:		CPM:	4	psi:	50	Discharge Rate:	5.0
Purge End:	1155	Time:		CPM:	3	psi:	50	Discharge Rate:	3.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1105	48.47	250	8.23	0.728	12.09	7.40	-155	115	1.25 L
1110	51.35	150	8.18	0.727	9.86	7.42	-164	222	2.0 L
1115	51.65	150	8.08	0.729	7.47	7.43	-172	187	2.55 L
1120	51.53	150	8.05	0.731	6.95	7.43	-174	106	3.30 L
1125	51.45	150	8.05	0.735	5.34	7.43	-179	72	4.05 L
1130	51.38	150	8.05	0.735	5.02	7.44	-179	58.5	4.80 L
1135	51.33	150	8.09	0.736	4.21	7.44	-184	39.6	5.55 L
1140	51.34	150	8.08	0.736	3.80	7.43	-184	34.6	6.30 L
1145	51.30	150	8.13	0.738	3.31	7.43	-184	28.7	7.05 L
1150	51.31	150	8.11	0.738	3.12	7.44	-185	27.8	7.80 L

Purge Water Description: Slightly turbid - gray hue

Sample ID: CFMW-035-GW Sample Time: 1200

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bladder: FA 00803

Horiba: FA 01008

Well Sampling Sheet

Well ID: CFMW-037 Date: 3/23/17

DTW: 88.65' Depth of Pump Intake: 101.00'

DTB: 103.11' Total Volume Purged: 4.0 gal.

Purge Start:	14:07	Purge Time:	1:13	CPM:	3	psi:	60	Discharge Rate:	270 ml/min
Purge End:	13:20	Time:	~~X~~	CPM:	3	psi:	60	Discharge Rate:	230 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Blinking - over max. Volume Purged (gallons)
14:11	89.01	270	9.95	0.396	9.12	7.51	129	0.00	0.0
14:16	88.97	250	8.98	0.410	6.00	7.57	158	0.00	
14:21	88.97	230	8.82	0.411	5.48	7.65	186	933	
14:26	88.97	230	8.62	0.411	5.21	7.68	203	549	
14:31	88.97	230	8.55	0.412	5.11	7.61	219	431	
14:36	88.97	230	8.51	0.413	5.07	7.62	226	224	
14:41	88.97	230	8.48	0.412	5.05	7.59	232	84.9	
14:44	88.97	230	8.47	0.413	5.04	7.70	229	60.7	
14:47	88.97	230	8.52	0.413	5.04	7.71	232	45.9	
14:50	88.97	230	8.49	0.413	5.01	7.71	233	37.5	
14:53	88.97	230	8.47	0.413	4.99	7.67	237	40.2	
14:56	88.97	230	8.50	0.413	4.98	7.68	238	39.8	
14:59	88.97	230	8.46	0.413	4.93	7.66	239	39.6	3.5

Purge Water Description: Clear, no particulates

Sample ID: CFMW-037-GW Sample Time: 15:00

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + Greg D
- Horiba: FA00627
- Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ Free cyanide (9016)	✓

Well Sampling Sheet

Well ID: CFMW - 038 Date: 3/24/17

DTW: 91.29' Depth of Pump Intake: 105.00'

DTB: 106.69' Total Volume Purged: 2.5 gal

Purge Start:	10:11	Purge Time:	05:54	CPM:	3	psi:	60	Discharge Rate:	180 ml/min
Purge End:	11:05	Time:	~~X~~	CPM:	3	psi:	60	Discharge Rate:	230 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
10:13	91.29	180	10.65	0.570	4.43	7.00	300	394	0.0
10:18	91.29	230	9.23	0.571	6.31	7.36	288	130	
10:23	91.29	230	9.10	0.570	5.04	7.33	293	25.1	
10:28	91.29	230	8.98	0.570	4.84	7.32	296	9.06	
10:33	91.29	230	8.90	0.570	4.59	7.28	301	0.00	
10:38	91.29	230	8.87	0.571	4.60	7.26	303	0.00	
10:43	91.29	230	8.84	0.571	4.50	7.26	306	0.00	2.0

Purge Water Description: Clear, no particulates

Sample ID: CFMW-038-GW Sample Time: 10:45

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + Greg D.
- Horiba: FA00627
- Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ Free Cyanide (9016)	✓

Well Sampling Sheet

Well ID: CFMW-040 Date: 3/30/17

DTW: 84.61' Depth of Pump Intake: 90.00'

DTB: 92.82' Total Volume Purged: 3.5 gal.

Purge Start:	11:12	Purge Time:	01:30	CPM:	4	psi:	60	Discharge Rate:	5 sec
Purge End:	12:42	Time:	~~X~~	CPM:	4	psi:	60	Discharge Rate:	6 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:17	84.81	100	9.38	0.513	10.40	6.92	218	94.4	0.0
11:22	84.83	210	8.95	0.515	9.19	6.93	270	179	
11:27	84.81	210	8.89	0.517	8.58	6.92	284	291	
11:32	84.85	210	8.89	0.518	8.18	6.92	290	223	
11:37	84.83	210	8.87	0.518	8.16	6.92	294	161	
11:42	84.81	210	8.90	0.518	7.86	6.93	297	109	
11:47	84.81	210	8.93	0.518	7.69	6.94	298	73.8	
11:52	84.81	210	8.95	0.518	7.58	6.95	300	61.0	
11:55	84.81	210	9.01	0.518	7.49	6.96	301	52.9	
11:58	84.81	210	9.13	0.518	7.47	6.96	301	53.0	
12:01	84.81	210	9.09	0.518	7.43	6.97	301	41.0	
12:04	84.81	210	9.03	0.518	7.38	6.98	302	43.2	
12:07	84.81	210	9.03	0.519	7.42	6.98	302	30.7	
12:10	84.81	210	9.00	0.519	7.36	6.98	303	28.0	
12:13	84.81	210	9.05	0.519	7.19	6.99	304	27.8	3.0

Purge Water Description: Clear, no particulates

Sample ID: CFMW-040-GW Sample Time: 12:15

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + MaryBeth L.
- Horiba: FA01008
- Bladder: FA02073

Well Sampling Sheet

Well ID: CFMW-042 Date: 3/27/17

DTW: DRY Depth of Pump Intake: —

DTB: 63.05 Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: — Sample Time: —

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

Not sampled due to lack of water in well

Well Sampling Sheet

Well ID: CFMW-043 **Date:** 3/20/17

DTW: 55.04 **Depth of Pump Intake:** 60.0'

DTB: 62.96 **Total Volume Purged:** 15.0L

Purge Start:	1350	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	5.0
Purge End:	1440	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	5.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1355	55.05	300	8.54	0.535	25.52	7.50	278	250	1.5L
1400	55.05	300	8.37	0.533	14.71	7.52	273	183	3.0L
1405	55.05	300	8.11	0.532	7.34	7.49	270	128	4.5L
1410	55.05	300	8.03	0.535	7.13	7.46	275	86.7	6.0L
1415	55.05	300	8.00	0.535	7.02	7.46	280	55.4	7.5L
1420	55.05	300	8.01	0.536	6.93	7.49	283	40.0	9.0L
1425	55.05	300	8.00	0.535	6.89	7.48	286	31.3	10.5L
1430	55.05	300	8.01	0.536	6.85	7.47	289	21.4	12.0L
1435	55.05	300	8.02	0.535	6.80	7.48	291	19.6	13.5L

Purge Water Description:

Sample ID: CFMW-043-GW Sample Time: 1500

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Bladder: FA00803

Horiba: FA01008

Well Sampling Sheet

Well ID: CFMW-044 Date: 3/28/17

DTW: 52.92 Depth of Pump Intake: ~~54~~ 53.5'

DTB: 54.12 Total Volume Purged: 2.5 gallons

Purge Start:	0800	Time:		CPM:	3	psi:	60	Discharge Rate:	3
Purge End:	0920	Time:		CPM:	3	psi:	60	Discharge Rate:	3

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0810	52.26	200	8.96	0.700	5.01	6.61	-6	6.29	0.2
0815	52.27	200	7.92	0.632	3.02	7.34	-45	3.10	0.4
0820	52.26	200	7.84	0.626	3.08	7.35	-47	1.84	0.6
0825	52.26	200	7.78	0.620	3.39	7.36	-48	2.17	0.8
0830	52.27	200	7.74	0.617	3.58	7.36	-50	1.12	1.0
0835	52.27	200	7.72	0.613	3.69	7.36	-49	0.35	1.2
0840	52.27	200	7.72	0.611	3.82	7.37	-49	0.00	1.4
0845	52.27	200	7.72	0.609	4.01	7.35	-47	0.00	1.6
0850	52.27	200	7.70	0.607	4.26	7.36	-45	0.00	1.8
0855	52.27	200	7.70	0.604	4.29	7.37	-44	0.00	2.0

Purge Water Description: clear, no odor or color

Sample ID: CFMW-044-GW Sample Time: 0900

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:
Horiba: FA01008
bladder: FA00803

mouse in well in Round 2
no evidence this round
associated with CFMW-EB26-AQ

ROUX ASSOCIATES, INC.

2478.0001y.100/SAP-AP

Well Sampling Sheet

Well ID: CFMW-044a
Date: 3/21/17
DTW: 57.85'
Depth of Pump Intake: 110'
DTB: 112.93'
Total Volume Purged: 2.5 gal

Purge Start:	14:38	Purge Time:	1:12	CPM:	3	psi:	75	Discharge Rate:	300 ml/min
Purge End:	15:50	~~Time:~~		CPM:	4	psi:	65	Discharge Rate:	150 ml/min

Swap batteries, still not allowing to take an NTU reading

Switch → to CPM4

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
14:40	58.03	300	9.15	0.279	4.36	10.50	44	----	0.0
14:45	60.12	230	8.58	0.433	1.13	8.92	56	----	
14:50	60.32	150	8.57	0.431	0.87	9.03	48	----	
14:55	60.56	150	8.55	0.424	1.03	9.06	43	----	
15:00	60.89	150	8.50	0.410	0.71	9.10	41	----	
15:05	61.02	150	8.54	0.397	0.61	9.13	38	----	
15:10	61.12	150	8.53	0.381	0.67	9.12	38	----	
15:15	61.22	150	8.61	0.374	0.50	9.19	34	----	
15:20	61.36	150	8.64	0.375	0.46	9.21	34	----	
15:23	61.41	150	8.66	0.380	0.44	9.20	35	----	
15:26	61.44	150	8.64	0.382	0.42	9.18	37	----	2.0 gal

Purge Water Description:

Sample ID: CFMW-044a-GW
Sample Time: 15:30
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Greg D
- Horiba: FA00627
- Bladder: FA02073
- ★ Horiba says batteries are low w/ new batteries, not obtaining NTU reading

→ Continuously changing batteries, still receiving battery error - not allowing for turbidity reading. Water clear w/ no signs of turbidity before taking sample.

ROUX ASSOCIATES, INC.

 DF ~~AQ Free Cyanide (9016)~~

2476.0001y.100/SAP-AP

Well Sampling Sheet

Well ID: CFMW-044b
Date: 3/24/17
DTW: 64.89'
Depth of Pump Intake: 235.00'
DTB: 240.70'
Total Volume Purged: 2.0 gal

Purge Start:	13:50	Purge Time:	01:35	CPM:	3	psi:	110	Discharge Rate:	35 ml/min
Purge End:	15:25	Time:	~~X~~	CPM:	3	psi:	110	Discharge Rate:	110 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
14:02	64.56	35	8.67	0.273	3.60	7.91	-117	42.7	0.0
14:07	64.63	60	8.39	0.280	2.71	8.08	-164	58.8	
14:12	64.68	90	8.31	0.313	1.75	8.23	-205	43.9	
14:17	64.80	110	8.13	0.345	1.22	8.29	-228	32.8	
14:22	64.88	110	8.14	0.356	0.96	8.34	-247	32.9	
14:27	64.94	110	8.10	0.368	0.83	8.36	-257	28.6	
14:32	65.01	110	8.09	0.377	0.54	8.40	-269	27.7	
14:35	65.03	110	8.03	0.380	0.43	8.43	-272	25.4	
14:38	65.05	110	8.07	0.382	0.39	8.42	-274	25.2	
14:41	65.07	110	8.13	0.383	0.42	8.40	-273	24.1	
14:44	65.08	110	8.09	0.386	0.43	8.41	-275	23.7	1.5

Purge Water Description: Clear, slight yellow tint.

Sample ID: CFMW-44b - GW
Sample Time: 14:45
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F + Greg D
- Horiba: FA00627
- Bladder: FA02073

Well Sampling Sheet

Well ID: CFMW-045 Date: 3/23/17

DTW: 90.75 Depth of Pump Intake: 97.0

DTB: 99.3 Total Volume Purged: 11.25 L

Purge Start:	0810	Time:		CPM:	5	psi:	50	Discharge Rate:	7.0
Purge End:	945	Time:		CPM:	5	psi:	50	Discharge Rate:	7.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0825	90.90	125	8.51	0.541	8.22	6.86	204	621	1.875 L
0830	90.97	125	8.46	0.538	9.02	6.89	236	562	2.5 L
0835	90.97	125	8.07	0.546	9.32	6.90	266	488	3.125 L
0840	90.98	125	8.06	0.544	9.19	6.90	266	439	3.75 L
0845	90.97	125	7.96	0.544	9.06	6.90	270	372	4.375 L
0850	90.98	125	7.86	0.548	8.90	6.90	274	324	5.0 L
0855	90.98	125	7.75	0.548	8.67	6.91	276	278	5.625 L
0900	90.97	125	7.71	0.548	8.60	6.91	276	227	6.25 L
0905	90.99	125	7.59	0.552	8.40	6.92	277	178	6.875 L
0910	90.98	125	7.54	0.546	8.24	6.93	278	138	7.5 L
0915	90.99	125	7.50	0.552	8.16	6.93	279	102	8.125 L
0920	90.98	125	7.46	0.552	8.01	6.95	279	66.5	8.75 L
0925	90.99	125	7.44	0.555	7.97	6.95	280	45.0	9.375 L
0930	90.97	125	7.37	0.558	7.77	6.98	280	34.0	10.0 L
0935	90.99	125	7.37	0.557	7.60	7.01	279	24.4	10.625 L
0940	90.99	125	7.37	0.559	7.58	7.01	279	22.3	11.25 L

Purge Water Description: Water turbid, brown hue. Air bubbles coming out of Horiba - not going in.

Sample ID: CFMW-045-GW Sample Time: 1000

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba. FA 01008

Bladder: FA 00803

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-045a

Date: 3/24/17

DTW: 91.89'

Depth of Pump Intake: 150.00'?

DTB: •153.23' → w/ tape measure

Total Volume Purged: 3.0 gal

Purge •161.25' → w/ water level meter

possibly getting caught on screen?

Purge Start:	11:36	Time:	01:39	CPM:	3	psi:	80	Discharge Rate:	170 ml/min
Purge End:	13:15	~~Time~~		CPM:	3	psi:	7~~8~~5 DF	Discharge Rate:	150 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:40	92.05	170	9.34	0.241	6.43	9.03	130	119	0.0
11:45	93.10	170	8.75	0.414	1.89	8.17	69	457	
11:50	93.70	150	8.44	0.466	1.04	8.19	-95	217	
11:55	93.60	75	8.50	0.470	0.72	8.15	-121	127	
12:00	93.93	150	8.11	0.472	0.68	8.16	-127	119	
12:05	94.19	150	8.19	0.461	0.48	8.40	-146	97.9	
12:10	94.45	150	8.19	0.405	0.39	8.73	-141	97.0	
12:15	94.57	150	8.20	0.411	0.31	8.49	-161	63.4	
12:20	94.70	150	8.23	0.420	0.25	8.41	-180	46.8	
12:25	94.74	150	8.22	0.431	0.22	8.26	-178	41.2	
12:30	94.79	150	8.28	0.454	0.16	8.14	-178	28.1	
12:33	94.83	150	8.31	0.463	0.15	8.08	-175	21.6	
12:36	94.87	150	8.37	0.475	0.13	8.08	-174	16.0	
12:39	94.91	150	8.41	0.481	0.12	8.04	-172	15.2	
12:42	94.93	150	8.42	0.484	0.12	7.99	-166	14.8	2.5

Purge Water Description: Clear, no particulates

Sample ID: CFMW-045a-GW

Sample Time: 12:45

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:

- Doug F + Greg D
- Horiba: FA00627
- Bladder: FA02073

*DTB different w/ tape measure and water level meter.

Well Sampling Sheet

Well ID: CFMW-047 Date: 3/23/17

DTW: ~~100.57~~ 98.58' Depth of Pump Intake: 121.00'

DTB: 123.09' Total Volume Purged: 3.5 gal

Purge Start:	12:40	Purge Time:	1:10	CPM:	3	psi:	70	Discharge Rate:	280 ml/min
Purge End:	13:50	~~Time:~~		CPM:	3	psi:	70	Discharge Rate:	280 ml/min

Blinking over max.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
12:44	98.78	280	9.53	0.408	5.85	7.09	183	0.00	0.0
12:49	98.78	280	9.09	0.517	4.20	7.06	275	710	
12:54	98.78	280	8.99	0.525	4.05	7.11	279	363	
12:59	98.78	280	8.98	0.526	3.76	7.22	278	264	
13:04	98.78	280	8.90	0.527	3.65	7.31	277	180	
13:09	98.78	280	8.94	0.526	3.54	7.22	282	158	
13:14	98.78	280	9.04	0.527	3.68	7.35	275	99.9	
13:17	98.78	280	9.07	0.528	3.54	7.36	277	85.0	
13:20	98.78	280	9.04	0.529	3.55	7.28	281	76.6	
13:23	98.78	280	9.05	0.529	3.55	7.39	276	66.8	
13:26	98.78	280	9.02	0.529	3.53	7.39	277	64.2	
13:29	98.78	280	9.05	0.530	3.51	7.44	276	62.1	3.0

Purge Water Description: Mostly Clear w/slight turbidity

Sample ID: CFMW-047-GW Sample Time: 13:30

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F. + Greg D.
- Horiba: FA00627
- Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ Free cyanide (9016)	✓

Well Sampling Sheet

Well ID: CFMW-049 Date: 3/23/17

DTW: 100.57' Depth of Pump Intake: 112.00'

DTB: 113.97' Total Volume Purged: 3.5 gal

Purge Start:	07:58	Purge Time:	1:07	CPM:	3	psi:	70	Discharge Rate:	280 ml/min
Purge End:	09:05	Time:	~~X~~	CPM:	3	psi:	70	Discharge Rate:	280 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
8:02	100.57	280	8.58	0.403	9.64	7.53	196	50.1	0.0
8:07	100.57	280	8.25	0.405	8.29	7.58	202	54.5	
8:12	100.57	280	8.21	0.406	7.89	7.51	220	38.6	
8:17	100.57	280	8.22	0.406	7.62	7.45	232	33.9	
8:22	100.57	280	8.23	0.406	7.49	7.38	248	16.9	
8:27	100.57	280	8.19	0.406	7.41	7.25	254	9.46	
8:32	100.57	280	8.15	0.407	7.50	7.22	257	8.70	
8:35	100.57	280	8.15	0.407	7.35	7.19	259	2.22	✓ ⊗
8:38	100.57	280	8.11	0.407	7.47	7.22	257	0.00	
8:41	100.57	280	8.11	0.407	7.36	7.17	261	0.00	
8:44	100.57	280	8.12	0.407	7.37	7.16	263	0.00	3.0

Purge Water Description: Clear, no particulates

Sample ID: CFMW-049-GW Sample Time: 08:45

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + Greg D
- Horiba: FA00627
- Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ Free cyanide (9016)	✓

Well Sampling Sheet

Well ID: CFMW-049a
Date: 3/23/17
DTW: 100.08'
Depth of Pump Intake: 148.00'
DTB: 151.10'
Total Volume Purged: 2.5 gal.

Purge Start:	09:21	Purge Time:	01:24	CPM:	3	psi:	75	Discharge Rate:	90 ml/min
Purge End:	10:45	~~Time:~~		CPM:	3	psi:	75	Discharge Rate:	15 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
09:28	100.21	90	6.71	2.17	4.52	11.70	24	57.4	0.0
09:33	100.19	90	6.93	7.67	1.91	12.19	-69	197	
09:38	100.19	90	6.99	9.29	1.10	12.41	-105	255	
09:43	100.24	175	7.13	9.69	0.84	12.44	-119	213	
09:48	100.29	175	7.34	9.61	0.75	12.60	-129	153	
09:53	100.27	175	7.45	8.98	0.71	12.86	-141	89.2	
09:58	100.25	175	7.48	7.99	0.55	12.81	-139	65.9	
10:03	100.23	175	7.54	7.24	0.39	12.82	-141	73.8	
10:08	100.23	175	7.52	6.51	0.29	12.82	-142	38.9	
10:11	100.23	175	7.57	6.13	0.30	12.82	-142	27.6	
10:14	100.23	175	7.60	5.77	0.40	12.83	-141	21.3	
10:17	100.23	175	7.69	5.66	0.52	12.84	-134	14.9	
10:20	100.23	175	7.70	5.56	0.54	12.84	-135	13.8	
10:23	100.23	175	7.67	5.48	0.55	12.84	-131	13.6	2.0

Purge Water Description: Clear w/ some cloudy precipitate

Sample ID: CFMW-049a-GW
Sample Time: 10:30
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
-Doug F. + Greg D.
-Hach: FA00627
-Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ Free cyanide (9016)	✓

Well Sampling Sheet

Well ID: CFMW-050 Date: 3/23/17

DTW: 100.89' Depth of Pump Intake: 121.00'

DTB: 123.37 Total Volume Purged: 3.0 gal

Purge Start:	11:11	Purge Time:	1:04	CPM:	3	psi:	70	Discharge Rate:	170 ml/min
Purge End:	12:15	Time:	~~X~~	CPM:	3	psi:	80	Discharge Rate:	270 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:15	100.89	170	7.95	0.392	7.06	8.35	2	119	0.0
11:20	100.89	100	7.91	0.407	7.53	7.83	18	42.3	↓
11:25	100.89	160	7.99	0.410	7.74	7.63	80	77.5	↓
11:30	100.89	270	8.10	0.409	7.70	7.54	119	66.3	↓
11:35	100.89	270	8.12	0.409	7.63	7.62	158	42.9	↓
11:40	100.89	270	8.14	0.409	7.39	7.68	178	30.1	↓
11:45	100.89	270	8.24	0.409	7.62	7.59	199	22.6	↓
11:48	100.89	270	8.31	0.409	7.52	7.57	212	11.4	↓
11:51	100.89	270	8.29	0.409	7.60	7.54	219	10.1	↓
11:54	100.89	270	8.32	0.408	7.50	7.52	226	9.99	↓
11:57	100.89	270	8.39	0.408	7.59	7.50	228	9.23	2.5

Purge Water Description: Clear, no particulates

Sample ID: CFMW-050-GW Sample Time: 12:00

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F. + Greg D.
- ~~Bladder~~ Horiba: FA00627
- ~~Horiba~~ Bladder: FA02073

Analysis	
AQ TCL VOCS 8260	✓
AQ TCL SVOCs 8270	✓
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ Free Cyanide 9016	✓

Well Sampling Sheet

Well ID: CFMW-053 Date: 3/30/17

DTW: 75.94' Depth of Pump Intake: —

DTB: 76.06' Total Volume Purged: —

Purge Start:		Time:		CPM:		psi:		Discharge Rate:	
Purge End:		Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

Purge Water Description:

Sample ID: Sample Time:

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:
Not sampled due to limited amount of water

Well Sampling Sheet

Well ID: CFMW-053a

Date: 3/27/17

DTW: 88.09'

Depth of Pump Intake: 160.00'

DTB: 162.48'

Total Volume Purged: 2.0 gal

Purge Start:	14:01	Purge Time:	01:59	CPM:	3	psi:	75	Discharge Rate:	100 ml/min
Purge End:	16:00	~~Time:~~		CPM:	3	psi:	80	Discharge Rate:	80 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
14:13	89.45	100	8.70	7.08	5.57	11.87	-91	264	0.0
14:18	90.40	100	9.07	9.81	2.34	12.43	-118	137	
14:23	91.43	100	8.75	10.4	1.09	12.73	-143	59.7	
14:28	91.99	90	8.75	10.2	0.84	12.99	-161	30.4	
14:33	92.47	80	8.73	10.1	0.75	13.06	-169	15.6	
14:38	93.05	80	8.60	10.0	0.71	13.16	-174	15.9	
14:43	93.60	80	8.56	9.96	0.66	13.20	-175	6.21	
14:48	94.08	80	8.48	9.87	0.62	13.22	-175	4.81	
14:53	94.55	80	8.33	9.77	0.58	13.24	-174	7.89	
14:56	94.87	80	8.48	9.68	0.54	13.22	-173	6.08	
14:59	95.28	80	8.50	9.61	0.52	13.22	-173	1.44	
15:02	95.37	80	8.50	9.56	0.51	13.21	-173	1.49	✓
15:05	95.55	80	8.47	9.52	0.51	13.22	-173	1.96	1.5

Purge Water Description: Clear, cloudy precipitate

Sample ID: CFMW-053a - GW

Sample Time: 15:15

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:

- Doug F. + Greg D.
- Horiba: FA00627
- Bladder: FA02073
- ★13:50: Pause transducer + pull out of well.

Well Sampling Sheet

Well ID: CFMW - 054 Date: 3/22/17

DTW: 81.12 Depth of Pump Intake: 85.0'

DTB: 87.40 Total Volume Purged: 10.4L

Purge Start:	1325	Time:		CPM:	4	psi:	50	Discharge Rate:	7.0
Purge End:	1420	Time:		CPM:		psi:		Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1335	81.25	200	9.51	0.586	17.29	7.54	309	>1000	2.0L
1340	81.30	200	9.40	0.583	12.37	7.53	313	962	3.0L
1345	81.30	200	9.11	0.585	7.72	7.52	322	989	4.0L
1350	81.30	200	9.05	0.584	7.48	7.52	324	691	5.0L
1355	81.29	200	9.21	0.581	7.68	7.51	324	567	6.0
1400	81.30	200	9.14	0.580	6.91	7.48	326	76.7	7.0L
1405	81.30	200	9.11	0.581	6.94	7.46	326	16.3	8.0L
1410	81.30	200	9.12	0.581	6.96	7.45	326	17.3	9.0L
1415	81.30	200	9.09	0.581	6.93	7.45	326	12.4	10.0L
1417	81.30	200	9.10	0.581	6.93	7.44	327	2.12	10.4L
			8.60	0.582	7.33	7.52	324	0	
				0.582	7.24	7.49	327	0	

Purge Water Description: Slightly turbid

Sample ID: CFMW-054-GW Sample Time: 1430

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba. FA 01008

Bladder. FA 00803

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-056 Date: 3/22/17

DTW: 82.85' Depth of Pump Intake: 178.00'

DTB: 180.71' Total Volume Purged: 2.0 gal

Purge Start:	15:05	Purge Time:	0:45	CPM:	3	psi:	90	Discharge Rate:	100 ml/min
Purge End:	15:50	Time:	~~X~~	CPM:	3	psi:	95	Discharge Rate:	180 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
15:11	82.88	100	11.92	0.096	3.77	7.81	-23	125	0.0
15:16	82.89	180	7.74	0.357	3.51	7.84	-175	152	|
15:21	82.90	180	7.68	0.393	3.07	7.81	-195	194	|
15:26	82.90	180	7.69	0.399	2.73	7.85	-206	209	|
15:31	82.90	180	7.67	0.400	2.59	7.85	-211	216	|
15:36	82.90	180	7.69	0.400	2.51	7.87	-213	209	|
15:41	82.90	180	7.68	0.400	2.44	7.87	-214	197	1.5 gal

Purge Water Description: Dark grey in color, slightly turbid, slight sulfur odor.

Sample ID: CFMW-056-GW Sample Time: 15:45

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F + Greg D
- Hach: FA00627
- Bladder: FA02073

Well Sampling Sheet

Well ID: CFMW-056a
Date: 3/22/17
DTW: 78.43'
Depth of Pump Intake: 135.00
DTB: 137.48'
Total Volume Purged: 2.5 gal

Purge Start:	12:55	Purge Time:	1:45	CPM:	3	psi:	75	Discharge Rate:	160 ml/min
Purge End:	14:40	Time:		CPM:	3	psi:	70	Discharge Rate:	110 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
13:00	76.17	160	8.85	0.262	2.82	9.13	-274	0.00	0.0
13:05	77.24	160	7.80	0.370	1.01	8.19	-287	0.00	
13:10	78.21	145	7.77	0.372	1.61	8.13	-277	0.00	
13:~~15~~21	78.78	110	8.70	0.359	1.28	7.94	-165	0.00	
13:~~20~~26	79.22	110	8.01	0.362	1.17	8.15	-258	0.00	
13:~~25~~31	79.86	110	7.88	0.361	1.59	8.19	-295	0.00	
13:~~30~~36	80.38	110	7.99	0.348	1.99	8.26	-314	0.00	
13:41	80.90	110	7.95	0.319	1.97	8.64	-379	1000	
13:46	81.01	110	7.93	0.298	1.59	8.83	-421	851	
13:51	81.13	110	7.90	0.292	1.30	8.90	-437	712	
13:56	81.25	110	7.86	0.302	1.41	8.81	-441	425	
13:59	81.82	110	7.79	0.318	1.94	8.63	-431	356	
14:02	82.39	110	7.80	0.320	2.26	8.59	-426	300	
14:05	82.90	110	7.78	0.316	2.45	8.65	-429	258	
14:08	83.01	110	7.73	0.308	2.54	8.72	-436	272	
14:11	83.14	110	7.84	0.307	2.43	8.73	-438	255	2.25 gal

Blinking over max.

13:12 - clean out Horiba

Blinking over max.

Purge Water Description: Slight turbid, light grey in color, sulfur odor.

Sample ID: CFMW-056a-GW
Sample Time: 14:15
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Greg D.
- Horiba: FA00627
- Bladder: FA02073
- ☆13:12 - Clean out Horiba, pause purge.

- Not analyzed - resampled on 3/30/17

Well Sampling Sheet

Well ID: CFMW-056a
Date: 3/30/17
DTW: 78.35'
Depth of Pump Intake: 135.00'
DTB: 137.33'
Total Volume Purged: 3.0 gal

Purge Start:	08:02	Purge Time:	02:28	CPM:	3	psi:	70	Discharge Rate:	10 sec
Purge End:	10:30	~~Time:~~		CPM:	3	psi:	70	Discharge Rate:	8 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
08:04	77.66	170	13.10	0.026	10.69	4.35	100	249	0.0
08:09	78.05	170	7.96	0.345	2.63	8.90	-288	551	
08:14	78.85	170	7.60	0.359	2.26	8.68	-296	0.00	
08:19	79.49	170	7.43	0.358	2.11	8.45	-287	0.00	
08:24	79.94	150	7.25	0.360	2.03	8.37	-296	262	
08:~~29~~35	80.51	170	7.06	0.344	4.61	8.03	-133	0.00	
08:~~34~~40	81.01	150	6.93	0.351	2.11	8.29	-259	0.00	
08:45	81.56	150	6.86	0.354	1.94	8.27	-272	795	
08:50	82.25	150	6.89	0.341	1.84	8.36	-297	751	
08:55	82.23	80	6.95	0.335	1.76	8.35	-308	593	
09:00	82.41	140	6.78	0.336	1.79	8.39	-311	757	
09:05	82.73	140	7.02	0.340	1.72	8.31	-314	375	
09:10	83.08	140	7.10	0.348	1.70	8.21	-309	221	
09:15	83.36	140	7.15	0.359	1.65	8.15	-301	166	
09:20	83.61	140	7.18	0.348	1.63	8.15	-303	91.1	
09:25	84.08	140	7.20	0.344	1.61	8.18	-314	63.8	
09:30	84.50	140	7.21	0.343	1.59	8.17	-317	53.2	
09:35	84.58	140	7.21	0.343	1.57	8.17	-318	38.2	
09:38	84.67	140	7.24	0.343	1.55	8.17	-317	34.8	
09:41	84.72	140	7.24	0.342	1.54	8.17	-317	36.9	
09:44	84.80	140	7.19	0.343	1.54	8.15	-318	36.5	2.5

Blinking over max.

08:25 - clean Horiba of silt.

Purge Water Description: Slightly cloudy w/ strong sulfur odor.

Sample ID: CFMW-056a-GW
Sample Time: 09:45
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Mary Beth L.
- Horiba: FA01008
- Bladder: FA02073

08:25 - Stop purge + clean out Horiba.

Well Sampling Sheet

Well ID: CFMW-056b **Date:** 3/21/17

DTW: 35.09 **Depth of Pump Intake:** 50 ft

DTB: 52.62 **Total Volume Purged:** 14 L

Purge Start:	820	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	5
Purge End:	900	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0825	35.11	350	7.85	0.437	10.87	7.29	197	460	1.75 L
0830	35.11	350	7.72	0.435	9.94	7.35	209	334	3.5 L
0835	35.11	350	7.65	0.435	9.55	7.36	219	176	5.25 L
0840	35.11	350	7.65	0.435	9.39	7.40	227	63.5	7.0 L
0845	35.11	350	7.62	0.435	9.29	7.38	231	21.0	8.75 L
0850	35.11	350	7.59	0.436	9.19	7.38	235	12.0	10.5 L
0855	35.11	350	7.60	0.436	9.15	7.40	236	1.80	12.25 L

Purge Water Description:

Sample ID: CFMW-056b-GW Sample Time: 0920

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA01008

Bladder: FA00803

CFMW-DUP7-GW @ 0930

Well Sampling Sheet

Well ID: CFMW-057 Date: 3/22/17

DTW: 79.38' Depth of Pump Intake: 180.00'

DTB: 183.63' Total Volume Purged: 2.5 gal.

Purge Start:	11:30	Purge Time:	1:00	CPM:	3	psi:	90	Discharge Rate:	80 ml/min
Purge End:	12:30	Time:	~~X~~	CPM:	3	psi:	95	Discharge Rate:	230 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
11:37	79.42	80	7.76	0.156	2.53	8.38	-192	36.3	0.0
11:42	79.45	230	7.09	0.282	1.62	7.62	-242	90.7	
11:47	79.45	230	6.90	0.350	3.66	7.57	-277	132	
11:52	79.45	230	6.89	0.359	3.36	7.63	-286	129	
11:57	79.45	230	6.88	0.361	3.21	7.65	-288	130	
12:02	79.45	230	6.88	0.361	3.15	7.69	-291	133	
12:07	79.45	230	6.87	0.362	3.13	7.70	-292	121	2.0 gal

Purge Water Description: Dark grey in color, slightly turbid.

Sample ID: CFMW-057-GW Sample Time: 12:15

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ Free Cyanide (9016)	N/A

NOTES:
- Davy F. + Greg D.
- Horiba: FA00627
- Bladder: FA02073

NOT analyzed - resampled on 3/29/17

Well Sampling Sheet

Well ID: CFMW-057 Date: 3/29/17

DTW: 78.22' Depth of Pump Intake: 181.00'

DTB: 183.79' Total Volume Purged: 3.0 gal

Purge Start:	10:48	Purge Time:	01:12	CPM:	3	psi:	90	Discharge Rate:	12 sec.
Purge End:	12:00	Time:	~~X~~	CPM:	3	psi:	90	Discharge Rate:	12 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
10:52	78.27	270	7.25	0.209	3.28	8.80	-194	34.6	0.0
10:57	78.27	270	6.92	0.290	3.44	8.37	-271	34.0	
11:02	78.28	270	6.92	0.297	2.80	8.33	-290	35.8	
11:07	78.28	270	6.86	0.299	2.67	8.25	-293	37.9	
11:12	78.28	270	6.89	0.300	2.67	8.24	-297	36.2	
11:17	78.28	270	6.90	0.300	2.63	8.23	-301	37.1	
11:22	78.28	270	6.82	0.298	2.68	8.21	-304	39.5	2.5

Myron: 9.38 pH

Purge Water Description: Clear, no particulates

Sample ID: CFMW-057-GW Sample Time: 11:30

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	✓ 12:00
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Scott M.
- Horiba: FA00627
- Bladder: FA02073
- ☆ CFMW-DUP11-GW taken - 12:00
- Resample - initial sample not analyzed

ROUX ASSOCIATES, INC.

2476.0001y.100/SAP-AP

Well Sampling Sheet

Well ID: CFMW-057a **Date:** 3/22/17

DTW: 74.67' **Depth of Pump Intake:** 140.00'

DTB: 141.84' **Total Volume Purged:** 2.0 gal.

Purge Start:	09:50	Purge **Time:**	1:20	**CPM:**	3	**psi:**	75	**Discharge Rate:**	180 ml/min
Purge End:	11:10	~~**Time:**~~		**CPM:**	4	**psi:**	~~100~~ 75	**Discharge Rate:**	100 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
09:54	74.31	180	7.78	2.53	7.29	11.91	-100	799	0.0
09:59	75.83	180	7.11	5.18	3.05	12.27	-182	386	
10:04	76.57	125	7.16	4.58	1.67	12.27	-198	162	
10:09	77.33	125	7.14	4.17	1.58	12.31	-205	78.0	
10:14	77.75	50	7.09	3.90	1.48	12.29	-206	80.4	
10:19	78.52	75	6.97	3.58	1.54	12.27	-208	67.3	
10:24	79.24	100	6.87	3.28	1.63	12.26	-209	75.4	
10:27	79.58	100	6.83	3.04	1.74	12.25	-210	62.4	
10:30	79.72	100	6.79	3.01	1.80	12.23	-210	59.3	
10:33	79.85	100	6.79	2.95	1.90	12.24	-210	57.7	1.5 gal

switch to CPM4

Fluctuate blw recharge + discharge to stabilize DTW.

Purge Water Description: Clear, reactive w/ NaOH.

Sample ID: CFMW-057a-GW Sample Time: 10:35

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ FREE CYANIDE (9016)	N/A

NOTES:
- Doug F + Greg D
- Horiba: FA00627
- Bladder: FA02073

Well Sampling Sheet

Well ID: CFMW - 059 Date: 3/23/17

DTW: 68.58 Depth of Pump Intake: 89.0'

DTB: 92.71 Total Volume Purged: 16.0 L

Purge Start:	1325	Time:		CPM:	5	psi:	50	Discharge Rate:	6.0
Purge End:	1445	Time:		CPM:	5	psi:	50	Discharge Rate:	6.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1335	68.63	200	8.42	0.587	10.61	7.36	219	474	2.0 L
1340	68.65	200	8.32	0.587	10.46	7.35	221	302	3.0 L
1350	68.62	200	8.06	0.589	10.03	7.29	228	191	5.0 L
1355	68.65	200	8.00	0.590	9.61	7.22	234	147	6.0 L
1400	68.65	200	7.99	0.591	9.36	7.15	240	81.2	7.0 L
1405	68.60	200	8.00	0.591	9.35	7.16	240	70.5	8.0 L
1410	68.65	200	8.00	0.591	9.32	7.15	241	55.3	9.0 L
1415	68.60	200	7.99	0.592	9.33	7.17	241	44.9	10.0 L
1420	68.62	200	7.96	0.592	9.25	7.18	241	33.2	11.0 L
1425	68.62	200	7.97	0.592	9.25	7.20	241	27.7	12.0 L
1430	68.64	200	7.97	0.592	9.28	7.21	241	22.0	13.0 L
1435	68.63	200	7.99	0.593	9.30	7.22	241	17.9	14.0 L
1440	68.64	200	8.00	0.593	9.31	7.24	240	20.6	15.0 L

Purge Water Description: Slightly turbid, mostly clear

Sample ID: CFMW - 059 - GW Sample Time: 1450

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	X
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Well Sampling Sheet

Well ID: CFMW-059a

Date: 3/22/17

DTW: 68.05'

Depth of Pump Intake: 160.00'

DTB: 163.93'

Total Volume Purged: ~~2.25~~ 3.0 gal

		Purge							
Purge Start:	07:55	Time:	1:31	CPM:	3	psi:	80	Discharge Rate:	85 ml/min
Purge End:	09:26	~~Time:~~		CPM:	3	psi:	90	Discharge Rate:	180 ml/min

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
08:00	68.11	85	11.14	0.137	3.92	9.93	-21	628	0.0
08:05	68.18	180	9.17	0.160	3.41	10.35	-147	306	↓
08:10	68.27	180	7.67	0.228	1.24	11.09	-346	964	↓
08:15	68.36	180	7.61	0.180	0.95	10.69	-354	442	↓
08:20	68.42	180	7.54	0.178	0.80	10.08	-339	309	↓
08:25	68.48	180	7.50	0.190	0.73	9.74	-325	263	↓
08:30	68.53	180	7.49	0.201	0.66	9.60	-318	221	↓
08:35	68.58	180	7.62	0.209	0.60	9.49	-313	167	↓
08:40	68.63	180	7.50	0.219	0.57	9.39	-309	141	↓
08:43	68.67	180	7.48	0.224	0.55	9.35	-308	133	↓
08:46	68.70	180	7.47	0.227	0.53	9.30	-307	130	2.5 gal

Purge Water Description: Clear, no sign of particulates

Sample ID: CFMW-059a-GW

Sample Time: 08:50

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
AQ Free cyanide (9016)	N/A

NOTES:
- Doug F. + Greg D.
- Horiba: FA00627
- Bladder: FA02073
- ☆ CFMW-DUP8-GW @ 12:00

Resampled on 3/29/17
This sample not analyzed

Well Sampling Sheet

Well ID: CFMW-059a

Date: 3/29/17

DTW: 67.48'

Depth of Pump Intake: 161.00'

DTB: 163.87'

Total Volume Purged: 3.0 gal

Purge Start:	12:26	Purge Time:	01:34	CPM:	3	psi:	80	Discharge Rate:	10 sec.
Purge End:	14:00	~~Time:~~		CPM:	3	psi:	80	Discharge Rate:	12 sec.

Blinking - over max?

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
12:30	67.51	120	8.72	0.000	14.24	9.70	-174	218	0.0
12:35	67.53	120	8.75	0.138	4.35	10.15	-205	640	
12:40	67.56	120	7.77	0.182	0.45	10.69	-317	465	
12:45	67.59	120	7.61	0.188	0.12	10.84	-334	368	
12:50	67.63	120	7.61	0.175	0.00	10.48	-336	279	
12:55	67.68	120	7.58	0.182	0.00	10.21	-331	224	
13:00	67.73	120	7.57	0.189	0.00	9.92	-320	183	
13:05	67.73	170	7.56	0.198	0.00	9.77	-315	159	
13:10	67.75	170	7.62	0.209	0.00	9.66	-309	125	
13:15	67.78	180	7.59	0.221	0.00	9.49	-301	103	
13:20	67.81	180	7.67	0.231	0.00	9.42	-295	97.9	
13:25	67.85	180	7.62	0.239	0.00	9.36	-291	86.8	
13:28	67.88	180	7.57	0.245	0.00	9.34	-289	80.7	
13:31	67.92	180	7.66	0.249	0.00	9.33	-288	75.4	
13:34	67.95	180	7.62	0.251	0.00	9.32	-287	73.1	2.5 gal

Myron pH = 9.20

Purge Water Description: Clear, no particulates

Sample ID: CFMW-059a GW

Sample Time: 13:45

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ Free Cyanide 9016	N/A
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

NOTES:
- Doug F. + Scott M
- Horiba: FA00627
- Bladder: FA02073

Resample - initial sample not analyzed

Well Sampling Sheet

Well ID: CFMW-061 **Date:** 3/23/17

DTW: 9.62 **Depth of Pump Intake:** 22.0'

DTB: 26.05 **Total Volume Purged:**

Purge Start:	1210	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	2.5
Purge End:	1245	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	2.5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
12.20	9.62	450	8.93	0.414	8.18	7.56	224	96.5	4.5 L
12.25	9.64	450	9.22	0.407	4.15	7.51	230	57.8	6.75 L
12.30	9.64	450	9.33	0.405	3.84	7.52	231	36.4	9.0 L
1235	9.64	450	9.49	0.402	3.37	7.52	232	21.5	11.25 L
1240	9.64	450	9.52	0.401	3.28	7.50	232	18.1	13.5 L
1245	9.62	450	9.60	0.398	3.18	7.54	230	13.6	15.75 L

Purge Water Description: Began slightly turbid, cleared quickly

Sample ID: CFMW-061-GW Sample Time: 1250

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Well Sampling Sheet

Well ID: CFMW-064 **Date:** 3/23/17

DTW: 10.20 **Depth of Pump Intake:** 30.0'

DTB: 33.08 **Total Volume Purged:** 22.5 Liters

Purge Start:	1050	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	5.0
Purge End:	1140	**Time:**		**CPM:**	4	**psi:**	50	**Discharge Rate:**	5.0

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1055	10.22	450	7.86	0.422	4.77	7.67	219	>1000	2.25 L
1100	10.22	450	7.23	0.389	4.65	7.64	252	>1000	4.5 L
1105	10.20	450	7.02	0.391	4.46	7.61	262	850	6.75 L
1110	10.20	450	7.00	0.398	4.05	7.61	272	459	9.0 L
1115	10.22	450	6.98	0.398	3.88	7.51	278	350	11.25 L
1120	10.22	450	6.99	0.398	3.86	7.52	277	264	13.5 L
1125	10.22	450	7.01	0.399	3.77	7.54	277	182	15.75 L
1130	10.23	450	7.00	0.399	3.76	7.53	276	148	18.0 L
1135	10.22	450	7.02	0.399	3.76	7.55	274	143	20.25 L
1140	10.22	450	7.02	0.399	3.71	7.54	273	142	22.5 L
~~1145~~									~~24.75 L~~
									~~27.0 L~~

Purge Water Description:

Sample ID: CFMW-064-GW **Sample Time:** 1200

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	X
AQ TCL SVOCs 8270	X
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ Free Cyanide 9016	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

Horiba: FA 01008

Bladder: FA 00803

Well Sampling Sheet

Well ID: CFMW-001
DTW: 96.18'
DTB: 153.00'

Date: 6/19/17
Depth of Pump Intake: 150'
Total Volume Purged: 4.0 gal.

Purge Start:	1255	Time:	1 hr 5 min	CPM:	3	psi:	80	Discharge Rate:	9 sec.
Purge End:	1430	Time:	X	CPM:	3	psi:	90	Discharge Rate:	12 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1302	96.25	100	22.02	0.254	1.92	7.93	-46	0.00	0.0
1307	96.29	160	14.25	0.401	0.87	8.21	-69	0.00	
1312	96.33	160	13.63	0.403	0.70	8.21	-66	0.00	
1317	96.37	160	13.36	0.406	0.63	8.19	-63	0.00	
1322	96.46	300	11.81	0.407	0.58	8.18	-58	0.00	
1327	96.50	300	11.19	0.410	0.50	8.15	-56	0.00	
1332	96.55	300	11.12	0.409	0.45	8.12	-54	806	
1337	96.57	300	11.19	0.409	0.43	8.09	-55	337	
1342	96.59	300	11.19	0.410	0.41	8.07	-55	337	
1347	96.60	300	10.98	0.410	0.40	8.07	-54	203	
1352	96.60	300	11.00	0.411	0.37	8.05	-53	151	
1357	96.60	300	11.27	0.413	0.38	8.08	-55	125	
1402	96.60	300	12.64	0.419	0.41	8.06	-55	110	
1405	96.60	300	11.36	0.411	0.41	8.05	-53	102	
1408	96.60	300	11.31	0.411	0.38	8.04	-53	109	
1411	96.60	300	11.30	0.411	0.38	8.04	-53	106	4.0

Blinking

Purge Water Description: Clear while sampling

Sample ID: CFMW-001-GW
Sample Time: 1415
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
-Horiba: FA00738
-Bladder: FA06408
-DFIGD

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-002 Date: 6/27/17

DTW: 68.82 Depth of Pump Intake: 75 ft

DTB: 82.80 Total Volume Purged: 3.5 gal

Purge Start:	1205	Time:	55	CPM:	4	psi:	55	Discharge Rate:	5sec
Purge End:	1300	Time:	min	CPM:	4	psi:	55	Discharge Rate:	5sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1228	68.90	250	52	0.564	0.00	8.05	310	141	
1233	68.85	250	54.1	0.561	0.00	8.02	320	60.2	
1238	68.87	250	52.1	0.564	0.00	7.98	331	36.6	
1243	68.87	250	51.7	0.574	0.00	7.97	333	34.1	
1248	68.87	250	52.0	0.577	0.00	7.95	334	0.00	
1253	68.87	250	52.0	0.576	0.00	7.94	335	31.1	
1258	68.87	250	51.9	0.577	0.00	7.94	335	38.0	

Purge Water Description: Clear while sampling.

Sample ID: CFMW-002-GW Sample Time: 1300

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Mariba FA01956

Compressor FA02086

MS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-003 Date: 6/27/14

DTW: 19.15 Depth of Pump Intake: 50 ft

DTB: 54.00 Total Volume Purged: 7 gal

Purge Start:	757	Time:	1hr	CPM:	4	psi:	40	Discharge Rate:	5 secs
Purge End:	940	Time:	43 min	CPM:	4	psi:	40	Discharge Rate:	5 secs

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
805	19.37	280	55.2	2.86	0.04	6.64	250	311	
810	19.37	280	54.2	2.87	0.00	6.69	242	295	
815	19.38	280	52.5	2.88	0.00	6.78	221	257	
820	19.37	280	52.0	2.78	0.00	6.82	208	707	
825	19.37	280	52.3	2.66	0.00	6.87	205	203	
830	19.37	280	52.3	2.60	0.00	6.88	201	827	
835	19.37	280	52.1	2.65	0.00	6.83	194	692	
845	19.37	280	52.2	2.63	0.00	6.84	187	516	
855	19.40	280	52.2	2.59	0.00	6.83	180	277	
905	19.39	280	52.0	2.56	0.00	6.83	173	147	
910	19.39	280	51.9	2.56	0.00	6.84	170	148	
915	19.39	280	51.8	2.55	0.00	6.82	168	148	
925	19.40	280	52.0	2.55	0.00	6.83	163	99.1	
930	19.40	280	52.2	2.55	0.00	6.85	157	77.9	
935	19.40	280	52.2	2.54	0.00	6.84	156	77.2	
940	19.40	280	52.3	2.54	0.00	6.83	155	79.6	7 gal

Purge Water Description: Clear while sampling, colorless

Sample ID: CFMW-003-GW Sample Time: 945

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FAO 1956

Compressor FAO 2086

AS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-003a
DTW: 143.74'
DTB: 203.02'

Date: 6/19/17
Depth of Pump Intake: 200'
Total Volume Purged: 3.5 ~~4.0~~ gal. (DF)

Purge Start:	0930	Time:	3 hrs	CPM:	3	psi:	110	Discharge Rate:	11 sec.
Purge End:	1230	Time:	X	CPM:	3	psi:	95	Discharge Rate:	9 ~~1~~ sec. (DF)

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%] (DF)	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
					2.95	8.86			
0935	145.20	100	15.15	0.376	19.76	8.52	-102	257	0.0
0940	145.75	100	14.48	0.351	8.93	8.82	-123	247	
0945	146.13	100	12.68	0.310	~~8.86~~	~~2.95~~	-152	228	
0950	146.39	100	12.22	0.300	2.42	8.85	-171	224	
0955	146.62	100	12.00	0.296	1.90	8.86	-170	212	
1000	146.85	100	11.99	0.295	1.61	8.85	-166	206	
1005	147.05	100	11.92	0.295	1.32	8.83	-165	198	
1010	147.25	100	12.05	0.294	1.12	8.86	-166	212	
1015	147.42	100	11.93	0.294	0.96	8.88	-169	276	
1020	147.60	100	11.84	0.294	0.82	8.89	-171	316	
1025	147.70	100	11.84	0.293	0.73	8.89	-171	391	
1030	147.80	100	11.85	0.293	0.68	8.91	-172	466	
1035	147.90	100	11.77	0.294	0.63	8.91	-172	455	
1040	147.94	100	11.65	0.294	0.58	8.95	-174	436	
1045	147.98	100	11.65	0.294	0.55	8.95	-173	380	
1050	148.02	100	11.66	0.293	0.54	8.97	-174	333	
1055	148.03	100	11.81	0.290	0.52	8.96	-173	293	
1100	148.03	100	11.83	0.288	0.50	8.96	-173	242	
1105	148.02	100	11.83	0.287	0.50	8.96	-171	211	
1110	147.97	100	11.87	0.288	0.49	8.97	-172	184	
1115	147.95	100	11.83	0.289	0.49	8.95	-170	166	
1120		100	11.90	0.290	0.47	8.92	-168	149	3.0

Purge Water Description: Slightly Cloudy w/ sulfur odor

Sample ID: CFMW-003a-GW
Sample Time: 1145
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD
- Sulfur Odor

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

11 26	147.94	100	12.00	0.292	0.47	8.91	-167	132
11 30	147.92	100	12.03	0.293	0.47	8.90	-166	132
11 33	147.91	100	12.11	0.293	0.47	8.88	-165	120
11 36	147.90	100	12.10	0.295	0.47	8.88	-164	114

3.7

Well Sampling Sheet

Well ID: CFMW-007 Date: 6/19/17

DTW: 52.57' Depth of Pump Intake: 155'

DTB: 159.30 Total Volume Purged: 2.25 gal.

Purge Start:	1447	Time:	1 hrs	CPM:	3	psi:	80	Discharge Rate:	9 sec
Purge End:	1550	~~Time:~~	3 min	CPM:	3	psi:	85	Discharge Rate:	12 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1453	52.58	140	7.99	0.336	7.38	7.28	143	27.2	0.0
1458	52.58	280	11.09	0.365	1.57	8.17	-28	63.0	
1503	52.58	280	10.08	0.393	0.76	8.31	-81	64.1	
1508	52.58	280	9.92	0.394	0.57	8.36	-96	61.3	
1513	52.58	280	9.81	0.394	0.52	8.40	-100	55.5	
1518	52.58	280	9.82	0.394	0.48	8.41	-103	56.3	
1523	52.58	280	9.73	0.394	0.45	8.41	-104	55.7	
1528	52.58	280	9.73	0.394	0.44	8.41	-105	52.0	2.25

Purge Water Description:

Sample ID: CFMW-007-GW Sample Time: 1530

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DFIGD

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-008 Date: 6/20/17

DTW: 30.54' Depth of Pump Intake: 185.00'

DTB: 187.52' Total Volume Purged: 2.0 gal

Purge Start:	1112	Time:	1 hrs	CPM:	3	psi:	110	Discharge Rate:	12 sec
Purge End:	1230	~~Time:~~	18 min	CPM:	3	psi:	110	Discharge Rate:	12 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1135	30.30	220	15.71	0.353	4.12	7.62	-34	285	0.0
1140	30.50	220	11.65	0.695	1.68	6.17	32	348	
1145	30.70	220	10.94	0.715	1.24	6.07	29	344	
1150	30.90	220	10.70	0.721	1.06	6.02	29	334	
1155	~~30.83~~ 1155	220	10.59	0.723	0.97	5.97	34	333	
1200	31.18	220	10.48	0.725	0.92	5.95	36	331	
1205	31.30	220	10.37	0.726	0.89	5.91	38	339	
1210	31.45	220	10.31	0.727	0.88	5.91	38	339	2.0

Purge Water Description: Visibly clear during sampling, dark grey in color, green when mixing w/ NaOH.

Sample ID: CFMW-008-GW Sample Time: 1215

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD
- 1120 - Air tube disconnected from pump, pull up, connect, and resume purging @ 1130.

Well Sampling Sheet

Well ID: CFMW-008a
Date: 6/28/17
DTW: 62.53
Depth of Pump Intake: 94 ft
DTB: 99.00
Total Volume Purged: 2 gal

Purge Start:	1152	Time:	43	CPM:	3	psi:	65	Discharge Rate:	9 sec
Purge End:	1235	Time:	min	CPM:	3	psi:	60	Discharge Rate:	4 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1205	66.3	330	52.2	5.48	0.00	12.59	-154	0.00	
1210	68.50	180	51.9	5.53	0.00	12.60	-153	0.00	
1215	68.90	100	52.9	5.59	0.00	12.61	-152	0.00	
1220	69.50	100	54.1	5.61	0.00	12.58	-151	0.00	
1225	70.10	100	54.3	5.58	0.00	12.57	-151	0.00	
1230	70.55	100	54.1	5.59	0.00	12.58	-153	0.00	
1235	70.99	100	54.0	5.61	0.00	12.59	-153	0.00	

Purge Water Description: clear while sampling, colorless, odorless

Sample ID: CFMW-008a-GW
Sample Time: 1235
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Honda FA01956
Compressor FA02086
AS/LC
Not recharging quickly
high pH

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-010 Date: 6/27/17

DTW: 68.90 ft Depth of Pump Intake: 82 ft

DTB: 87.00 Total Volume Purged: 5 gal

Purge Start:	1017	Time:		CPM:	4	psi:	60	Discharge Rate:	5sec
Purge End:	1130	Time:		CPM:	4	psi:	60	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1025	68.92	270	53.1	0.622	1.39	8.21	293	370	
1030	68.90	270	52.4	0.622	0.00	8.24	300	222	
1035	68.91	270	50.8	0.627	0.00	8.27	310	158	
1040	68.90	270	49.9	0.641	0.00	8.29	313	148	
1045	68.92	270	49.8	0.651	0.00	8.29	314	135	
1050	68.92	270	49.8	0.654	0.00	8.30	314	111	
1055	68.92	270	49.8	0.647	0.00	8.32	313	125	
1100	68.92	270	49.8	0.628	0.00	8.35	310	110	
1105	68.90	270	49.5	0.634	0.00	8.35	309	99.5	
1110	68.90	270	49.7	0.645	0.00	8.36	310	127	
1115	68.90	270	49.8	0.646	0.00	8.33	311	95.7	
1120	68.90	270	49.4	0.655	0.00	8.35	313	126	
1125	68.92	270	49.7	0.658	0.00	8.33	314	125	
1130	68.92	270	49.9	0.658	0.00	8.29	315	123	

Purge Water Description: Clear while sampling, Slight yellow tint

Sample ID: CFMW-010-GW Sample Time: 1135

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FA01956

Compressor FA02086

PS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW -011 Date: 6/28/17

DTW: 28.86 Depth of Pump Intake: 47.5 ft

DTB: 52.50 Total Volume Purged: 3 gal

Purge Start:	758	Time:	50	CPM:	4	psi:	40	Discharge Rate:	5 sec
Purge End:	910	Time:	min	CPM:	4	psi:	40	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
810	28.9	250	49.5	0.404	12.21	7.01	265	0.00	
815	28.9	250	48.2	0.394	10.53	7.38	281	0.00	
820	28.9	250	48.1	0.382	10.92	7.40	285	0.00	
~~825~~ 840	28.9	250	51.9	0.379	8.25	7.54	262	0.00	
~~830~~ 845	28.9	250	51.1	0.377	5.91	7.55	267	0.00	
~~835~~ 850	28.9	250	49.4	0.378	2.08	7.55	285	0.00	
~~840~~ 855	28.9	250	48.8	0.382	0.91	7.55	295	0.00	
900	28.9	250	48.6	0.384	0.64	7.56	300	0.00	
905	28.9	250	48.4	0.386	0.57	7.56	305	0.00	
910	28.9	250	48.3	0.387	0.53	7.55	307	0.00	

Purge Water Description: Clear while sampling, Colorless

Sample ID: CFMW -011-GW Sample Time: 910

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FA01956
Compressor FA02086
AS/LC
Horiba batteries
Dred, Stopped
readings to
Change
DUP 15

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-011a
Date: 6/29/17
DTW: 92.25
Depth of Pump Intake: 164.00
DTB: 164.31
Total Volume Purged: 4.0 gal

Purge Start:	0831	Time:	2	CPM:	3	psi:	90	Discharge Rate:	10 sec
Purge End:	1045	Time:	14	CPM:	3	psi:	90	Discharge Rate:	10 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0834	92.44	230	15.17	0.399	5.67	5.64	145	0.00	0.0
0839	92.46	230	11.22	0.383	1.39	7.11	-17	0.00	
0844	92.48	230	9.77	0.404	1.10	7.30	-40	0.00	
0849	92.51	230	9.30	0.410	0.95	7.46	-49	0.00	
* 0858	92.40	230	9.72	0.404	2.36	7.15	9	1,000	
0903	92.42	230	9.03	0.399	1.06	7.43	-49	658	
0908	92.45	230	8.93	0.403	0.75	7.52	-62	422	
0913	92.47	230	8.74	0.405	0.69	7.55	-68	317	
0918	92.52	230	8.76	0.403	0.61	7.56	-69	240	
0923	92.57	230	8.85	0.400	0.60	7.57	-70	219	
0933	92.62	280	8.88	0.396	0.58	7.56	-68	159	
0938	92.63	280	8.90	0.390	0.56	7.55	-69	143	
0943	92.63	280	8.89	0.389	0.56	7.50	-70	133	
0948	92.65	280	8.92	0.389	0.56	7.48	-70	119	
0951	92.66	280	9.00	0.383	0.55	7.46	-70	114	4.0

Purge Water Description: Slightly cloudy

Sample ID: CFMW-011a-GW
Sample Time: 1000
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	✓
Matrix Spike Duplicate	✓

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

NOTES:
- DFIAS
- Horiba: FA00738
- Bladder: FA00408
- 0850 - Stop readings and clean out Horiba
- Myron 6P pH reading: 7.12

Well Sampling Sheet

Well ID: CFMW-012 Date: 6/23/17

DTW: 65.46 Depth of Pump Intake: 80 ft

DTB: 82.00 Total Volume Purged: 3 gal

Purge Start:	1335	Time:	40	CPM:	4	psi:	60	Discharge Rate:	5 sec
Purge End:	1415	Time:	min	CPM:	4	psi:	60	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1340	65.53	250	51.5	4.28	0.00	9.62	162	0.00	
1345	65.53	250	49.8	4.29	0.00	9.61	170	0.00	
1350	65.53	250	49.6	4.27	0.00	9.59	172	0.00	
1355	65.53	250	49.3	4.21	0.00	9.58	174	0.00	
1400	65.53	250	49.2	4.13	0.00	9.60	175	0.00	
1405	65.53	250	49.1	4.08	0.00	9.59	177	0.00	
1410	65.53	250	49.0	3.98	0.00	9.57	180	0.00	3
1415	65.53	250	48.8	3.86	0.00	9.56	184	0.00	

Purge Water Description: Brown color

Sample ID: CFMW-012-GW Sample Time: 1420

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba # FA01956
Compressor # FA02086
AD/SM
pH slightly higher than usual

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-012a
Date: 6/20/17
DTW: 136.75'
Depth of Pump Intake: 210.00'
DTB: 213.40'
Total Volume Purged: 3.0 gal.

Purge Start:	0757	Time:	2 hrs	CPM:	3	psi:	100	Discharge Rate:	9 sec
Purge End:	1035	~~Time:~~	38 min	CPM:	3	psi:	115	Discharge Rate:	13 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0810	136.76	70	10.86	0.302	2.80	8.29	160	481	0.0
0815	136.76	130	11.90	0.349	2.27	8.15	107	733	
0820	136.77	160	10.46	0.379	1.71	7.53	75	362	
0825	136.79	160	9.59	0.388	1.55	7.49	61	261	
0830	136.78	160	9.42	0.390	1.43	7.48	52	201	
0835	136.77	160	9.32	0.392	1.38	7.52	43	166	
0840	136.76	160	9.05	0.392	1.34	7.52	36	162	
0845	136.76	160	9.18	0.393	1.28	7.54	27	146	
0850	136.76	160	9.12	0.394	1.23	7.54	19	131	
0855	136.76	160	8.92	0.394	1.21	7.54	10	111	
0900	136.76	160	8.92	0.395	1.19	7.56	4	103	
0905	136.76	160	9.02	0.395	1.15	7.56	-2	94.9	
0910	136.76	160	8.99	0.395	1.09	7.55	-8	75.8	
~~0915~~	~~136.76~~	~~160~~	8.96	0.395	1.10	7.57	-10	73.0	3.0
		175							

Purge Water Description: Clear while sampling, slight yellow tint @ beginning of sample.

Sample ID: CFMW-012a-GW
Sample Time: 0930

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	✓
Matrix Spike Duplicate	✓

NOTES:
- Horiba: FA00738
- Bladder: FA0[illegible]08
- DF-1GD

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Well Sampling Sheet

Well ID: CFMW -014 Date: 6/27/17

DTW: 67.55 Depth of Pump Intake: 84 ft

DTB: 94 ft Total Volume Purged: 3 gal

Purge Start:	1458	Time:	37	CPM:	3	psi:	65	Discharge Rate:	9 secs
Purge End:	1535	Time:	min	CPM:	3	psi:	65	Discharge Rate:	9 secs

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1505	67.60	300	63.2	0.448	2.87	8.31	258	0.00	
1510	67.60	300	61.9	0.438	0.61	8.17	288	0.00	
1515	67.60	300	57.7	0.431	0.00	7.94	327	0.00	
1520	67.60	300	56.7	0.443	1.36	7.90	337	0.00	
1525	67.60	300	56.1	0.449	1.23	7.91	340	0.00	
1530	67.60	300	56.2	0.454	0.74	7.92	341	0.00	
1535	67.60	300	55.4	0.456	0.37	7.91	343	0.00	

Purge Water Description: clear while sampling colorless

Sample ID: CFMW -014 -GW Sample Time: 1535

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FA01956

Compressor FA02026

AS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-015 Date: 6/27/17

DTW: 65.55 Depth of Pump Intake: 89 ft

DTB: 94 Total Volume Purged: 3 gal

Purge Start:	1342	Time:	43	CPM:	3	psi:	65	Discharge Rate:	9 sec
Purge End:	1425	Time:	min	CPM:	3	psi:	65	Discharge Rate:	9 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1354	65.60	320	55.7	3.07	0.00	9.71	153	0.00	
1359	65.60	320	54.1	3.10	0.00	9.72	154	0.00	
1404	65.60	320	51.8	3.13	0.00	9.70	157	0.00	
1409	65.60	320	51.4	3.21	0.00	9.67	160	0.00	
1414	65.60	320	51.2	3.23	0.00	9.65	161	0.00	
1419	65.60	320	50.9	3.24	0.00	9.62	163	0.00	
1424	65.60	320	50.9	3.25	0.00	9.63	162	0.00	
1429									

Purge Water Description: light brown in color, clear, metallic/iron odor

Sample ID: CFMW-015-GW Sample Time: 1430

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FAO1956

Compressor FAO2086

AS/LC

traces of iron/rust on top of bladder when pulled up

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-016 Date: 6/29/17

DTW: 72.28 Depth of Pump Intake: ~~42~~ ft 90

DTB: 97.80 Total Volume Purged: 8 gal

Purge Start:	1315	Time:	1hr	CPM:	3	psi:	60	Discharge Rate:	9 sec
Purge End:	1500	Time:	45min	CPM:	3	psi:	60	Discharge Rate:	9 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1335	72.33	330	17.34	0.305	9.33	7.15	178	293	
1340	72.33	330	16.13	0.302	8.85	7.19	179	257	
1345	72.33	330	14.01	0.305	8.35	7.18	180	276	
1350									
1355	72.33	330	12.31	0.327	10.02	7.56	148	264	
1400	72.32	330	11.88	0.328	9.87	7.55	153	209	
1405	72.32	330	11.28	0.333	9.68	7.52	167	171	
1410	72.32	330	10.93	0.341	9.34	7.48	185	173	
1415	72.32	330	10.69	0.344	9.30	7.47	193	118	
1420	72.32	330	10.43	0.345	9.34	7.48	196	124	
1425	72.32	330	10.20	0.347	9.38	7.50	199	140	
1430	72.32	330	10.35	0.349	9.33	7.50	199	111	
1435	72.32	330	10.46	0.346	9.28	7.66	193	130	
1440	72.32	330	10.78	0.346	9.16	7.70	192	121/140	
1445	72.32	330	10.66	0.346	9.38	7.79	189		
1448	72.32	330	10.79	0.346	9.36	7.80	188	129	
1451	72.32	330	10.63	0.346	9.42	7.80	189	130	
1454	72.32	330/330	10.87	0.344	9.31	7.81	189	138	
1457	72.32								

Purge Water Description: Clear while sampling, colorless, odorless

Sample ID: CFMW-016-GW Sample Time: 1500

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

NOTES:

Horiba
Compressor FA02086
Bladder
AS/DF
Transducer plaused
and resumed
- stopped readings to
Clean Horiba

22.664°C -20.915 ft
10.715 psi level DTW

Well Sampling Sheet

Well ID: CFMW-016a

Date: 6/26/17

DTW (DF) 71.81'

Depth of Pump Intake: 123.00'

DTB: 128.38'

Total Volume Purged: 5.0 gal.

Purge Start:	1103	Time:	1 hr	CPM:	3	psi:	80	Discharge Rate:	10 sec.
Purge End:	1230	~~Time:~~	27 min	CPM:	3	psi:	80	Discharge Rate:	10 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1107	72.01	300	13.93	2.51	9.08	12.29	-59	105	0.0
1112	71.90	280	10.91	1.98	7.88	12.42	-59	47.3	
1117	71.91	280	10.24	1.52	7.44	12.45	-47	25.2	
1122	71.95	290	10.02	1.15	7.68	12.44	-37	35.2	
1127	71.99	290	10.08	0.969	7.42	12.38	-29	68.4	
1132	71.92	290	9.93	0.827	7.75	12.28	-20	53.4	
1137	71.91	290	9.89	0.700	7.91	12.23	-16	58.1	
1142	71.91	290	9.86	0.623	7.87	12.13	-9	62.3	
1147	71.91	290	9.97	0.553	7.58	12.04	-3	69.7	
1152	71.91	290	9.80	0.527	8.00	12.01	1	68.8	
1157	71.91	290	9.79	0.385	7.80	11.83	3	74.0	
1202	71.91	290	9.76	0.400	7.87	11.83	18	69.3	(DF)
1207	71.91	290	9.74	0.320	7.93	11.83	18	59.3	
1210	71.91	290	9.65	0.316	8.10	11.59	18	60.5	
1213	71.91	290	9.69	0.318	8.08	11.53	19	81.2	5.0

Purge Water Description: Clear while sampling

Sample ID: CFMW-016a-GW

Sample Time: 1215

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DFISM
- Myron 6P pH reading = 10.53
- ★ Pressure transducer - paused + resumed
  - ↳ Temp 31.984°C
  - ↳ Level DTW = -22.273'
  - ↳ 16.338 PSI

Well Sampling Sheet

Well ID: CFMW-017 Date: 6/26/17

DTW: 115.33' Depth of Pump Intake: 135.00

DTB: 140.95' Total Volume Purged: 20 gal

Purge Start:	1408	Time:	1 hrs	CPM:	3	psi:	90	Discharge Rate:	11 sec
Purge End:	1515	~~Time:~~	7 min	CPM:	3	psi:	90	Discharge Rate:	11 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1412	115.42	210	17.87	0.334	8.64	8.36	153	0.00	0.0
1417	115.43	210	12.02	0.363	8.81	8.17	272	0.00	|
1422	115.43	205	11.57	0.359	7.51	8.12	287	0.00	|
1427	115.43	205	11.01	0.358	7.64	8.11	299	0.00	|
1432	115.43	205	10.74	0.358	7.63	8.08	300	0.00	|
1437	115.43	205	10.66	0.357	7.49	8.11	303	0.00	|
1442	115.43	205	10.59	0.357	7.47	8.12	305	0.00	20

Purge Water Description: Clear white sampling.

Sample ID: CFMW-017-GW Sample Time: 1445

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DFSM

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-018 Date: 6/20/17

DTW: 119.26' Depth of Pump Intake: 125.00'

DTB: 126.83' Total Volume Purged: 2.5 gal.

Purge Start:	1252	Time:	1 hrs	CPM:	3	psi:	85	Discharge Rate:	10 sec
Purge End:	1420	Time:	28 min	CPM:	3	psi:	85	Discharge Rate:	10 sec

Blinking

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1256	119.25	220	18.36	0.406	10.71	6.63	120	1,000	0.0
1301	119.25	220	12.91	0.436	10.30	7.54	136	1,000	
1306	119.25	220	11.54	0.444	10.17	7.63	203	651	
1311	119.25	220	11.13	0.445	9.97	7.64	227	414	
1316	119.25	220	11.13	0.446	9.93	7.63	238	297	
1321	119.25	220	10.83	0.446	9.93	7.62	249	208	
1326	119.25	220	10.61	0.446	9.92	7.58	261	163	
1331	119.25	220	10.71	0.446	9.71	7.55	266	112	
1336	119.25	220	10.70	0.447	9.77	7.53	272	135	
1341	119.25	220	10.68	0.447	9.79	7.52	277	167	
1346	119.25	220	10.64	0.447	9.72	7.49	278	137	
1349	119.25	220	10.82	0.447	9.75	7.49	281	90.7	
1352	119.25	220	10.81	0.448	9.80	7.49	282	112	
1355	119.25	220	11.00	0.447	9.82	7.48	282	107	2.5
1358	119.25	220	10.95	0.448	9.87	7.47	282	109	

Purge Water Description: Visually clear while sampling, slightly cloudy @ end of parameters

Sample ID: CFMW-018-GW Sample Time: 1400

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-019 Date: 6/29/17

DTW: 65.05 Depth of Pump Intake: 91 ft

DTB: 96.50 ft Total Volume Purged: 3.5 gal

Purge Start:	1130	Time:	1hr	CPM:	3	psi:	60	Discharge Rate:	9 sec
Purge End:	1235	Time:	5min	CPM:	3	psi:	60	Discharge Rate:	9 secs

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1140	65.07	330	12.77	1.01	3.49	6.91	290	56.1	
1145	65.07	330	11.48	1.03	2.72	6.70	315	62.0	
1150	65.07	330	10.30	1.06	1.87	6.22	343	56.0	
1155	65.07	330	10.07	1.08	1.87	6.06	351	47.0	
1200	65.07	330	10.06	1.08	1.97	6.35	352	46.9	
1205	65.07	330	10.14	1.08	2.05	6.68	354	44.7	
1210	65.07	330	10.17	1.07	2.14	6.91	355	37.1	
1215	65.07	330	10.16	1.07	2.25	7.08	358	1.91	
1220	65.07	330	10.21	1.06	2.31	7.22	359	0.00	
1225	65.07	330	10.10	1.05	2.34	7.31	359	0.00	
1228	65.07	330	10.05	1.05	2.37	7.36	359	[illegible]	35.7
1231	65.07	330	10.13	1.05	2.42	7.40	357	34.8	
1234	65.07	330	10.19	1.05	2.45	7.42	357	36.4	

Purge Water Description: clear while sampling

Sample ID: CFMW-019-GW Sample Time: 1240

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba FA00738
Bladder FA00408
AS/DF
Compressor FA02086
Pressure transducer
paused & resumed

7.530 °C -12.444
10.372 psi Leve DTW

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-019a
Date: 6/26/17
DTW: 133.09'
Depth of Pump Intake: 218.00'
DTB: 223.01'
Total Volume Purged: 3.5 gal

Purge Start:	0815	Time:	1 hrs	CPM:	3	psi:	110	Discharge Rate:	10 sec
Purge End:	1030	~~Time:~~	15 min	CPM:	3	psi:	110	Discharge Rate:	12.5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0826	133.12	85	17.44	0.395	2.22	9.79	-35	140	0.0
0831	133.12	100	14.12	0.318	1.38	9.52	-86	0.00	
0836	133.12	100	11.91	0.312	1.11	9.12	-98	0.00	
0841	133.12	100	11.42	0.312	0.88	9.00	-106	0.00	
0846	133.12	120	11.16	0.312	0.76	8.93	-113	911	
0851	133.12	120	10.79	0.314	0.69	8.89	-120	854	
0856	133.12	120	10.48	0.315	0.65	8.92	-128	668	
0901	133.12	120	10.28	0.315	0.61	8.92	-132	486	
0906	133.12	120	10.18	0.316	0.59	8.89	-136	390	
0911	133.12	120	10.07	0.317	0.57	8.88	-140	305	
0916	133.12	120	10.02	0.320	0.55	8.81	-143	246	
0921	133.12	120	10.00	0.323	0.55	8.72	-146	209	
0926	133.12	120	10.07	0.326	0.55	8.62	-150	187	
0931	133.12	120	9.99	0.331	0.57	8.46	-155	169	
0936	133.12	120	10.06	0.334	0.59	8.35	-148	142	
0941	133.12	150	10.09	0.337	0.62	8.26	-143	122	
0946	133.12	150	10.18	0.342	0.67	8.12	-134	100	
0951	133.12	150	10.30	0.344	0.70	8.06	-126	94.7	
0954	133.12	150	10.46	0.346	0.73	7.99	-121	90.6	
0957	133.12	150	10.59	0.346	0.72	7.96	-116	88.7	3.5

Blinking

Purge Water Description: Slightly cloudy.

Sample ID: CFMW-019a-GW
Sample Time: 1000
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/SM
- Myron GP pH reading = 6.95
- ★ Pressure transducer - paused + resumed
  - ↳ Temp - 30.4599
  - ↳ Level DTW = -5.799'
  - ↳ -3.144 PSI

Well Sampling Sheet

Well ID: CFMW-020 Date: 6/26/17

DTW: 74.29' Depth of Pump Intake: 128.00'

DTB: 133.90' Total Volume Purged: 3.0 gal.

Purge Start:	1250	Time:	0 hrs	CPM:	3	psi:	80	Discharge Rate:	10 sec.
Purge End:	1345	~~Time:~~	55 min	CPM:	3	psi:	80	Discharge Rate:	11 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1253	74.33	250	17.46	0.342	7.78	8.80	85	15.6	0.0
1258	74.33	250	10.97	0.365	9.14	8.23	141	0.83	
1303	74.34	250	10.10	0.365	8.74	8.06	162	0.00	
1308	74.34	250	9.74	0.364	8.64	7.94	172	0.00	
1313	74.34	250	9.64	0.365	8.60	7.90	175	0.00	
(DF) 1318	74.34	280	9.74	0.365	8.52	7.83	176	0.00	
1321	74.34	280	9.67	0.365	8.64	7.84	175	0.00	
1324	74.34	280	9.66	0.365	8.62	7.81	175	0.00	3.0

Purge Water Description: Clear white sampling

Sample ID: CFMW-020-GW Sample Time: 1330

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00406
- DF/SM

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-021 Date: 6/26/17

DTW: 65.15 Depth of Pump Intake: 85 ft

DTB: 90.00 Total Volume Purged: 3.5 gal

Purge Start:	1335	Time:	45	CPM:	3	psi:	60	Discharge Rate:	10 sec
Purge End:	1420	Time:	min	CPM:	3	psi:	60	Discharge Rate:	10 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1345	65.18	210	72.5	0.392	11.14	7.83	257	23.1	
1350	65.20	320	68.5	0.407	5.34	7.78	269	19.4	
1355	65.20	320	61.3	0.399	0.07	7.66	296	23.3	
1400	65.20	320	59.5	0.424	0.86	7.63	302	22.3	
1405	65.20	320	60.0	0.427	0.08	7.67	300	29.0	
1410	65.20	320	59.6	0.427	0.00	7.66	305	36.1	
1415	65.20	320	52.8	0.457	0.00	7.63	307	62.6	
1420	65.20	320	51.7	0.481	0.00	7.64	309	18.1	

Purge Water Description: Clear while sampling Slight yellowish tint

Sample ID: CFMW-021-GW Sample Time: 1420

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba FA01956
Compressor FA02086
MS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-022 Date: 6/26/17

DTW: 61.74 Depth of Pump Intake: 78 ft

DTB: 83.5 ft Total Volume Purged: 2.5 gal

Purge Start:	1450	Time:	40	CPM:	4	psi:	50	Discharge Rate:	5 sec
Purge End:	1530	Time:	min	CPM:	4	psi:	50	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1458	61.74	250	61.5	0.301	11.40	7.80	234	0.00	
1503	61.74	250	52.2	0.306	9.61	7.73	243	0.00	
1508	61.74	250	53.7	0.316	5.46	7.61	258	0.00	
1513	61.74	250	51.4	0.337	4.31	7.57	270	0.00	
1518	61.74	250	51.4	0.338	4.12	7.55	274	0.00	
1523	61.74	250	51.1	0.338	3.85	7.56	276	0.00	
1528	61.74	250	50.9	0.338	3.53	7.56	278	0.00	

Purge Water Description: Clear when sampling, colorless, odorless

Sample ID: CFMW-022-GW Sample Time: 1530

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FA01956

Compressor FA02086

AS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-023 Date: 6/27/17

DTW: 115.55' Depth of Pump Intake: 138.00'

DTB: 143.12' Total Volume Purged: 2.0 gal

Purge Start:	0806	Time:	0 hrs	CPM:	3	psi:	90	Discharge Rate:	10 sec.
Purge End:	0900	~~Time:~~	54 min	CPM:	3	psi:	90	Discharge Rate:	10 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0810	115.62	290	15.30	0.488	11.69	5.77	265	26.2	0.0
0815	115.64	290	10.47	0.407	10.60	6.85	214	0.00	
0820	115.66	290	9.67	0.398	10.69	7.11	226	0.00	
0825	115.69	290	9.31	0.396	10.60	7.24	234	0.00	
0830	115.69	290	9.34	0.396	10.57	7.30	239	0.00	
0835	115.69	290	9.13	0.396	10.70	7.31	245	0.00	
0840	115.69	290	9.08	0.396	10.57	7.31	250	0.00	2.0

Purge Water Description: Clear while sampling

Sample ID: CFMW-023-GW Sample Time: 0845

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DT/GD

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: SFMW-025 Date: 6/29/17

DTW: 26.55' Depth of Pump Intake: —

DTB: 27.15' Total Volume Purged: —

Purge Start:	—	Time:	—	CPM:	—	psi:	—	Discharge Rate:	—
Purge End:	—	Time:	—	CPM:	—	psi:	—	Discharge Rate:	—

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)

N/A

Purge Water Description:

Sample ID: — Sample Time: —

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	—
Matrix Spike	—
Matrix Spike Duplicate	—

Analysis	
8270D - SVOC	—
8260B - VOC	—
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	—
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	—
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	—
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	—
2320B - Alkalinity	—
300.0 - Dissolved Fluoride	—
2540C - Total Dissolved Solids	—
2540D - Total Suspended Solids	—
6020A/7470A - TAL Metals (dissolved)	—
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	—

NOTES:

* Did not collect sample - not enough water.

Well Sampling Sheet

Well ID: CFMW-025a Date: 6/22/17

DTW: 39.78 Depth of Pump Intake: 90'

DTB: 98.30 Total Volume Purged: 7

Purge Start:	0755	Time:	2hr	CPM:	3	psi:	60	Discharge Rate:	5
Purge End:	1035	Time:	40min	CPM:	3	psi:	60	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0815	40.19	220							
0835	40.29	180							
0900	40.29	185							2.5
0910	40.28	185	54.0	0.386	0.00	7.68	-95	0.00	
0915	40.24	180	53.6	0.386	0.00	7.63	-93	0.00	
0920	40.23	180	53.3	0.388	0.00	7.59	-94	0.00	3.5
0925	40.25	180	53.2	0.389	0.00	7.53	-96	0.00	
0930	40.22	150	53.2	0.391	0.00	7.49	-97	0.00	
0935	40.23	150	53.7	0.390	0.00	7.47	-95	859	
0940	40.23	150	53.6	0.385	0.00	7.48	-84	859	4.5
0945	40.23	150	53.6	0.386	0.00	7.49	-83	182	
0950	40.23	150	53.7	0.386	0.00	7.59	-85	257	
0955	40.23	150	53.9	0.389	0.00	7.60	-93	352	5.25
1000	40.23	150	53.9	0.391	0.00	7.68	-100	395	
1005	40.23	150	53.9	0.392	0.00	7.61	-87	856	
1010	40.23	150	54	0.393	0.00	7.62	-93	952	

Purge Water Description: Turbid, slightly brown/yellow

Sample ID: CFMW-025a-GW Sample Time: 1035

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Turbidity "0.00" readings suspect Horiba was maxed out while reading "0." Came down but the back up 2.5hr purge

Analysis	
8270D - SVOC	NA
8260B - VOC	NA
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	NA

All others parameters were stable

Time	PR	DTW	T	SC	DO	pH	ORP	Turb.
1015	150	40.23	54.2	0.394	0.00	7.61	-98	1000
1020	150	40.23	56.8	0.397	0.00	7.59	-68	881
1026	150	40.23	56.2	0.385	0.00	7.63	-85	881
1030	150	40.23	55.9	0.386	0.00	7.61	-84	859
1035	150	40.23	55.7	0.390	0.00	7.64	-96	773

Well Sampling Sheet

Well ID: CFMW-025b
Date: 6/22/17
DTW: 30.22
Depth of Pump Intake: 58 ft
DTB: 64.80 ft
Total Volume Purged: 2 gal

Purge Start:	1125	Time:		CPM:	4	psi:	50	Discharge Rate:	5 scc
Purge End:	1215	Time:		CPM:	4	psi:	50	Discharge Rate:	5 sc

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1125	30.22	300							
1135	30.38	300	75.9	0.308	4.58	8.01	-146	61.6	
1140	30.37	300	72.9	0.303	0.00	7.97	-159	52.4	
1145	30.38	280	61.8	0.320	0.00	7.96	-173	45.6	
1150	30.37	280	52.0	0.400	0.00	7.98	-181	47.0	
1155	30.37	280	51.8	0.401	0.00	7.97	-184	44.7	
1200	30.37	280	51.7	0.401	0.00	7.95	-185	44.6	
1205	30.38	280	51.6	0.401	0.00	7.94	-186	43.3	
1210	30.37	280	51.6	0.401	0.00	7.95	-188	43.5	

Purge Water Description: Clear, colorless

Sample ID: CFMW-025b-GW Sample Time: 1215

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba FA01956
Compressor FA02036
AS/SM

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	NA

Well Sampling Sheet

Well ID: CFMW-026-
Date: 6/22/17
DTW: 32.71
Depth of Pump Intake: 41 ft
DTB: 47.00
Total Volume Purged: 3.5

Purge Start:	1300	Time:		CPM:	4	psi:	40	Discharge Rate:	See
Purge End:		Time:		CPM:	4	psi:	40	Discharge Rate:	

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1305	32.78	400	52.6	0.427	24.49	7.52	34	111	
1310	32.78	250	52.1	0.427	11.47	7.51	40	44.2	
1315	32.77	250	51.4	0.425	0.00	7.44	60	26.7	
1320	32.78	240	50.9	0.429	0.00	7.43	69	16.9	
1325	32.78	240	50.8	0.431	0.00	7.44	75	8.34	
1330	32.78	240	50.7	0.432	0.00	7.44	81	5.35	
1335	32.78	240	50.6	0.432	0.00	7.43	87	3.46	
1340	32.78	240	50.5	0.433	0.00	7.43	91	1.52	3.5

Purge Water Description: Clear when sampling, Colorless

Sample ID: CFMW-026-GW
Sample Time: 1345
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba # FA01956
Compressor # FA02086
AS/SM

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-027 Date: 6/26/17

DTW: 24.94 Depth of Pump Intake: 41 ft

DTB: 48.50 Total Volume Purged: 3 gal

Purge Start:	1200	Time:	50	CPM:	4	psi:	35	Discharge Rate:	5 sec
Purge End:	1250	Time:	min	CPM:	4	psi:	35	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1213	24.97	200	69.0	0.511	2.28	7.74	283	194	
1218	24.97	200	65.1	0.519	0.71	7.69	305	133	
1223	24.97	200	62.7	0.534	0.00	7.66	317	60.3	
1228	24.97	200	60.7	0.544	0.00	7.64	325	0.00	
1233	24.97	200	60.0	0.555	0.00	7.64	327	0.00	
1238	24.97	200	59.9	0.558	0.00	7.64	330	0.00	
1243	24.97	200	59.5	0.559	0.00	7.63	331	0.00	
1248	24.97	200	59.1	0.562	0.00	7.64	332	0.00	

Purge Water Description: Clear while sampling, odorless, colorless

Sample ID: CFMW-027-GW Sample Time: 1250

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FA01956

Compressor FA02026

AS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-028 Date: 6/26/17

DTW: 36.60 Depth of Pump Intake: ~~38 ft~~ ~~56~~ 53 ft

DTB: 62.00 Total Volume Purged: 6 gal

Purge Start:	800	Time:	2	CPM:	4	psi:	50	Discharge Rate:	5 sec
Purge End:	1000	Time:	hr	CPM:	3	psi:	40	Discharge Rate:	7 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
807	37.85	260	52.4	0.493	14.58	6.64	291	302	
812	38.17	260	51.2	0.480	9.06	6.90	297	392	
817	37.80	200	50.0	0.458	1.23	7.38	312	360	
822	37.80	200	50.1	0.454	0.00	7.48	317	241	
827	37.98	200	49.7	0.456	0.00	7.52	323	299	
832	37.80	200	49.7	0.458	0.00	7.55	325	285	
837	37.80	200	49.7	0.459	0.00	7.53	326	392	
842	37.90	200	50.8	0.456	0.00	7.57	321	305	
847	37.95	200	52.4	0.440	0.00	7.59	322	358	
852	37.95	200	52.9	0.434	0.00	7.59	321	294	
857	37.96	200	53.1	0.436	0.00	7.61	321	297	
902	37.97	180	53.7	0.441	0.00	7.59	323	368	
907	37.65	180	54.2	0.445	0.00	7.59	321	365	
912	37.95	300	53.6	0.445	0.00	7.56	325	370	
917	38.35	300	52.4	0.444	0.00	7.54	329	392	
922	38.20	250	52.7	0.450	0.00	7.56	329	320	5 gal

Purge Water Description: Water was clear while sampling

Sample ID: CFMW-028-GW Sample Time: 1000

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

NOTES:

Horiba FAQ 1956
Compressor FAQ2086
A3 KC
-more on back
All parameters
were stable
Water was clear
and not turbid

Time	DTW	RR	T	Sp. Cond.	DO	pH	ORP	NTU
927	38.15	250	~~7.56~~ 53.9	0.453	0.00	7.55	330	391
932	38.14	250	53.9	0.452	0.00	7.58	329	382
937	38.15	250	54.0	0.449	0.00	7.58	329	384
942	38.15	250	53.7	0.452	0.00	7.55	331	384
947	38.07	250	53.7	0.454	0.00	7.55	331	363
952	38.12	250	54.2	0.455	0.00	7.57	330	357
957	38.12	250	54.1	0.455	0.00	7.55	330	352

Well Sampling Sheet

Well ID: CFMW-028a
Date: 6/27/17
DTW: 36.41'
Depth of Pump Intake: 117.00'
DTB: 122.31'
Total Volume Purged: 6.0 gal.

Purge Start:	0921	Time:	2 hrs	CPM:	3	psi:	75	Discharge Rate:	9 sec.
Purge End:	1144	~~Time:~~	23 min	CPM:	3	psi:	75	Discharge Rate:	9 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0925	36.85	240	14.25	0.213	2.62	7.51	174	183	0.0
0930	36.80	190	12.14	0.232	1.02	10.39	107	1000	
0935	36.88	190	10.39	0.255	0.76	10.90	83	960	
0940	36.86	190	10.24	0.266	0.61	11.09	68	1000	
0945	36.86	190	10.06	0.271	0.55	11.20	56	984	
0950	36.93	190	10.11	0.278	0.51	11.25	44	917	
0955	36.94	240	10.00	0.277	0.47	11.26	37	936	
1000	36.95	240	9.81	0.275	0.44	11.28	29	963	
1007	36.88	240	12.04	0.281	2.30	10.59	42	928	
1012	36.90	240	9.95	0.268	0.42	11.06	23	716	
1017	36.92	240	9.82	0.263	0.57	11.11	-1	654	
1022	36.94	240	9.84	0.254	0.49	11.09	-23	574	
1027	36.96	240	9.60	0.242	0.47	10.96	-40	492	
1032	36.97	240	9.59	0.235	0.49	10.80	-51	413	
1037	36.97	240	9.49	0.229	0.46	10.67	-57	359	
1042	36.98	240	9.59	0.228	0.42	10.51	-60	293	
1047	36.96	240	9.69	0.230	0.39	10.41	-63	241	
1052	36.93	240	9.60	0.234	0.39	10.31	-64	200	
1057	36.91	240	9.70	0.237	0.37	10.21	-64	176	
1102	36.91	240	9.66	0.241	0.39	10.16	-65	153	
1107	36.91	240	9.67	0.246	0.37	10.10	-66	129	
1112	36.91	240	9.75	0.248	0.35	10.07	-68	115	

Purge Water Description: Slightly Cloudy

Sample ID: CFMW-028a-GW
Sample Time: 1120
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GP
- Myron GP pH reading = 8.61
- Paused readings, cleaned out Horiba.

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

1115	36.91	240	9.74	0.250	0.37	10.04	-70	110	
1118	36.91	240	9.67	0.251	0.35	10.03	-71	106	6.0

Well Sampling Sheet

Well ID: CFMW-029 Date: 6/26/17

DTW: 59.85 Depth of Pump Intake: 55 ft

DTB: 78.00 Total Volume Purged: 2.5 gal

Purge Start:	1035	Time:	45	CPM:	4	psi:	50	Discharge Rate:	5 sec
Purge End:	1120	Time:	min	CPM:	4	psi:	50	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1043	59.89	250	62.3	0.350	10.44	7.48	204	81.4	
1048	59.89	250	59.1	0.351	4.35	7.63	245	79.2	
1053	59.89	250	55.8	0.365	2.71	7.72	278	0.00	
1058	59.89	250	550	0.373	3.84	7.73	285	0.00	
1103	59.89	250	54.6	0.376	3.28	7.72	290	0.00	
1108	59.90	250	54.1	0.380	2.68	7.70	296	0.00	
1113	59.90	250	53.9	0.382	2.23	7.70	297	0.00	
1118	59.90	250	53.9	0.383	1.92	7.71	298	0.00	

Purge Water Description: Clear while sampling, colorless

Sample ID: CFMW-029-GW Sample Time: 1120

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Marlboro FA01956

Compressor FA02086

AS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-031 Date: 6/21/17

DTW: 38.50 Depth of Pump Intake: 47 ft

DTB: 52.00 Total Volume Purged: 3 gal

Purge Start:	0748	Time:	38	CPM:	4	psi:	40	Discharge Rate:	5 sec
Purge End:	0830	Time:	min	CPM:	4	psi:	40	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
755	38.50	300	54.3	0.380	1.55	6.75	268	12.2	
800	38.50	300	57.1	0.373	0.79	6.89	279	2.64	
805	38.50	300	54.8	0.371	0.00	7.10	300	0.00	
810	38.50	300	53.9	0.378	0.00	7.14	309	0.00	
815	38.50	300	52.6	0.384	0.00	7.12	320	0.00	
820	32.50	300	52.5	0.388	0.00	7.09	326	0.00	
825	38.50	300	52.5	0.389	0.00	7.06	330	0.00	
830	38.50	300	52.1	0.390	0.00	7.07	332	0.00	

Purge Water Description: Clear, colorless while sampling

Sample ID: CFMW-031-GW Sample Time: 830

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba # FA01956
Compressor # FA02086
AS/LC
DUP13

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-032 Date: 6/20/17

DTW: 43.08 Depth of Pump Intake: 52 feet

DTB: 57.70 Total Volume Purged: 4.5 gal

Purge Start:	800	Time:	1hr	CPM:	4	psi:	45	Discharge Rate:	5secs
Purge End:	920	Time:	20 min	CPM:	4	psi:	45	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
825	43.32	250	54.2	1.41	0.00	6.90	280	266	
830	43.33	250	53.3	1.38	0.00	6.83	286	199	
835	43.30	250	52.1	1.33	0.00	6.85	297	155	
840	43.31	250	51.6	1.23	0.00	6.84	304	119	2
845	43.30	250	51.3	1.24	0.00	6.79	308	78.3	
850	43.30	250	51.2	1.20	0.00	6.79	312	59.7	
855	43.33	250	51.2	1.18	0.00	6.80	316	54.4	
900	43.33	250	50.9	1.15	0.00	6.48	318	69.7	3
905	43.33	250	50.9	1.18	0.00	6.47	321	66.4	
910	43.33	250	51.1	1.09	0.00	6.75	325	65.2	
915	43.33	250	50.9	1.08	0.00	6.74	327	71.5	

Purge Water Description: Slightly turbid, mostly clear, no odor

Sample ID: CFMW-032-GW Sample Time: 920

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba # FA01956

Compressor # FA02086

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-032a
Date: 6/27/17
DTW: 104.87'
Depth of Pump Intake: 200.00'
DTB: 206.50'
Total Volume Purged: 2.0 gal.

Purge Start:	1206	Time:	1 hrs	CPM:	3	psi:	110	Discharge Rate:	~~10~~ 10 sec.
Purge End:	1350	~~Time:~~	44 min	CPM:	3	psi:	110	Discharge Rate:	10 sec.

DF

Time	★DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1212	104.31	70	12.30	3.08	6.29	12.30	9	0.00	0.0
1217	105.18	170	15.21	6.45	3.03	12.89	-103	239	
1222	106.22	130	13.35	7.81	1.07	13.30	-128	175	
1227	107.29	130	12.76	7.93	0.84	13.39	-136	56.2	
1232	108.33	130	12.34	7.21	0.73	13.36	-136	19.3	
1237	109.21	130	12.27	6.46	0.77	13.25	-132	0.00	
1242	109.97	130	12.36	5.93	0.76	13.04	-129	0.00	
1247	110.64	130	12.08	5.68	0.77	12.86	-128	0.00	
1252	110.99	130	11.98	5.51	0.75	12.77	-138	0.00	
1257	111.99	130	12.07	5.35	0.72	12.71	-150	0.00	
1302	112.49	100	12.23	5.22	0.72	12.66	-152	0.00	
1307	113.01	100	12.24	5.15	0.73	12.63	-146	0.00	2.0

→ Not blinking

Purge Water Description: Clear while sampling w/ trace cloudy particulate

Sample ID: CFMW-032a-GW
Sample Time: 1310
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD
- Myron GP pH reading = 12.13

★DTW vs purge rate → Losing more than 0.3' per 3 readings, but want rate of at least 100 ml/min.

Well Sampling Sheet

Well ID: CFMW-033 Date: 6/19/17

DTW: 40.12 Depth of Pump Intake: 58 feet

DTB: 63.50 Total Volume Purged: 4.5 gals

Purge Start:	855	Time:		CPM:	4	psi:	50	Discharge Rate:	5secs
Purge End:	0935	Time:		CPM:	4	psi:	50	Discharge Rate:	"

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	°F T ~~°C~~ [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
900	40.14	380	50.3	0.474	0.93	6.96	280	0.0	
905	40.15	380	49.1	0.471	0.00	7.29	309	0.0	
910	40.15	380	48.8	0.472	0.00	7.38	320	0.0	1
915	40.16	380	48.6	0.473	0.00	7.41	327	0.0	
920	40.15	380	48.5	0.472	0.00	7.42	330	0.0	
925	40.15	380	48.5	0.472	0.00	7.42	333	0.0	2.5
930	40.15	380	48.3	0.472	0.00	7.42	336	0.0	
935	40.15	380	48.3	0.473	0.00	7.43	338	0.0	3.3

Purge Water Description: clear, colorless, odorless

Sample ID: CFMW-033-GW Sample Time: 0940

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Flowbar # FA01956
Bladder #
Compressor # FA02086

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-034

DTW: 39.52

DTB: 62.20

Date: 6/19/17

Depth of Pump Intake: 57 ft

Total Volume Purged: 8 gal

Purge Start:	1032	Time:		CPM:	4	psi:	50	Discharge Rate:	5
Purge End:	1245	Time:		CPM:	3	psi:	45	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1035	39.55	350	53.2	0.490	3.05	7.45	296	931	
1040	39.51	350	50.2	0.550	0.00	7.33	333	655	
1045	39.52	350	50.3	0.503	0.00	7.32	335	780	
1050	39.53	"	50.7	0.507	0.00	7.29	339	694	
1055	39.53	250	51.0	0.505	0.00	7.28	340	564	2
1100	39.53	250	50.8	0.501	0.00	7.28	341	463	
1105	39.53	"	51.0	0.503	0.00	7.27	342	368	
1110	39.53	250	50.7	0.503	0.00	7.27	342	331	3
1115	39.53	250	50.9	0.503	0.00	7.26	343	284	
1120	39.53	250	51.0	0.502	0.00	7.25	344	272	
1125	39.53	250	50.9	0.501	0.00	7.25	343	283	
1130	39.53	250	51.0	0.501	0.00	7.26	343	239	
1135	39.53	250	51.4	0.499	0.00	7.26	343	187	
1140	39.53	250	51.9	0.497	0.00	7.26	342	209	
1145	39.53	250	52.8	0.500	0.00	7.26	340	205	
1150	39.53	250	53.9	0.498	0.00	7.27	338	166	5 gal

Purge Water Description: light brown, turbid became mostly clear

Sample ID: CFMW-034-GW

Sample Time: 1245

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Houba # FA01456

Compressor # FA02086

Break in readings

Car battery died

needed jump

sampled w/TURB

@ 110

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Time	DTW	Temp	PR	Spcond	DO	Turb	pH	ORP
1200	39.53	54.3	250	0.487	0.00	200	7.24	333
1205	39.53	54.1	250	0.484	0.00	211	7.24	336
1210	39.53	53.7	250	0.485	0.00	193	7.25	337
1215	39.53	53.3	250	0.487	0.00	175	7.25	339
1220	39.53	53.2	250	0.487	0.00	174	7.24	341
1225	39.53	53.3	250	0.487	0.00	186	7.23	342
1230	39.53	53.4	250	0.491	0.00	146	7.24	339
1235	39.53	53.9	250	0.489	0.00	107	7.24	337
1240	39.53	53.9	250	0.487	0.00	118	7.25	337
1245	39.53	53.4	250	0.489	0.00	110	7.25	337

Sampled @ 1245

Well Sampling Sheet

Well ID: CFMW-035 Date: 6/20/17

DTW: 36.95 Depth of Pump Intake: 60

DTB: 71.00 Total Volume Purged: 4.5 gal

Purge Start:	1420	Time:	1 hr	CPM:	4	psi:	50	Discharge Rate:	5s
Purge End:	1535	Time:	15m	CPM:	3	psi:	40	Discharge Rate:	9s

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1430	41.02	360	57.5	0.731	11.97	7.24	-68	79.4	
1435	41.97	360	55.9	0.725	1.38	7.20	-69	189	
1440	41.83	360	55.3	0.730	0.00	7.15	-72	160	
1445	41.89	220	56.2	0.736	0.00	7.12	-75	130	
1450	41.91	220	55.4	0.727	0.00	7.07	-76	263	
1455	41.96	220	54.4	0.738	0.00	7.02	-75	270	
1500	42.00	220	54.2	0.746	0.00	6.97	-74	303	
1505	42.04	220	54.1	0.749	0.00	6.91	-72	367	
1510									
1515	41.53	220	57.7	0.700	0.00	6.81	-18	90	
1520	41.70	100	56.8	[illegible]	0.00	6.81	-30	72.6	
1525	41.09	100	57.6	0.741	0.00	6.81	-46	114	
1530	40.65	100	59.8	0.756	0.00	6.81	-54	217	
1535	40.35	100	61.4	0.757	0.00	6.80	-61	273	
1540									
1545									

Purge Water Description: Some sediment, turbid, no odor

Sample ID: CFMW-035-GW Sample Time: 1535

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

All other parameters stable

NOTES:
Horiba # 1956
Compressor # 07086
2nd attempt
Turb high
Horiba might not be giving accurate readings

Approved by LJ to sample
2nd Day attempting to sample

Well Sampling Sheet

Well ID: CFMW-037 Date: 6/20/17

DTW: 62.74' Depth of Pump Intake: 100.00'

DTB: 103.21' Total Volume Purged: 2.5 gal

Purge Start:	1442	Time:	1 hrs	CPM:	3	psi:	65	Discharge Rate:	10 sec
Purge End:	1555	Time:	13 min	CPM:	3	psi:	55	Discharge Rate:	10 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1444	63.29	280	17.06	0.390	10.65	6.91	203	298	0.0
1449	63.38	220	11.81	0.427	13.34	7.83	260	173	
1454	63.50	220	11.54	0.429	12.26	7.92	279	71.6	
1459	63.52	220	11.22	0.430	11.85	7.93	290	46.1	
1504	63.55	220	11.04	0.430	11.48	7.92	295	34.2	
1509	63.58	220	10.89	0.430	11.33	7.92	299	29.7	
1514	63.60	220	10.71	0.431	11.13	7.90	303	13.4	
1519	63.58	220	10.81	0.431	10.87	7.86	306	7.36	
1522	63.56	220	10.66	0.431	10.98	7.84	308	7.53	
1525	63.55	220	10.67	0.431	10.84	7.83	310	7.82	2.5

Purge Water Description: Clear during sampling

Sample ID: CFMW-037-GW Sample Time: 1530

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DTGD

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-038 Date: 6/27/17

DTW: 83.27' Depth of Pump Intake: 102.00'

DTB: 106.76' Total Volume Purged: 2.0 gal.

Purge Start:	1405	Time:	0 hrs	CPM:	3	psi:	70	Discharge Rate:	10 sec.
Purge End:	1500	Time:	55 min	CPM:	3	psi:	70	Discharge Rate:	10 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1408	83.30	290	17.87	0.534	10.57	8.29	162	23.0	0.0
1413	83.30	290	11.75	0.577	8.41	7.64	310	0.00	
1418	83.29	290	11.31	0.574	7.78	7.62	319	0.00	
1423	83.29	290	10.93	0.575	7.86	7.63	325	0.00	
1428	83.29	290	10.91	0.575	7.84	7.61	331	0.00	
1433	83.29	290	10.84	0.574	7.62	7.61	334	0.00	
1438	83.29	290	10.70	0.576	7.66	7.63	335	0.00	2.0

Purge Water Description: Clear while sampling

Sample ID: CFMW-038-GW Sample Time: 1440

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DFIGD
- ☆ No sand pack surrounding PVC within stickup.

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-40 Date: 6/20/17

DTW: 68.45 Depth of Pump Intake: 63

DTB: 93.70 Total Volume Purged: 3 gal

Purge Start:	1238	Time:	47	CPM:	4	psi:	50	Discharge Rate:	5
Purge End:	1325	Time:	min	CPM:	4	psi:	50	Discharge Rate:	5

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1245	68.59	200	59.0	0.564	8.23	7.25	326	246	
1250	68.59	200	57.6	0.563	7.09	7.25	334	166	
1255	68.63	200	55.4	0.576	4.19	7.21	350	68.7	
1300	68.60	200	55.1	0.577	3.65	7.22	354	37.3	
1305	68.64	200	55.1	0.578	3.59	7.21	354	20.2	
1310	68.65	200	55.3	0.579	3.48	7.22	355	11.0	
1315	68.62	200	55.2	0.576	3.11	7.22	357	0.00	
1320	68.62	200	55.2	0.575	3.54	7.22	360	0.00	
1325	68.62	200	54.8	0.574	3.44	7.22	362	0.00	

Purge Water Description: Clear, colorless, no odor

Sample ID: CFMW-40-GW Sample Time: 1330

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba # FA01[illegible]56
Compressor # FA02086

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-042 Date: 6/20/17

DTW: 47.05 Depth of Pump Intake: 55 ft

DTB: 63.8 Total Volume Purged: 4 gal

Purge Start:	1028	Time:	1 hr	CPM:	4	psi:	40	Discharge Rate:	5s
Purge End:	1150	Time:	22 min	CPM:	4	psi:	40	Discharge Rate:	5s

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1035									
1040									
1045	47.09	235	53.4	0.580	3.00	6.97	357	444	
1050	47.09	235	52.9	0.576	4.97	6.99	361	413	
1055	47.09	235	51.9	0.575	0.63	6.99	366	332	
1100	47.09	235	51.7	0.580	0.22	7.00	368	282	
1105	47.09	235	51.4	0.583	0.00	7.01	370	214	
1110	47.09	235	51.4	0.585	0.00	7.02	371	149	
1115	47.09	235	51.6	0.586	0.00	7.04	371	103	
1120	47.09	235	51.4	0.585	0.00	7.05	372	96.3	
1125	47.09	235	51.5	0.585	0.00	7.05	373	74.3	
1130	47.09	235	51.5	0.585	0.00	7.06	373	70.2	
1135	47.09	235	51.4	0.586	0.00	7.08	374	64.8	
1140	47.09	235	51.2	0.586	0.00	7.07	374	59.9	
1145	47.09	235	51.4	0.587	0.00	7.09	374	67.5	
1150									

Purge Water Description: Mostly clear, no odor

Sample ID: CFMW-042-GW Sample Time: 1150

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba # FA01956
Compressor # FA02086

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-043 Date: 6/21/17

DTW: 43.13 Depth of Pump Intake: ~~57~~ ft 55

DTB: 62.52 Total Volume Purged: 5 gal

Purge Start:	927	Time:	1hr	CPM:	4	psi:	40	Discharge Rate:	5sec
Purge End:	1035	Time:	7min	CPM:	4	psi:	40	Discharge Rate:	5sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
935	43.20	225	54.1	0.603	25.68	7.37	299	205	
940	43.20	225	53.4	0.604	13.65	7.34	306	158	
945	43.21	225	52.0	0.607	4.84	7.30	317	132	
950	43.19	225	51.5	0.614	3.31	7.26	323	108	
955	43.20	225	51.1	0.617	3.05	7.23	329	96.4	
1000	43.20	225	51.1	0.620	2.75	7.19	333	78.3	
1005	43.20	225	51.1	0.621	2.56	7.13	341	88.0	
1010	43.20	225	50.8	0.623	2.39	7.09	342	90.3	
43.15 1015	43.20	225	50.9	0.624	2.32	7.07	343	95.3	
1020	43.15	225	51.5	0.623	1.90	7.13	344	73.3	
1025	43.15	225	51.7	0.619	1.95	7.12	346	49.0	
1030	43.15	225	51.7	0.617	2.40	7.03	350	50.3	
1035	43.15	225	51.7	0.619	2.48	7.02	358	49.6	

Purge Water Description: Colorless, clear while sampling

Sample ID: CFMW-043-GW Sample Time: 1040

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba # FA01956
Compressor # FA02076
AS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-44 Date: 6/21/17

DTW: 41.90 Depth of Pump Intake: 49 ft

DTB: 54.00 Total Volume Purged: 5 gal

Purge Start:	1125	Time:		CPM:	4	psi:	40	Discharge Rate:	5 sec
Purge End:	1200	Time:	35 min	CPM:	4	psi:	40	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1130	42.01	250	55.8	0.731	0.00	7.55	-167	15.5	
1135	42.01	250	54.8	0.726	0.00	7.57	-175	9.29	
1140	42.02	250	52.8	0.727	0.00	7.60	-186	9.56	
1145	42.05	250	51.6	0.736	0.00	7.62	-195	8.88	
1150	42.05	250	51.1	0.741	0.00	7.61	-200	10.2	
1155	42.05	250	50.8	0.742	0.00	7.60	-200	16.9	
1200	42.05	250	50.8	0.739	0.00	7.57	-196	13.5	

Purge Water Description: Clear when sampling colorless, smelled like dead animal was in well

Sample ID: CFMW-44-GW Sample Time: 1205

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba # FAO 1956
Compressor # FAO 2026
AS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-044a
Date: 6/23/17
DTW: 46.57
Depth of Pump Intake: 107.00
DTB: 112.94
Total Volume Purged: 2.5 gal.

Purge Start:	0808	Time:	1 hrs	CPM:	3	psi:	75	Discharge Rate:	10 sec.
Purge End:	0930	Time:	22 min	CPM:	3	psi:	70	Discharge Rate:	7 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0810	47.09	300	11.93	0.431	3.47	6.88	191	318	0.0
0815	48.84	300	9.74	0.455	0.91	8.77	-107	759	
0820	49.77	230	9.36	0.446	0.60	8.63	-100	438	
0825	50.02	230	9.48	0.427	0.74	8.55	147	281	
0830	50.38	230	9.35	0.410	0.72	8.52	138	190	
0835	50.49	230	9.38	0.401	0.67	8.54	130	127	
0840	50.64	230	9.30	0.411	0.64	8.56	125	111	
0845	50.45	230	9.75	0.415	0.68	8.57	120	105	
0850	50.33	230	9.37	0.417	0.60	8.54	117	101	
0855	50.39	210	9.32	0.420	0.59	8.50	112	68.9	
0900	50.46	210	9.25	0.428	0.57	8.50	108	66.6	
0905	50.52	210	9.31	0.428	0.55	8.50	105	63.5	2.5

Purge Water Description: Clear while sampling, no sign of precipitate.

Sample ID: CFMW-044a-GW
Sample Time: 0915
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- GD/DF
- Myron 6P pH reading - 8.12

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-044b
Date: 6/23/17
DTW: 57.22'
Depth of Pump Intake: 235.00'
DTB: 291.50'
Total Volume Purged: 2.0 gal

Purge Start:	0946	Time:	3 hrs	CPM:	3	psi:	110	Discharge Rate:	12.5 sec
Purge End:	1250	Time:	4 min	CPM:	3	psi:	110	Discharge Rate:	12 sec

Horiba loses air.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0955	56.81	80	15.30	0.297	2.16	7.08	-24	86.5	0.0
1000	56.90	80	12.97	0.334	1.58	7.10	-24	97.4	
1005	56.96	80	15.22	0.339	1.26	6.99	-143	126	
1010	57.01	80	14.70	0.350	1.27	6.95	-144	134	
1015	57.10	80	16.08	0.355	1.06	6.92	-142	130	
1020	57.16	80	16.45	0.359	1.08	7.08	-139	193	
1025	57.20	100	14.08	0.409	1.48	7.98	-123	55.3	
1030	57.24	100	13.44	0.405	0.99	8.24	-155	55.9	
1045	57.28	100	12.64	0.405	0.82	8.37	-168	88.2	
1050	57.31	100	13.23	0.405	0.65	8.39	-175	102	
~~1055~~	~~57.34~~	~~100~~	~~12.87~~	~~0.412~~	~~0.55~~	~~8.41~~	~~-182~~	~~48.5~~	
1100	57.38	100	12.44	0.409	0.50	8.51	-189	43.9	
1103		100	12.93	0.403	0.46	8.56	-189	33.4	
1113		100	12.97	0.405	0.46	8.56	-190	32.4	
1116		100	13.05	0.406	0.47	8.56	-189	31.3	
~~1119~~		~~100~~							2.0

Purge Water Description: Clear w/ yellowish tint.

Sample ID: CFMW-044b-GW
Sample Time: 1130
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD
- ★ Stop purge @ 1020 due to Horiba releasing air, take apart Horiba, recalibrate, and resume purge @ 1035

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-045

Date: 6/28/17

DTW: 75.80

Depth of Pump Intake: 92 ft

DTB: 99.50

Total Volume Purged: 3.5 gal

Purge Start:	1015	Time:	55	CPM:	3	psi:	65	Discharge Rate:	9 sec
Purge End:	1110	Time:	min	CPM:	3	psi:	65	Discharge Rate:	9 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1035	75.80	330	58.1	0.523	6.27	7.53	255	36.3	
1040	75.83	330	54.9	0.529	4.17	7.44	286	15.3	
1045	75.80	330	52.5	0.552	1.76	7.37	316	0.74	
1050	75.77	330	52.0	0.563	1.64	7.37	317	0.00	
1055	75.80	330	51.8	0.566	1.50	7.34	320	0.00	
1100	75.80	330	51.7	0.567	1.08	7.32	323	0.00	
1105	75.80	330	51.7	0.569	0.87	7.34	322	0.00	
1110	75.80	330	51.7	0.569	0.84	7.36	322	0.00	

Purge Water Description: Clear while sampling

Sample ID: CFMW-045-GW

Sample Time: 1115

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FA01956

Compressor FA02086

AS/LC

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-045a
Date: 6/23/17
DTW: 82.80'
Depth of Pump Intake: 155.00'
DTB: 161.29'
Total Volume Purged: 3.25 gal

Purge Start:	1314	Time:	1 hrs	CPM:	3	psi:	90	Discharge Rate:	11 sec
Purge End:	1510	~~Time:~~	56 min	CPM:	3	psi:	85	Discharge Rate:	8 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1317	82.71	290	20.36	0.205	5.25	8.62	108	49.3	0.0
1322	85.20	290	12.56	0.483	0.81	7.85	-118	110	
1327	85.80	200	12.35	0.385	0.72	8.64	-179	70.0	
1332	85.98	160	12.09	0.341	0.59	8.85	-169	48.3	
1337	85.20	160	12.40	0.356	0.58	8.71	-155	31.7	
1342	85.68	160	12.35	0.374	0.56	8.49	-150	28.0	
1347	85.97	160	12.37	0.391	0.55	8.32	-144	19.3	
1352	86.45	160	12.34	0.396	0.52	8.20	-135	3.86	
1357	86.52	160	12.57	0.409	0.44	8.19	-132	172	
1402	86.60	160	11.84	0.443	0.42	8.15	-127	153	
1407	86.58	160	14.68	0.406	0.98	8.16	-124	192	
1412		160	11.53	0.533	0.71	8.16	-125	11.9	
1417	86.56	160	11.39	0.533	0.62	8.19	-125	13.2	
1422		160	11.30	0.533	0.46	8.16	-125	0	
1425	86.51	160	11.34	0.535	0.41	8.15	-123	0	
1428	86.48	160	11.34	0.539	0.39	8.15	-122	0	
1431	86.46	160	11.20	0.543	0.38	8.10	-122	0	3.25

Purge Water Description: Clear while sampling.

Sample ID: CFMW-045a-GW
Sample Time: 1435
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD: Team

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-047 Date: 6/21/17

DTW: 94.61' Depth of Pump Intake: 118.00'

DTB: 123.13' Total Volume Purged: 3.0 gal.

Purge Start:	1342	Time:	1 hrs	CPM:	3	psi:	80	Discharge Rate:	11 sec.
Purge End:	1445	Time:	~~3~~ min	CPM:	3	psi:	80	Discharge Rate:	9.5 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1346	94.88	310	16.45	0.447	10.80	8.27	198	406	0.0
1351	94.89	270	12.26	0.485	11.16	7.87	304	436	
1356	95.89	270	11.90	0.484	10.97	7.94	308	289	
1401	95.10	310	11.58	0.483	10.46	7.94	313	283	
1406	95.03	310	11.51	0.485	10.24	7.96	314	395	
1411	94.99	310	11.46	0.485	10.09	7.96	316	400	
1416	94.94	290	11.54	0.484	9.68	7.94	321	9.69	
1421	94.98	290	11.37	0.484	9.79	7.95	323	3.81	
1426	94.98	290	11.41	0.484	9.33	7.89	327	3.98	
1429	94.98	290	11.34	0.484	9.23	7.91	327	3.72	3.0

Purge Water Description: Clear while sampling

Sample ID: CFMW-047-GW Sample Time: 1430

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD
- Myron 6P pH reading: 7.98

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-049 Date: 6/21/17

DTW: 93.54' Depth of Pump Intake: 110.00'

DTB: 114.01' Total Volume Purged: 2.0 gal

Purge Start:	1047	Time:	0 hrs	CPM:	3	psi:	70	Discharge Rate:	11 sec
Purge End:	1145	Time:	58 min	CPM:	3	psi:	70	Discharge Rate:	11 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1050	93.54	280	15.07	0.437	12.79	7.91	148	21.8	0.0
1055	93.54	280	10.84	0.446	11.05	7.34	264	8.38	
1100	93.54	280	10.28	0.441	9.60	7.54	280	3.75	
1105	93.54	280	10.22	0.440	9.29	7.84	287	2.73	
1110	93.54	280	10.27	0.440	9.13	8.04	295	1.42	
1115	93.54	280	10.31	0.439	9.23	8.07	300	0.97	
1120	93.54	280	10.14	0.441	9.16	8.08	303	0.95	
1125	93.54	280	10.28	0.441	8.89	8.05	307	0.91	2.0

Purge Water Description: Clear while Sampling

Sample ID: CFMW-049-GW Sample Time: 1130

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-049a
Date: 6/21/17
DTW: 93.78'
Depth of Pump Intake: 145.00'
DTB: 151.13'
Total Volume Purged: 3.5 gal

Purge Start:	0757	Time:	2 hrs	CPM:	3	psi:	85	Discharge Rate:	10 sec.
Purge End:	1020	~~Time:~~	23 min	CPM:	3	psi:	85	Discharge Rate:	11 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0801	94.22	190	15.36	0.368	8.60	7.36	321	249	0.0
0806	94.22	160	11.96	6.38	3.75	12.76	-10	114	
0811	94.10	160	10.95	5.98	3.38	12.87	-55	123	
0816	94.24	210	10.71	4.26	4.05	12.76	-57	75.9	
0821	94.25	210	10.67	3.05	4.56	12.59	-47	64.1	
0826	94.25	210	10.57	2.27	5.24	12.43	-37	63.1	
0831	94.26	220	10.46	1.86	6.01	12.28	-26	99.0	
0836	94.25	220	10.40	1.65	5.87	12.20	-20	86.7	
0841	94.25	220	10.43	1.47	6.64	12.13	-11	71.1	
0846	94.24	220	10.39	1.34	6.63	12.09	-6	81.2	
0851	94.24	220	10.46	1.22	6.39	12.09	1	87.7	
0856	94.23	220	10.35	1.14	7.16	12.08	9	99.9	
0901	94.23	220	10.37	1.09	7.16	12.07	12	95.0	
0906	94.23	220	10.41	1.05	7.27	12.08	18	93.4	3.5

Purge Water Description: Clear with cloudy ~~particle~~ DF precipitate.

Sample ID: CFMW-049a-GW Sample Time: 0915

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	✓
Matrix Spike Duplicate	✓

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD
- Myron 6P pH reading = 11.21

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW - 050
Date: 6/21/17
DTW: 96.59'
Depth of Pump Intake: 120.00'
DTB: 123.39'
Total Volume Purged: 3.5 gal.

Purge Start:	1215	Time:	1 hrs	CPM:	3	psi:	85	Discharge Rate:	11 sec
Purge End:	1325	Time:	10 min	CPM:	3	psi:	85	Discharge Rate:	11 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1220	96.60	280	14.14	0.428	6.76	8.48	116	238	0.0
1225	96.60	280	13.24	0.439	10.57	8.05	142	92.0	
1230	96.60	280	11.72	0.449	10.60	8.06	186	53.7	
1235	96.60	280	11.37	0.454	10.47	8.10	232	35.5	
1240	96.60	280	11.05	0.455	10.06	8.09	259	32.5	
1245	96.60	280	10.96	0.455	9.85	8.07	271	26.7	
1250	96.60	280	10.76	0.457	9.80	8.08	279	20.8	
1255	96.60	280	10.80	0.456	9.83	8.07	282	18.1	
1300	96.60	280	10.78	0.459	9.81	8.07	288	17.7	
1305	96.60	280	10.79	0.459	9.79	8.07	289	16.9	3.5

Purge Water Description: Clear while sampling

Sample ID: CFMW-050-GW
Sample Time: 1315
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF/GD

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-053 Date: 6/28/17

DTW: 48.35 Depth of Pump Intake: 71 ft

DTB: 76.60 Total Volume Purged: 2 gal

Purge Start:	1405	Time:	35	CPM:	4	psi:	50	Discharge Rate:	5 sec
Purge End:	1440	Time:	min	CPM:	4	psi:	50	Discharge Rate:	5 sec

Time	48.37 DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1410	~~[illegible]~~	230	59.3	0.509	9.27	8.93	190	0.00	
1415	48.35	230	54.6	0.504	6.12	8.42	237	0.00	
1420	48.35	230	51.0	0.499	0.00	7.75	288	0.00	
1425	48.35	230	50.2	0.510	0.00	7.60	301	0.00	
1430	48.35	230	50.0	0.514	0.00	7.55	307	0.00	
1435	48.35	230	49.8	0.515	0.00	7.51	312	0.00	
1440	48.35	230	49.7	0.516	0.00	7.49	316	0.00	

Purge Water Description: Clear white Sampling

Sample ID: CFMW-053-GW Sample Time: 1445

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

Horiba FA01956

Compressor FA02086

AS/LC

* Pressure transducer paused while sampling

S-Resumed @ 1510

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-053a
Date: 6/28/17
DTW: 84.26'
Depth of Pump Intake: 157.00'
DTB: 162.55'
Total Volume Purged: 2.0 gal

Purge Start:	1407	Time:	1 hrs	CPM:	3	psi:	85	Discharge Rate:	10 sec.
Purge End:	1600	Time:	53 min	CPM:	3	psi:	85	Discharge Rate:	9 sec.

Time 12	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1407	83.49	140	20.31	5.00	6.30	12.88	-54	4.04	0.0
1412	84.45	140	13.95	7.33	3.95	13.39	-95	0.00	
1422	85.21	100	12.52	7.94	1.47	13.43	-107	0.00	
1427	85.89	100	12.40	8.01	1.00	13.17	-98	0.00	
1432	86.41	100	12.61	7.93	0.83	12.65	-74	30.7	
1437	86.92	100	12.88	7.79	0.77	11.53	-20	0.00	
1442	87.31	100	13.80	7.70	0.71	10.97	16	0.00	
1447	88.07	100	12.51	7.75	0.64	9.81	70	0.00	
1452	88.68	100	13.28	7.90	0.64	9.03	110	21.8	
1457	89.47	100	14.33	7.33	0.68	8.94	111	0.00	
1502	90.15	100	12.86	7.41	0.68	9.60	79	0.00	
1507	90.97	100	12.53	7.31	0.65	10.11	54	0.00	
1513	91.34	100	13.48	7.32	0.88	10.37	47	0.00	
1520	92.46	100	12.30	7.18	0.61	10.51	40	0.00	
1523	92.90	100	12.30	7.15	0.62	10.53	41	0.00	2.0

Purge Water Description: Clear, trace precipitate film on water surface

Sample ID: CFMW-053a-GW
Sample Time: 1530
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DFGD
- Myron 6P pH reading: 12.37
- Pressure transducer paused + resumed
- DTB vs PTS ↳ Temp = 17.515°C
  Pressure = 24.278 PSI
  Level DTW = 9.804'

keep PR @ lowest min still turn transducer.

Bleeding

Well Sampling Sheet

Well ID: CFMW-054 Date: 06/21/17

DTW: 71.73 Depth of Pump Intake: 83 feet

DTB: 88.00 Total Volume Purged: 2.5 gal

Purge Start:	1455	Time:		CPM:	4	psi:	70	Discharge Rate:	5 sec
Purge End:	1535	Time:		CPM:	4	psi:	70	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1500	71.15	250	63.7	0.492	9.94	7.63	214	19.3	
1505	71.08	250	61.3	0.488	7.66	7.60	235	1.26	
1510	71.12	250	57.9	0.493	5.17	7.54	261	0.00	
1515	71.12	250	56.1	0.506	4.42	7.50	271	0.00	
1520	71.12	250	55.6	0.512	3.85	7.47	280	0.00	
1525	71.12	250	54.7	0.517	3.80	7.45	288	0.00	
1530	71.12	250	54.5	0.519	3.67	7.45	290	0.00	
1535	71.12	250	54.4	0.521	3.53	7.46	293	0.00	

Purge Water Description: Clear while sampling, colorless

Sample ID: CFMW-054-GW Sample Time: 1535

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

NOTES:
Moriba # FA01956
Compressor # FA02086
AS/LC

Well Sampling Sheet

Well ID: CFMW-056
Date: 6/22/17
DTW: 75.12'
Depth of Pump Intake: 175.00'
DTB: 180.06'
Total Volume Purged: 3.5 gal

Purge Start:	1209	Time:	1 hrs	CPM:	3	psi:	85	Discharge Rate:	11 sec
Purge End:	1315	~~Time:~~	6 min	CPM:	3	psi:	105	Discharge Rate:	12 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1215	75.15	180	21.08	0.177	1.84	9.14	53	42.9	0.0
1220	75.20	310	11.68	0.382	0.97	8.32	-165	19.8	
1225	75.25	310	10.66	0.398	0.79	8.36	-179	30.8	
1230	75.30	310	9.97	0.401	0.99	8.41	-180	44.8	
1235	75.32	310	9.89	0.401	1.10	8.40	-178	47.2	
1240	75.35	310	9.86	0.399	1.20	8.38	-177	43.2	
1245	75.38	310	9.73	0.400	1.32	8.36	-174	38.9	
1250	75.40	310	9.63	0.400	1.39	8.35	-172	36.8	
1255	75.42	310	9.72	0.399	1.43	8.30	-169	36.1	3.5

Purge Water Description: Clear while sampling

Sample ID: CFMW-056-GW
Sample Time: 1300
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Bladder: FA00408
- Horiba: FA00738
- DF/GD
- ~~A~~ J-plug off on well upon arrival - no rain recently, sample and take parameters of well.

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Well Sampling Sheet

Well ID: CFMW-056a
Date: 6/22/17
DTW: 68.73
Depth of Pump Intake: 128.00'
DTB: 137.52'
Total Volume Purged: 3.0 gal

Purge Start:	1355	Time:	1 hrs	CPM:	3	psi:	75	Discharge Rate:	10 sec
Purge End:	1545	Time:	50 min	CPM:	3	psi:	70	Discharge Rate:	7 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1358	69.14	250	17.64	0.259	22.65	10.06	-140	0.00	0.0
1403	71.25	250	11.61	0.286	0.78	10.46	-213	743	
1408	71.83	100	12.82	0.291	0.55	10.65	-246	239	
1413	72.19	100	14.20	0.291	0.56	10.62	-249	228	
1418	72.53	100	14.42	0.290	0.57	10.49	-250	292	
1423	73.38	100	13.02	0.288	0.56	10.28	-232	254	
1428	74.22	160	11.91	0.287	0.44	10.27	-241	185	
1433	75.25	160	10.21	0.289	0.40	10.21	-249	194	
1438	76.75	160	11.61	0.291	0.41	10.12	-252	194	
1443	76.97	158	11.29	0.299	0.47	10.03	-240	175	
1448	77.65	150	10.38	0.303	0.42	9.95	-247	183	
1453	78.08	150	10.96	0.303	0.44	9.87	-258	179	
1503	78.08	150	11.33	0.313	0.44	9.72	-260	175	
1506	78.61	150	11.27	0.314	0.44	9.71	-260	153	
1509	78.94	150	11.22	0.315	0.48	9.68	-263	162	
1512	79.01	150	11.14	0.315	0.42	9.68	-264	165	3.0

Purge Water Description: Slightly cloudy, greyish in color, heavy sulfur odor.

Sample ID: CFMW-056a-GW
Sample Time: 1515
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DI/GD
- Strong sulfur odor.
- Myron 6P pH reading: 8.53

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: CFMW-56b
Date: 6/22/17
DTW: 27.84
Depth of Pump Intake: 47 ft
DTB: 52.3 ft
Total Volume Purged: 3.5 gal

Purge Start:	1432	Time:	48	CPM:	4	psi:	40	Discharge Rate:	5 secs
Purge End:	1520	Time:	min	CPM:	4	psi:	35	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1440	27.90	330	50.5	0.511	5000	7.43	104	742	
1445	27.92	250	49.7	0.513	2.89	7.36	120	410	
1450	27.93	250	49.5	0.513	2.55	7.35	131	273	
1455	27.90	250	49.4	0.516	2.47	7.34	136	175	
1500	27.95	250	49.3	0.518	2.31	7.33	141	107	
1505	27.92	250	49.4	0.519	2.23	7.33	145	57	
1510	27.92	250	49.4	0.520	2.05	7.34	146	49.8	3
1515	27.93	250	49.3	0.520	1.92	7.33	148	27.8	
1520	27.93	250	49.1	0.521	1.82	7.32	150	26.1	3.5

Purge Water Description: Clear when sampling, odorless

Sample ID: CFMW-56b-GW
Sample Time: 1525
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba FA1956
Compressor FA0226
AS/SM

Analysis	
8270D - SVOC	NA
8260B - VOC	NA
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	NA

Well Sampling Sheet

Well ID: CEMW-057 Date: 6/28/17

DTW: 71.84' Depth of Pump Intake: 167.00'

DTB: 172.70' Total Volume Purged: 4.5 gal.

Purge Start:	0755	Time:	1 hrs	CPM:	3	psi:	85	Discharge Rate:	12 sec.
Purge End:	0950	~~Time:~~	55 min	CPM:	3	psi:	105	Discharge Rate:	13 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0802	71.87	140	14.22	0.241	1.70	5.66	86	6.33	0.0
0807	71.92	300	9.16	0.377	0.72	6.82	-136	79.5	
0812	71.90	300	8.32	0.398	0.59	6.60	-185	106	
0817	71.88	300	8.82	0.390	0.69	6.15	-184	94.0	
0822	71.86	~~300~~ 280	9.17	0.399	0.71	6.62	-178	79.4	
0827	71.87	~~300~~ 280	8.20	0.399	0.86	7.08	-184	87.3	
0832	71.87	~~300~~ 280	8.20	0.397	0.96	7.46	-192	78.7	
0837	71.87	280	8.22	0.396	1.10	7.71	-199	75.2	
0842	71.86	280	8.18	0.395	1.29	7.86	-193	64.2	
0847	71.85	280	8.33	0.395	1.46	7.92	-193	63.7	
0852	71.84	280	8.44	0.394	1.62	7.99	-190	57.9	
0857	71.84	280	8.39	0.394	1.77	7.96	-188	53.1	
0902	71.84	280	8.40	0.393	1.88	7.97	-187	49.5	
0907	71.84	280	8.51	0.393	1.98	7.97	-186	44.0	
0910	71.84	280	8.47	0.394	2.00	7.99	-184	43.8	↓
0913	71.84	280	8.47	0.394	2.02	7.97	-184	43.1	4.5

Purge Water Description: Clear, grey in color

Sample ID: CEMW-057-GW Sample Time: 0915

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	✓
Matrix Spike Duplicate	✓

NOTES:
- Floriba: FA00738
- Bladder: FA00408
- GP/DF

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Well Sampling Sheet

Well ID: CFMW-057a
Date: 6/28/17
DTW: 66.69'
Depth of Pump Intake: 135.00'
DTB: 140.41'
Total Volume Purged: 1.75 gal

Purge Start:	1005	Time:	1 hrs	CPM:	3	psi:	75	Discharge Rate:	11 sec.
Purge End:	1135	Time:	30 min	CPM:	3	psi:	75	Discharge Rate:	10 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1010	66.67	150	16.77	1.22	6.08	11.81	23	49.5	0.0
1015	66.78	150	13.30	2.06	2.44	12.30	-65	9.16	
1020	68.09	150	12.16	2.19	1.49	12.43	-90	6.69	
1025	69.52	150	11.81	1.99	1.35	12.49	~~-114~~	14.5	
1030	69.94	100	11.67	1.87	1.57	12.51	~~-97~~	14.7	
1035	70.39	100	11.69	1.76	1.89	12.52	-99	9.58	
1040	71.40	100	11.72	1.65	2.39	12.53	-95	3.12	
1045	72.44	100	11.68	1.59	2.61	12.53	-93	4.17	
1050	73.48	100	11.69	1.55	2.66	12.55	-99	4.04	
1055	74.45	100	11.76	1.52	2.63	12.57	-96	3.86	1.75

Purge Water Description: Clear while sampling - no sign of precipitate

Sample ID: CFMW-057a-GW
Sample Time: 1100

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA004008
- DF/GD
- Myron GP pH reading = 11.51
- DTW vs PR problem - losing more than 0.3' per 3 readings while PR @ low - 100 ml/min.

Well Sampling Sheet

Well ID: CFMW-059 Date: 6/21/17

DTW: 63.17 Depth of Pump Intake: ~~89~~ 87

DTB: 94.00 Total Volume Purged: 4 gal

Purge Start:	1255	Time:	1hr	CPM:	4	psi:	70	Discharge Rate:	5 sec
Purge End:	1425	Time:	30m	CPM:	3	psi:	65	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1305	63.28	210	67.6	0.472	8.13	7.60	8	324	
1310	63.30	210	61.9	0.488	5.15	7.49	61	348	
1315	63.28	210	57.3	0.519	3.15	7.41	99	325	
1320	63.29	210	56.3	0.518	2.99	7.38	105	378	
1325	63.26	210	55.7	0.523	2.91	7.95	112	311	
1330	63.30	210	55.9	0.522	2.99	7.28	122	240	
1335	63.30	210	55.3	0.523	2.98	7.24	124	233	
1340	63.28	210	55.7	0.526	3.04	7.24	129	232	
1345	63.30	210	55.5	0.528	3.10	7.23	132	214	
1350	63.28	190	55.4	0.530	3.16	7.23	132	218	
1355	63.30	190	56.4	0.537	4.00	7.25	132	203	
1400	63.30	190	56.3	0.534	4.25	7.24	133	185	
1405	63.30	190	56.7	0.532	4.39	7.23	133	146	
1410	63.30	190	56.8	0.531	4.20	7.25	133	123	
1415	63.30	190	56.6	0.531	4.14	7.27	135	120	
1416	63.30	190	56.5	0.532	4.19	7.28	132	110	1416
1419	63.30	190	56.6	0.531	4.22	7.29	130	95.8	1419
1422	63.30	190	56.8	0.534	4.10	7.31	130	87.5	1422

Purge Water Description: Slightly turbid, Clear while Sampling

Sample ID: CFMW-059-GW Sample Time: 1425

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Horiba # FA01956
Compass # FA02026
PB/LC
All parameters stable
Sample @ 26.5 NTU

Analysis	
8270D - SVOC	
8260B - VOC	
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	

Well Sampling Sheet

Well ID: CFMW-059a
Date: 6/28/17
DTW: 64.61'
Depth of Pump Intake: 158.00'
DTB: 163.98'
Total Volume Purged: 3.0 gal.

Purge Start:	1157	Time:	1 hrs	CPM:	3	psi:	80	Discharge Rate:	10 sec
Purge End:	1332	Time:	35 min	CPM:	3	psi:	80	Discharge Rate:	12 sec.

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1201	64.65	130	20.36	0.129	2.08	9.99	-75	0.00	0.0
1206	64.73	180	14.73	0.163	0.87	10.82	-147	0.00	
1211	64.78	180	12.98	0.181	0.49	11.16	-167	1,000	
1216	64.84	180	12.52	0.173	0.49	11.01	-165	698	
1221	64.90	180	12.43	0.176	0.44	10.55	-153	495	
1226	64.97	180	12.10	0.187	0.42	10.24	-145	353	
1231	65.01	180	11.83	0.201	0.39	10.01	-139	240	
1236	65.01	180	11.77	0.210	0.39	9.87	-136	182	
1241	65.01	200 ~~180~~	11.21	0.219	0.36	9.75	-133	139	
1246	65.08	200 ~~180~~	11.31	0.226	0.34	9.67	-132	129	
1251	65.16	200	11.07	0.235	0.34	9.58	-130	104	
1256	65.22	200	10.74	0.240	0.32	9.51	-127	87.2	
1301	65.24	200	10.61	0.246	0.32	9.45	-126	81.5	
1304	65.26	200	10.62	0.249	0.31	9.42	-125	68.5	
1307	65.28	200	10.68	0.250	0.30	9.39	-125	65.7	
1310	65.30	200	10.62	0.252	0.30	9.38	-125	67.8	3.0

Blinking

Purge Water Description: Clear, slight odor sulfur, No precipitate observed.

Sample ID: CFMW-059a-GW
Sample Time: 1315
Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Horiba: FA00738
- Bladder: FA00408
- DF-1GD
- Myron GP pH reading = 8.89

Analysis	
8270D - SVOC	N/A
8260B - VOC	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Well Sampling Sheet

Well ID: CFMW-061 Date: 6/23/17

DTW: 9.48 Depth of Pump Intake: 21 ft

DTB: 26.00 Total Volume Purged: 4 gal

Purge Start:	1205	Time:	45	CPM:	4	psi:	25	Discharge Rate:	5sec
Purge End:	1250	Time:	min	CPM:	4	psi:	25	Discharge Rate:	5 sec

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
1212	9.52	450	54.8	0.404	44.43	7.60	205	19.7	
1217	9.52	450	53.6	0.405	12.47	7.54	202	0.00	
1222	9.52	450	52.7	0.407	0.00	7.47	198	0.00	
1227	9.52	450	52.3	0.410	0.00	7.45	194	0.00	
1232	9.52	450	52.1	0.412	0.00	7.43	189	0.00	
1237	9.52	450	52.0	0.413	0.00	7.42	184	0.00	3.5
1242	9.52	450	52.0	0.413	0.00	7.41	181	0.00	
1247	9.52	450	51.9	0.413	0.00	7.39	179	0.00	4

Purge Water Description: Clear while sampling

Sample ID: CFMW-061-GW Sample Time: 1250

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
FAO 1956 Horiba
Compressor FAO2008
AS/SM

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Well Sampling Sheet

Well ID: OFMW-064 Date: 6/23/17

DTW: 10.14 Depth of Pump Intake: 25 ft

DTB: 32.70 Total Volume Purged: 9.5 gal

Purge Start:	815	Time:	2 hr	CPM:	4	psi:	40	Discharge Rate:	5 sec
Purge End:	1635	Time:	20 min	CPM:	3	psi:	25	Discharge Rate:	7

Time	DTW (ft bls) [0.3 ft*]	PR (ml/min) [100-500 ml/min]	T (°C) [3%]	Sp. Cond. (mS/cm) [3%]	DO (mg/L) [10%]	pH (SU) [+/- 0.1 units]	ORP (mV) [+/- 10 mV]	Turb (NTU) [10%]	Volume Purged (gallons)
0817	10.17	450	54.9	0.420	0.00	6.76	240	>1000	
0822	10.18	410	53.0	0.408	0.00	6.96	253	>1000	
0827	10.18	320	52.2	0.404	0.00	7.24	266	>1000	
0832	10.18	320	51.6	0.409	0.00	7.43	275	>1000	
0837	10.18	310	51.6	0.412	0.00	7.46	275	>1000	
0842	10.18	310	51.1	0.412	0.00	7.45	278	1000	
0847	10.18	310	50.4	0.414	0.00	7.49	280	>1000	
0852	10.18	310	50.2	0.416	0.00	7.52	286	>1000	4.5
0908	10.18	390	48.7	0.417	0.00	7.07	230	162	
0913	10.18	390	48.7	0.431	0.00	7.42	268	749	
0918	10.18	390	49.4	0.435	0.00	7.46	272	917	
0928	10.18	390	51.1	0.441	0.00	7.49	273	469	
0933	10.18	120	51.9	0.436	0.00	7.51	274	415	7.0
0938	10.18	120	52.1	0.433	0.00	7.53	276	750	
0945	10.18	120	53.9	0.432	0.00	7.52	275	687	
0950	10.18	140	54.1	0.433	0.00	7.53	274	649	

Purge Water Description: Clear while sampling

Sample ID: OFMW-064-GW Sample Time: 1035

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

see back of sheet

Monsoon HFA01956

Compressor HFA02026

AS/SM

Analysis	
8270D - SVOC	✓
8260B - VOC	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
350.1 - Ammonia; 353.2_Pres Nitrogen, Nitrate-Nitrite	✓
2320B - Alkalinity	✓
300.0 - Dissolved Fluoride	✓
2540C - Total Dissolved Solids	✓
2540D - Total Suspended Solids	✓
6020A/7470A - TAL Metals (dissolved)	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Time	DTW	PR	T	SC	DO	pH	ORP	Turb	Vol
0955	10.18	140	54.3	0.433	0.00	7.54	275	253	
1000	10.18	140	53.6	0.429	0.00	7.54	280	202	
1005	10.18	140	53.3	0.430	0.00	7.53	285	194	
1010	10.18	140	53.4	0.432	0.00	7.52	280	158	
1015	10.18	140	54.0	0.434	0.00	7.52	290	133	
1020	10.18	140	54.1	0.433	0.00	7.53	291	120	9
1025	10.18	140	54.1	0.432	0.00	7.52	293	575	
1030	10.18	140	54.0	0.431	0.00	7.50	295	83.8	9.5
1035									

APPENDIX C-2

Surface Water Sample Field Data Sheets

Surface Water Sampling Sheet

Location ID: CFSWP-001 **Date:** 9/16/16

Site Feature: Flathead River

Visual Descrption: clear

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1110	12.86	0.168	12.62	7.71	175	0.00	

Sample ID: CFSWP-001-SW Sample Time: 1110

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-002 **Date:** 9/16/16

Site Feature: Flathead River

Visual Descrption: Clear

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1055	12.80	0.167	13.31	7.69	176	0.00

Sample ID: CFSWP-002-SW **Sample Time:** 1055

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-003 **Date:** 9-9-16

Site Feature: ~~El~~ Seep

Visual Descrption: clear water, biological sheen on surface of water

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0900	11.72	0.208	11.59	6.18	-25	281

Sample ID: CFSWP-003-SW Sample Time: 0845

Labrotory Name: TestAmerica

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-CC4 **Date:** 9-9-16

Site Feature: Seep

Visual Descrption: Clear, shallow water

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0925	10.66	0.520	9.88	6.75	112	6.21

Sample ID: CFSWP-CC4-SW Sample Time: 0915

Labrotory Name: TestAmerica

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-005 **Date:** 9-9-16

Site Feature: Seep

Visual Descrption: Clear water, biological sheen on surface

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	0950	10.00	0.517	10.06	6.75	192	0.00	

Sample ID: CFSWP-005-SW Sample Time: 0940

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-006 **Date:** 9-9-16

Site Feature: Flathead River

Visual Descrption: Clear

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1045	12.36	0.165	9.12	7.53	116	0.73

Sample ID: CFSWP-006-SW Sample Time: 1030

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-007-SW **Date:** 9/16/16

Site Feature: Flathead River

Visual Descrption: Clear

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0930	12.49	0.166	13.03	7.46	202	0.00

Sample ID: CFSWP-007-SW Sample Time: 0930

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-008-SW **Date:** 9/16/16

Site Feature: Flathead River

Visual Descrption: Clear

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	0910	12.36	0.166	11.65	7.31	197	0.00	

Sample ID: CFSWP-008-SW Sample Time: 0910

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-009 **Date:** 8/30/16

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Descrption: Dry creekbed

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0800	–	–	–	–	–	–

Sample ID: CFSWP-009-SW Sample Time: 0800

Labrotory Name: TEST America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED
CCROD dry as
of 8/30/16

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP - 010 - SW **Date:** 08/30/2016

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Descrption: Dry creek bed

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0815	-	-	-	-	-	-

Sample ID: CFSWP - 010 - SW Sample Time: 0815

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

No sample collected
CCROD dry as of
8/30/2016

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-011-SW **Date:** 8/30/2016

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Descrption: Dry creek bed

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0830	—	—	—	—	—	—

Sample ID: CFSWP-011-SW Sample Time: 0830

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED
CCR OD dry as of
8/30/2016

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CESWP - 012 - SW **Date:** 8/30/2016

Site Feature: Cedar Creek Reservoir overflow Drainage

Visual Descrption: Dry creek bed

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0845	—	—	—	—	—	—

Sample ID: CESWP - 012 - SW Sample Time: 0845

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED
CCROD dry as of
8/30/16

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-013-SW **Date:** 8/30/2016

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Descrption: Dry creek Bed

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0900	—	—	—	—	—	—

Sample ID: CFSWP-013-SW Sample Time: 0900

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

No SAMPLE COLLECTED
CCROD dry as of
8/30/2016

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP - 014 - SW **Date:** 8/29/16

Site Feature: Cedar Creek

Visual Descrption: Clear, very little visible sediments in water Rock and Sand substrate, Shallow water

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1400	18.83	.208	15.48	7.35	136	0.0

Sample ID: CFSWP - 014 - SW Sample Time: 1400

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP - 015 - SW **Date:** 8/29/16

Site Feature: Cedar Creek

Visual Descrption: Clear very little visible sediment in water rock and sand substrate

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1325	18.45	.311	19.02	7.38	132	0.0

Sample ID: CFSWP - 015 Sample Time: 1330

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

DUP 2@ 1335

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP - 016 - SW **Date:** 8/29/2016

Site Feature: Cedar Creek

Visual Descrption: Clear, very little visible sediment
Sand and rocky substrate w/logs/tree

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1235	17.71	0.310	16.83	7.44	127	0.0

Sample ID: CFSWP - 016 - SW Sample Time: 1240

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-017 **Date:** 9/16/16

Site Feature: Flathead River

Visual Descrption: Clear

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0900	10.77	0.274	11.86	7.28	176	0.00

Sample ID: CFSWP-017-SW Sample Time: 0900

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

~~Resample from FedEx error~~ (A10)

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-018-SW **Date:** 9/7/16

Site Feature: South Percolation Pond - SW pond

Visual Descrption: Dry - only small area with ~6" water on south west edge

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1345	–	–	–	–	–	–

Sample ID: CFSWP-018-SW Sample Time: –

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED
Pond dry. Sample previously collected during Pre-Round 1

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP - 019 - SW **Date:** 9/7/16

Site Feature: South Percolation Pond - Middle pond

Visual Descrption: Dry - ~6" water on Southern/middle edge

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1400	—	—	—	—	—	—

Sample ID: CFSWP-019 -SW Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED
Pond dry. Sample
previously collected
during Pre-Round 1

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-020-SW **Date:** 9/7/16

Site Feature: South Perlolation Pond - SE Pond

Visual Descrption: Dry - ~6" water on Southern/middle edge

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1320	—	—	—	—	—	—

Sample ID: CFSWP-020-SW Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED
Pond dry - Sample
previously collected
during Pre-Round 1

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP - 021 **Date:** 08/30/16

Site Feature: Northern Surface Water Area

Visual Descrption: Dry field

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0915	—	—	—	—	—	—

Sample ID: CFSWP - 021 - SW Sample Time: 0915

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED
No water present
in northern Surface
water area

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP- 022 **Date:** 08/30/2016

Site Feature: Northern Surface water Area

Visual Descrption: Dry field

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	0930	—	—	—	—	—	—	

Sample ID: CFSWP- 022- SW Sample Time: 0930

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED
No water present in
the northern surface
water area as of
8/30/2016

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-023 **Date:** 9/7/16

Site Feature: North West Percolation Pond

Visual Descrption: No water present

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0945	-	-	-	-	-	-

Sample ID: CFSWP-023-SW Sample Time: -

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

NO SAMPLE COLLECTED

Pond dry

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-024-SW **Date:** 9/7/16

Site Feature: North East Percolation Pond

Visual Descrption: No water present

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1015	–	–	–	–	–	–

Sample ID: CFSWP-024-SW Sample Time: –

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

NOTES:

NO SAMPLE COLLECTED
Pond dry

Surface Water Sampling Sheet

Location ID: CFSWP - 001 **Date:** 12/2/16

Site Feature: Flathead River

Visual Descrption: Flow steady

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1200	4.65	.194	12.41	7.98	190	0.0

Sample ID: CFSWP - 001-SW Sample Time: 1200

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Location ID: CFSWP - 002 Date: 12/2/16

Site Feature: Flathead River

Visual Descrption: Point moved slightly east for access.

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1140	4.38	.188	12.53	8.04	186	0.0	

Sample ID: CFSWP - 002 - SW Sample Time: 1140

Labrdtory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

Surface Water Sampling Sheet

Location ID: CFSWP-003-SW **Date:** 12/1/16

Site Feature: The Seep

Visual Description: ~~ye~~ on edge of seep (SW)

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1045	4.05	0.242	12.40	7.77	164	0.0

Sample ID: CFSWP-003-SW Sample Time: 1045

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba: FA 01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-004 **Date:** 12/1/14

Site Feature: The Seep

Visual Description: ice on edge of water

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1100	6.74	0.478	6.33	7.52	150	0.0

Sample ID: CFSWP-004-SW Sample Time: 1100

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Hon ho: FA01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-005 **Date:** 12/1/16

Site Feature: The Seep

Visual Description: ~~Ice on edge of water~~ (SW)

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
11 15	7.53	0.512	11.23	7.50	213	0.0

Sample ID: CFSWP-005-SW Sample Time: 1115

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
HONRA-FA01004

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	V

Surface Water Sampling Sheet

Location ID: CFSNP-006 **Date:** 12-1-16

Site Feature: Flathead River

Visual Description:

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1200	4.15	0.183	13.40	8.23	1.74	0.0

Sample ID: CFSNP-006-SW Sample Time: 1200

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Horiba: FA01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-007 **Date:** 12/2/16

Site Feature: Flathead River

Visual Descrption: Steady flow

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1120	4.26	0.189	12.98	3.02	187	0.0	

Sample ID: CFSWP-007-SW Sample Time: 1120

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-008-SW **Date:** 12/2/16

Site Feature: Flathead River

Visual Descrption: flowing, water level higher than in September

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1110	3.82	0.196	13.03	8.05	184	0.0	

Sample ID: CFSWP-008-SW Sample Time: 1110

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-010 **Date:** 11/30/16

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Descrption: No water present @ location.

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	

Sample ID: CFSWP-010-SW Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

No water present @ south end of CCROD. No sample collected.

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✗
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	✗
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP - 011 - SW **Date:** 11/30/16

Site Feature: Cedar Creek Reservoir overflow Drainage

Visual Descrption: No water present at location.

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	

Sample ID: CFSWP - 011 - SW Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

No water present at South end of CCROD. No sample collected.

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP - 012 - SW **Date:** 11/30/16

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Descrption: No water present @ location

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	

Sample ID: CFSWP - 012 - SW Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

No water present at location in CCR00. No sample collected.

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-013 **Date:** 11/30/16

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Descrption: no visual flow some turbid/murky ponded water ~ 0.3' deep

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1200	3.02	.321	8.67	7.72	63	65.7	

Sample ID: CFSWP-013-SW Sample Time: 1200

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

No flow measurements collected

Horiba: FA01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-014 **Date:** 11/30/16

Site Feature: Cedar Creek

Visual Descrption: no ice on creek edge, steady flow, clear

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1100	4.16	0.379	14.39	8.14	149	0.0

Sample ID: CFSWP-014-SW Sample Time: 1100

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

NOTES:

CFSWP-DUP3-SW @ 1130

Horiba: FA01009

Surface Water Sampling Sheet

Location ID: CFSWP- 015 **Date:** 11/30/16

Site Feature: Cedar creek

Visual Descrption: running water, clear, steady flow

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1004	3.92	0.354	14.35	8.21	128	0.0

Sample ID: CFSWP-015-SW Sample Time: 1000

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Horiba FA01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-015 **Date:** 12/20/16

Site Feature: Cedar Creek

Visual Description: Running water, clear, steady flow

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0900	2.57	.333	16.05	7.48	49	0.00

Sample ID: CFSWP-015-SW Sample Time: 0900

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Re-sample

Horiba: FA[illegible]0725

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-016 Date: 11/30/16

Site Feature: Cedar Creek

Visual Descrption: running water, clear, steady flow

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0919	3.85	0.385	17.53	8.0	195	0.0

Sample ID: CFSWP-016-SW Sample Time: 0919

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
HOLDING: FA01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓

Surface Water Sampling Field

Location ID: CFSWP - 017 **Date:** 12/2/14

Site Feature: Flathead River

Visual Descrption: flowing.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1045	3.79	0.195	13.58	7.69	209	0.0

Sample ID: CFSWP-017-SW Sample Time: 1045

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-018 **Date:** 12-7-16

Site Feature: Southwest percolation pond

Visual Description: ice on surface ~1" thick. Able to break to collect sample

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1000	1.15	0.417	6.18	7.46	134	127

Sample ID: CFSWP-018-SW Sample Time: 1000

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Horiba FA01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-019 **Date:** 12/1/16

Site Feature: S. Ctr Percolation Pond

Visual Description: Smaller pond of water present

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0930	5.00	0.400	8.45	7.39	219	0.0

Sample ID: CFSWP-019-SW Sample Time: 0930

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

NOTES:
Honba FA01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-020 **Date:** 12-1-16

Site Feature: Southeast percolation pond feature

Visual Description: about 1' ponded water, clear

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	0900	4.19	0.356	9.36	7.58	221	19.1	

Sample ID: CFSWP-020-SW Sample Time: 0900

Laboratory Name: TestAmerica

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Florida: FA01009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / **245.2** / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Location ID: CFSWP-021 Date: 11/30/16

Site Feature: running water feature

Visual Descrption: ponded water, no flow, clear and some ice

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1420	3.19	0.593	13.08	8.37	147	0.0

Sample ID: CFSWP-021-SW Sample Time: 1420

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Horiba: FAD1009

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP- 022- SW **Date:** 11/30/16

Site Feature: Northern water feature

Visual Descrption: Clearing where ponding was present Spring 2016 dry since Aug 2016. No water present to sample

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	

Sample ID: CFSWP- 022- SW Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

No water present at area where sample previously collected.

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-023 **Date:** 12/2/16

Site Feature: Northwest percolation pond

Visual Descrption: dry, no water present

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	—	—	—	—	—	—	—	

Sample ID: CFSWP-023-SW Sample Time: —

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
not sampled due to water not being present at sample location

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-024 **Date:** 12/2/16

Site Feature: Northeast Percolation Pond

Visual Description: dry, no water present

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	—	—	—	—	—	—	—	

Sample ID: — Sample Time: —

Laboratory Name: —

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Not sampled due to water not being present at time of visit

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

Surface Water Sampling Sheet

Location ID: CFSWP-025 **Date:** 12/20/16

Site Feature: Cedar Creek

Visual Descrption: Clear running water

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0920	2.61	0334	14.51	7.35	87	0.0

Sample ID: CFSWP-025-SW Sample Time: 0920

Labrotory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:

Honda - FA00725

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

Surface Water Sampling Sheet

Location ID: CFSWP-~~[illegible]~~001 (DP) Date: 4/4/17

Site Feature: Flat Head River

Visual Description: Clear, ≈2' deep w/ running water

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
10:36	3.59	0.179	14.87	7.08	208	0.00

Sample ID: CFSWP-D~~[illegible]~~ - SW Sample Time: 10:40

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
Horiba: FAD0108
MaryBeth L + Doug F
- Photo/point taken

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

9016 - Free Cyanide

Surface Water Sampling Sheet

Location ID: CFSWP-002 Date: 4/4/17

Site Feature: Flathead River

Visual Description: Clear, running water of ≈ 2'.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
10:19	3.55	0.166	15.26	7.26	198	0.00

Sample ID: CFSWP-002-SW Sample Time: 10:15

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
Horiba: FA01008
DOUG F + MARY BUHL
Point / photo taken

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

9016- Free Cyanide

Surface Water Sampling Sheet

Location ID: CFSWP - 003 **Date:** 3/16/17

Site Feature: Seep

Visual Description: Water appears turbid / cloudy. water at edge ~

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	11:00	4.45	0.170	13.44	3.33	320	N/A	

Sample ID: CFSWP - 003 - SW Sample Time: 11:00

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300. 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X

NOTES:

Horiba: # FA 01191

- Turbidity meter showing dashed lines - not reading value.
- Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-004 **Date:** 3/16/17

Site Feature: The Seep

Visual Description: Water turbid, some snow on bank, lots of reeds / logs in water.

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1130	5.07	0.207	14.9	3.72	281	0.0*	

Sample ID: CFSWP-004-SW Sample Time: 1130

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X

NOTES:

Horiba: # FA 01191
* Recalibrated Horiba to zero. In sediment-filled water, unlikely that turbidity level is @ 0 NTU.
* Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-005 **Date:** 3/16/17

Site Feature: The Seep

Visual Description: Turbid water, debris, reeds etc.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1200	5.18	0.222	13.01	3.65	236	0.0*

Sample ID: CFSWP-005-SW Sample Time: 1200

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300. 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X

NOTES:

Horiba: #FA 01191
Recalibrated Horiba to zero. However in turbid water, unlikely turbidity levels @ 0 NTU.

* Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-006 **Date:** 3/16/17

Site Feature: Flathead River

Visual Description:

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1230	2.22°	0.160	17.57	3.73	239	--

Sample ID: CFSWP-006-SW Sample Time: 1230

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X

NOTES:

Horiba : # FA 00191
Turbidity not reading, no parameter recorded
· Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP- 007 **Date:** 3/16/17

Site Feature: Flathead River

Visual Description: River level high - level on staff gauged increased ~1.3' above previous day. Ice chunks present, fast moving.

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1300	SW ~~3.93~~ 2.28	0.160	17.36	3.93	273	--	

Sample ID: CFSWP - 007 - SW Sample Time: 1300

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300. 350.1, 353.2, 365.1, SM2540B/C	X

9016 Free Cyanide

NOTES:

Horiba: #FA 01191
Turbidity sensor
not functioning
· Anomalous pH reading indicates pH
meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-008 **Date:** 4/4/17

Site Feature: Flathead River

Visual Description: Clear, sampling depth ≈ 1' within running water on eddy E of sampling location

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
09:58	3.95	0.170	16.23	7.14	188	1.34

Sample ID: CFSWP-008-SW Sample Time: 10:00

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
Horiba: FA01008
Doug F + Mary Beth L
- Paint / photo taken

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

9016 - Free Cyanide

Surface Water Sampling Sheet

Location ID: CFSWP-009 Date: 4/3/17

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Description: Clear, ≈2' of running water

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
11:50	4.05	0.317	12.24	7.79	159	0.00

Sample ID: CFSWP-009-SW Sample Time: 11:45

Laboratory Name: TestAmerica (Edison)

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + MaryBeth L
- Horiba: FA01008
- Point/photos taken

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
9016-Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-010-SW **Date:** 3/15/17

Site Feature: Cedar creek Reservoir overflow Drainage

Visual Description: No flowing water, ice and snow present, water approximately

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1330	1.86	0.171	10.44	3.10	228	N/A	

Sample ID: CFSWP-010-SW Sample Time: 1330

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	

NOTES:

Horiba: # FA 01191

Turbidity Sensor not functioning

· Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-011 Date: 4/3/17

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Description: Clear, ≈3' of running water

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
13:10	4.87	0.310	12.53	7.94	137	83.5

Sample ID: CFSWP-011-SW Sample Time: 13:00

Laboratory Name: Test America (Edison)

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	✓
Matrix Spike Duplicate	✓

NOTES:
- Doug F + Mary Beth L
- Horiba: FA01008
- Paint/photos taken

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
9016 - Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-012 Date: 4/3/17

Site Feature: Cedar Creek Reservoir Overflow Drainage

Visual Description: Clear, ≈3' of running water.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
13:50	4.23	0.316	12.18	7.46	162	0.00

Sample ID: CFSWP-012-SW Sample Time: 14:00

Laboratory Name: Test America (Edison)

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + MaryBeth L
- Horiba: FA0100 8
- Point photos taken
- DUPS (CFSWP-DUPS-SW) taken - sample time = 12^00

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
9016 - Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP - 013 **Date:** 3/15/17

Site Feature: Cedar Creek Reservoir overflow Drainag

Visual Description: No ice visible, no visible flow
1-1.5' deep.

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1400	3.12	0.290	10.56	3.32	211	N/A	

Sample ID: CFSWP-013-SW Sample Time: 1400

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	

NOTES:

H

- turbidity not reading, no parameters recorded.
- Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-014-SW **Date:** 3/13/17

Site Feature: Cedar Creek

Visual Description: ~1 ft water, snow on banks

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	10 55	4.17	0.351	10.94	3.06	278	–	

Sample ID: CFSWP-014-SW Sample Time: 1100

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	X
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X

NOTES:

Horiba: FA 01191

Turbidity meter not reading. Collect sample.

CFSWP-DUP-SW collected @ 1130

- Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-015 **Date:** 3/13/17

Site Feature: Cedar Creek

Visual Description: Creek ~ 1' water, some debris/fallen logs.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1210	4.79	0.356	10.07	3.25	182	Na

Sample ID: CFSWP-015-SW Sample Time: 1200

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X

NOTES:

Horiba : FA01191
Turbidity meter not functioning properly
-Anomalous pH reading indiates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-016 **Date:** 3/13/17

Site Feature: Cedar Creek

Visual Description: Creek about 1-1.5' of water flowing

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	1450	4.99	0.351	9.95	3.64	155	N/A	

Sample ID: CFSWP-016-SW Sample Time: 1430

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	X
Matrix Spike Duplicate	X

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X

NOTES:

Horiba: # FA 01191

Turbidity meter not functioning

Anomalous pH reading indicates pH meter is not functioning correctly.

Surface Water Sampling Sheet

Location ID: CFSWP-0017 (DE) Date: 4/4/17

Site Feature: Flathead River

Visual Description: Clear w/ sampling depth of ≈2'-3'. Running Water.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
09:42	4.30	0.171	19.28	5.87	206	0.00

Sample ID: CFSWP-0017 SW (DE) Sample Time: 09:45

Laboratory Name: ~~AEI~~ TestAmerica

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
Horiba: FA01008
Doug F + Mary Beth L
- Point/photo taken

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

9016 - Free Cyanide

Surface Water Sampling Sheet

Location ID: CFSWP-018 Date: 4/3/17

Site Feature: South Percolation Pond

Visual Description: Clear with trace organic material. ≈4' of pooled water.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
11:06	5.41	0.340	9.24	7.22	166	0.53

Sample ID: CFSWP-018-SW Sample Time: 11:10

Laboratory Name: Test America (Edison)

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + Mary Beth L.
- Horiba: FA01008
- Paint / Photos taken

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
9016 Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-019 Date: 4/3/17

Site Feature: South Percolation Ponds

Visual Description: Clear with trace organic material. ≈3' of pooled water.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
11:18	6.32	0.338	8.97	7.26	169	0.00

Sample ID: CFSWP-019-SW Sample Time: 11:15

Laboratory Name: Test America (Edison)

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + MaryBeth L.
- Horiba: FA0108
- Point/photos taken

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
9016 Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP -020 - SW **Date:** 3/16/17

Site Feature: Southeast Percolation Pond

Visual Description: ice/snow in addition to water. Approximately 1.5-2' of water present @ sampling location

	Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
		1.87	0.319	12.45	4.05	277	--	

Sample ID: CFSWP -020-SW Sample Time: 1330

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300. 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X

NOTES:

Horiba: #FA 01191
Turbidity meter on Horiba not functioning
- Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-021 **Date:** 3/15/17

Site Feature: Northern water feature

Visual Description: 1-2 feet of water present.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1230	3.69	0.515	11.41	2.96	292	N/A

Sample ID: CFSWP-021-SW **Sample Time:** ~~1245~~ 1230

Laboratory Name: Test America

SW

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X

9016 Free Cyanide

NOTES:

Horiba: # FA01191 Turbidity sensor not functioning.

Field Blank collected at this point @ 1300.

- Anomalous pH reading indicates pH meter is not functioning correctly

Surface Water Sampling Sheet

Location ID: CFSWP-022 **Date:** 4/3/2017

Site Feature: Northern Water Feature

Visual Description: Clear, ≈ max. of 3' pooled water.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
10:15	3.96	0.323	9.51	7.09	166	1.38

Sample ID: CFSWP-022-SW Sample Time: 10:30

Laboratory Name: Test America (Edison)

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- Doug F + Mary Beth L.
- Horiba: FA01008
- Paint taken using Trimble + photos taken

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
9016 Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-023 Date: 4/3/2017

Site Feature: NW Percolation Pond

Visual Description: Clear with trace organic material, ≈ max. of 2" pooled water.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
09:15	5.34	0.413	7.17	7.14	177	2.56

Sample ID: CFSWP-023 - SW Sample Time: 09:15

Laboratory Name: Test America (Edison)

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

Analysis	
AQ TCL VOCS 8260	N/A
AQ TCL SVOCs 8270	N/A
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	✓
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	N/A
AQ TCL PCBs 8082	N/A
AQ TCL Pesticides 8081	N/A
AQ Total Cyanide 335.4	✓
AQ General Chemistry 300, SM2023B, SM2340B	✓
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	✓
9016 Free Cyanide	N/A

NOTES:
- Doug F. + Mary Beth L.
- Horiba: FA01008
- Trimble experiencing problems initially - turned off and able to take point.
- Photos taken.

Surface Water Sampling Sheet

Location ID: CFSWP-024 Date: 4/3/17

Site Feature: Northeast Percolation Pond

Visual Description: No water present.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
N/A						

Sample ID: CFSWP-024-SW Sample Time: N/A

Laboratory Name: N/A

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

NOTES:
Sample not collected

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	
AQ General Chemistry 300, SM2023B, SM2340B	
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	

9016 Free Cyanide

Surface Water Sampling Sheet

Location ID: CFSWP - 025 **Date:** 3/13/17

Site Feature: Cedar Creek

Visual Description: water pooled deeper immediately upstream - below downed tree.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1330	4.83	0.380	9.67	3.40	167	–

Sample ID: CFSWP - 025 - SW Sample Time: 1315

Laboratory Name: Test America

Quality Control (QC) sample	
Field duplicate	
Matrix Spike	
Matrix Spike Duplicate	

Analysis	
AQ TCL VOCS 8260	
AQ TCL SVOCs 8270	
AQ TAL Metals EPA 200.2 / 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	X
AQ TAL Metals Dissolved EPA 200.7 / 200.8 / 245.2 / 6010C / 6020A / 7470A	
AQ TCL PCBs 8082	
AQ TCL Pesticides 8081	
AQ Total Cyanide 335.4	X
AQ General Chemistry 300, SM2023B, SM2340B	X
AQ Nutrients 300, 350.1, 353.2, 365.1, SM2540B/C	X
9016 Free Cyanide	X (SW)

NOTES:

Horiba # FA01191

Turbidity meter not functioning

-Anomalous pH reading indicates pH meter is not functioning correctly.

Surface Water Sampling Sheet

Location ID: CFSWP-001 **Date:** 6/14/17

Site Feature: Flathead River

Visual Description: Slightly turbid

Time	T (°C) DF	Sp. Cond. ~~[illegible]~~ us/cm³	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1130	6.23	133	11.71	7.43	282.5	20.5

Sample ID: CFSWP-001-SW Sample Time: 1130

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DF/AS

~~[illegible]~~ YSI -

114463

DF 111341

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

★ Location off from previous CFSWP-001 SW locations

Surface Water Sampling Sheet

Location ID: CFSWP-002 **Date:** 6/14/17

Site Feature: Flathead River

Visual Description: Slightly turbid

Time	T (°C)	DF	Sp. Cond. ~~[illegible]~~ µS/cm³	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1150	6.25		129	11.91	8.18	282.1	23.1

Sample ID: CFSWP-002-SW **Sample Time:** 1200

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DF/AS

~~[illegible]~~ YSI -

DF 114463

111341

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-003 **Date:** 6/14/17

Site Feature: Seep

Visual Description: Slightly turbid

Time	T (°C)	DF Sp. Cond. µS/cm³	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1328	6.86	145	11.29	8.27	257.7	20.9

Sample ID: CFSWP-003-SW Sample Time: 1330

Laboratory Name: TestAmerica-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- DF/AS
- YSI -
DF 114463
111341

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Surface Water Sampling Sheet

Location ID: CFSWP-004 **Date:** 6/14/17

Site Feature: Seep

Visual Description: Slightly Turbid

Time	T (°C)	Sp. Cond. (µS/cm³) DF	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1345	6.90	145	11.00	8.23	253.4	22.1

Sample ID: CFSWP-004-SW Sample Time: 1345

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DF/AS

~~[illegible]~~ YSI-

DF 114463

111341

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Surface Water Sampling Sheet

Location ID: CFSWP-005 **Date:** 6/14/17

Site Feature: Seep

Visual Description: Slightly turbid

Time	T (°C) DF	Sp. Cond ~~(mS/cm)~~ µS/cm³	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1405	7.80	304	10.04	7.87	231.6	14.3

Sample ID: CFSWP-005-SW Sample Time: 1410

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DF/AS

~~[illegible]~~ SI -

DF 114463

111341

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Surface Water Sampling Sheet

Location ID: CFSWP-006 **Date:** 6/14/17

Site Feature: Flathead River

Visual Description: Slightly turbid

Time	T (°C)	Sp. Cond. (µS/cm³) DF	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1210	6.24	127	12.12	8.20	276.3	28.2

Sample ID: CFSWP-006-SW Sample Time: 1215

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DF/AS

~~[illegible]~~ YSI-

DF 114463

111341

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Surface Water Sampling Sheet

Location ID: CFSWP-007 **Date:** 6/14/17

Site Feature: Flathead River

Visual Description: Slightly turbid

Time	T (°C)	Sp. Cond. (µS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1230	6.28	127	12.18	8.24	267.3	25.0

Sample ID: CFSWP-007-SW Sample Time: 1240

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
-DF/AS
YST -
DF 114463
111341

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-008 **Date:** 6/14/17

Site Feature: Flathead River

Visual Description: Slightly turbid

Time	T (°C)	DF Sp. Cond. µS/cm³	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1250	6.27	129	11.81	7.92	281.6	25.5

Sample ID: CFSWP-008-SW Sample Time: 1300

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DF/AS

DF ~~[illegible]~~ YSI - 114463 111341

A Relocated point due to heavy flow/bank collapse.

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSwP-009 **Date:** 6/12/17

Site Feature: Cedar Creek Reservoir overflow ditch (((BUD)

Visual Description: Clear while sampling

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1115	11.99	0.333	8.78	7.86	172	0.0

Sample ID: [redacted] CFSwP-009-SW Sample Time: 11:15

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

water slightly running

vegatation within water

-Horiba: FA02010

-DFIAJ

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-010 Date: 6/12/17

Site Feature: Cedar Creek Reservoir Overflow Ditch (CCROD)

Visual Description: Clear while Sampling

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1230	16.86	0.323	7.64	8.36	161	4.79

Sample ID: CFSWP-010-SW Sample Time: 1230

Laboratory Name: TestAmerica - Edison

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
Running water
-Horiba: FA02010
-AS/DF

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-011 **Date:** 6/12/17

Site Feature: CCROD

Visual Description: Clear during sampling

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1315	17.37	0.327	7.88	8.30	182	0.0

Sample ID: CFSWP-011-SW Sample Time: 1315

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	✓
Matrix Spike Duplicate	✓

NOTES:

Running water
-Horiba: FA02010
-DF/A)
-MS/MSD taken

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-012 Date: 6/12/17

Site Feature: CCRO D-Cedar Creek Reservoir Overflow Ditch

Visual Description: Clear while sampling

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
2400	16.81	0.287	9.01	8.39	152	6.46

Sample ID: CFSWP-012-SW Sample Time: 1400

Laboratory Name: Test America Edison

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
- Running water
vegetation
- Horiba: FA02010
- DFIAS

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-013 **Date:** 6/12/17

Site Feature: CCROD - Cedar Creek Reservoir Overflow Ditch

Visual Description: Clear while sampling

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1445	15.87	0.320	8.71	8.28	167	0.30

Sample ID: CFSWP-013-SW Sample Time: 1445

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	NA
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:

- running water, vegetation on bottom
- Horiba: F-A02010
- DF(A)

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-0164 **Date:** 6/13/17

Site Feature: Cedar Creek

Visual Description: Clear while Sampling.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1128	12.32	0.322	10.68	8.22	106	0.00

Sample ID: CFSWP-0164-SW Sample Time: 1130

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DF (AS

-Horiba: FA02010

-Running water

-Heavily vegetated

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Surface Water Sampling Sheet

Location ID: CFSWP-015 Date: 6/13/17

Site Feature: Cedar Creek

Visual Description: Clear while sampling

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
0900	12.86	0.328	10.48	7.85	222	1.52

Sample ID: CFSWP-015-SW Sample Time: 0915

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- DF/AS
- Horiba: FAO 2010
- Burning water, heavily vegetated.
- ★ CFSWP-DUP7-SW collected @ CFSWP-015-SW.

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Surface Water Sampling Sheet

Location ID: CFSWP-016 Date: 6/12/17

Site Feature: Cedar Creek

Visual Description: Clear while sampling

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
1530	14.73	0.337	8.95	8.27	187	[redacted]	0.0

Sample ID: CFSWP-016-S00 Sample Time: 1530

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	✓
Matrix Spike	NA
Matrix Spike Duplicate	NA

NOTES:
- Running water
- Horiba: F-A02010
- DFTAS
- CFSWP-DUP6-SW taken - noted as 1200 sample time

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-017 **Date:** 6/14/17

Site Feature: Flathead River

Visual Description: Slightly turbid

Time	T (°C)	Sp. Cond. (µS/cm³)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1310	6.31	129	12.04	8.17	272.1	25.1

DF

Sample ID: CFSWP-017-SW Sample Time: 1315

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DF/AS

~~[illegible]~~ YST-

DF 114463

111341

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-018 **Date:** 6/15/17

Site Feature: Southwest Percolation Pond

Visual Description: Slightly cloudy while sampling, trace organics - weeds

	Time	T (°C)	Sp. Cond. (~~mS/cm~~ µS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)	
	14:40	11.56	456	9.67	8.06	198.6	12.6	

Sample ID: CFSWP-018-SW Sample Time: 14:45

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- DFIAS
- YSI
- Ponded Water
- Marine organisms noted-shrimp?

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-019 **Date:** 6/15/17

Site Feature: South central percolation pond

Visual Description: Slightly turbid w/ some fine particulates + trace organics.

Time	T (°C)	Sp. Cond. ~~(mS/cm)~~ uS/cm³	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
14:58	12.68	303	8.72	8.27	210.8	11.0

Sample ID: CFSWP-019-SW Sample Time: 1500

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- DFIAS
- VST
- Ponded water
- Marine organism noted - shrimp?

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-020 **Date:** 6/15/17

Site Feature: Southeast Percolation Pond

Visual Description: Clear while sampling, broken trees in area.

Time	T (°C)	Sp. Cond. (~~mS/cm~~ uS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1405	11.30	315	8.52	8.03	219.6	3.95

Sample ID: CFSWP-020-SW Sample Time: 1415

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- DFIAS
- YSI
- Panded water

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	✓

Surface Water Sampling Sheet

Location ID: CFSWP-021 **Date:** 6/15/17

Site Feature: Pond w/ CFSWP-021 location

Visual Description: Visibly clear while sampling

Time	T (°C)	Sp. Cond. (~~mS/cm~~ µS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1325	7.45	398	10.03	7.64	250.8	1.06

Sample ID: CFSWP-021-SW Sample Time: 1330

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- DF/AS
- YST
- Ponded water, vegetated area.

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-022 **Date:** 6/15/17

Site Feature: Northwest Percolation Pond

Visual Description: No water present.

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample ID: CFSWP-022-SW Sample Time: N/A

Laboratory Name: TestAmerica-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

-DFLAS

*Sample not collected.

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	N/A
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	N/A
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	N/A
2320B - Alkalinity	N/A
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	N/A
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	N/A
SM4500_S2_F - Sulfide	N/A
300.0 - Dissolved Fluoride	N/A
9060A - DOC	N/A
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-023 **Date:** 6/15/17

Site Feature: Pond @ CFSWP-023 location

Visual Description: N/A - No water present

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sample ID: CFSWP-023 - SW Sample Time: N/A

Laboratory Name: TestAmerica - Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:

- DFIAS

*Sample not collected.

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	N/A
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	N/A
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	N/A
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	N/A
2320B - Alkalinity	N/A
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	N/A
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	N/A
SM4500_S2_F - Sulfide	N/A
300.0 - Dissolved Fluoride	N/A
9060A - DOC	N/A
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-024 **Date:** 6/15/17

Site Feature: Northeast Percolation Pond

Visual Description: Dark grey in color w/ slight sheen.

Time	T (°C)	µS/cm Sp. Cond. ~~(mO/cm)~~	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1240	13.95	119	5.41	5.37	290.4	17.5

Sample ID: CFSWP-024-SW Sample Time: 1245

Laboratory Name: Test America-Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	N/A
Matrix Spike Duplicate	N/A

NOTES:
- DFIAS
- YSI
- ★ Approximately 6"-8" of water-ponded
- Water dark grey in color w/ slight sheen.
- Black sediment located on bottom of samples.

Analysis	
8260 B - VOC and 8270D - SVOC	✓
8081B - Pesticides and 8082A - PCBs	✓
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

Surface Water Sampling Sheet

Location ID: CFSWP-025 Date: 6/13/17

Site Feature: Cedar Creek

Visual Description: Clear while sampling

Time	T (°C)	Sp. Cond. (mS/cm)	DO (mg/L)	pH (SU)	ORP (mV)	Turb (NTU)
1020	12.30	0.323	9.85	8.28	184	0.0

Sample ID: CFSWP-025-SW Sample Time: 1030

Laboratory Name: Test America - Edison

Quality Control (QC) sample	
Field duplicate	N/A
Matrix Spike	✓
Matrix Spike Duplicate	✓

NOTES:
- DF/AS
- Horiba: FAQ2010
- Burning water
- Water turbid in area - sandy bottom.
- Birch trees / branches in area.

Analysis	
8260 B - VOC and 8270D - SVOC	N/A
8081B - Pesticides and 8082A - PCBs	N/A
6020A/7470A - TAL Metals (dissolved)	✓
335.4 - Cyanide, Dissolved and 335.4 - Cyanide, Total	✓
300.0 - Chloride, Fluoride, Sulfate and 9056A - Orthophosphate	✓
6020A/7470A - TAL Metals (total) and 2340C - Hardness as calcium carbonate	✓
2320B - Alkalinity	✓
2540D - Total Suspended Solids and 2540C - Total Dissolved Solids	✓
350.1 - Ammonia; 353.2_Pres - Nitrogen, Nitrate-Nitrite	✓
SM4500_S2_F - Sulfide	✓
300.0 - Dissolved Fluoride	✓
9060A - DOC	✓
9016 - Free Cyanide and 9016 - Dissolved Free Cyanide	N/A

APPENDIX C-3

Slug Testing Field Data Sheets

Slug Testing Sheet

Well ID: CFMW-002

Date: 7/19/17

Time: 845

DTW: 73.87

DTB: 82.48

Depth to Top of Screen: 72.48

Depth to Bottom of Screen: 82.48

Pneumatic or Mechanical Test Performed: mechanical

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 2ft

Depth of Transducer below static water level: 4.56'

File Name: MW02m-11

Notes:

Test 2:

Actual Head Displacement: 2ft

Depth of Transducer below static water level: 4.56'

File Name: MW02m-12

Notes: Test 3:
Head Displace. 0.8ft
Trans. Depth: 4.56'
File Name: MW02m-13

Test 4.
Head Displace: 0.8
Trans Depth: 4.56
File Name MW02m-14
SAA MW02m-15

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.3'

Depth of Transducer below static water level: 4.56'

File Name: MW02m-21

Notes: Test 3:
Head Displace:
Trans. Depth: 6.59'
File Name: MW02m-23

Test 2:

Actual Head Displacement: 3.5'

Depth of Transducer below static water level: 4.57'

File Name: MW02m-22

Notes: Test 4:
Head Displace: 1.6'
Trans Depth: 6.59'
File Name: MW02m

Slug Testing Sheet

Well ID: CFMW-002

Date: 7/10/17

Time: 12:45

DTW: 71.24

DTB: 83.49*

Depth to Top of Screen: 73.49*

Depth to Bottom of Screen: 83.49*

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.15'

Depth of Transducer below static: 1.99'

File Name: MW002-11

Notes:

Test 2:

Actual Head Displacement: 0.9'

Depth of Transducer below static: 1.98'

File Name: MW002-12

Notes: Test3. 1.15'
1.98'
MW-002-13
*completed to ensure quality data was retrieved

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.8'

Depth of Transducer below static: ~~1.99'~~ 2.96'

File Name: MW002-21

Notes: *measured DTB as 82.48 in June 2017 w/ weighted measuring tape
2' head would be below screen w/ this DTB

Test 2:

Actual Head Displacement: 1.9'

Depth of Transducer below static: 3.0'

File Name: MW002-22

Notes:

Slug Testing Sheet

Well ID: CFMW-003

Date: 7/10/17

Time: 1345

DTW: 19.80

DTB: 54.18

Depth to Top of Screen: 44.18

Depth to Bottom of Screen: 54.18

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.7'

Depth of Transducer: 3.08' below static

File Name: MW003-11

Notes:

Test 2:

Actual Head Displacement: 1.0'

Depth of Transducer: 3.00' below static

File Name: MW003-12

Notes: Test 3: 1.0'
Actual Head Displacement: ~~2.98'~~
Depth of Transducer below static: 2.98'
File Name: MW003-13

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.1'

Depth of Transducer: 3.02' below static

File Name: MW003-21

Notes:

Test 2:

Actual Head Displacement: 2.0'

Depth of Transducer: 2.99 below static

File Name: MW003-22

Notes:

Slug Testing Sheet

Well ID: CFMW-003a

Date: 7/24/17

Time: 09:55

DTW: 145.92

DTB: 203.02

Depth to Top of Screen: 193.02

Depth to Bottom of Screen: 203.02

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: ~1.3

Depth of Transducer below static water level: 2.99

File Name: MW3aM-11

Notes: slow recovery, slow return to baseline

Test 2:

Actual Head Displacement: ~1.3

Depth of Transducer below static water level: 2.9

File Name: MW3a-12

Notes: " "

Head Displacement of 2 feet

Test 1:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes: Did not perform 2 ft. tests as each 1 ft test took over 2 hours to complete.

Test 2:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes:

Slug Testing Sheet

Well ID: CFMW-008a

Date: 7/24/17

Time: 930

DTW: 64.04

DTB: 99.36

Depth to Top of Screen: 89.36

Depth to Bottom of Screen: 99.36

Pneumatic or Mechanical Test Performed: mechanical

Head Displacement of 1 foot

Test 1:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes: 11:00 -1.26
12.25 - 0.818
14:05 -0.460
16.00 -0.202
7/26 13:10 +0.559

Test 2:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.01

Depth of Transducer below static water level: ~10.0

File Name: CFMW-008a-MST

Notes: used troll datalogger. TOOK ~9 hours to return to baseline pressure.

Completed test 1 7/24/17

Test 2:

Actual Head Displacement: 1.97

Depth of Transducer below static water level: ~9.5

File Name: CFMW-008a-MST2

Notes: Test 2 started 7/25/17 @ 12:30
1530 - 0.907
Pulled up slug to produce head drop 7/26
1730: -0.026

Slug Testing Sheet

Well ID: CFMW-010

Date: 7-10-17

Time: 13:15

DTW: 72.24

DTB: 86.85

Depth to Top of Screen: 76.85

Depth to Bottom of Screen: 86.85

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.1'

Depth of Transducer: 3.02' below static

File Name: MW010-11

Notes:

Test 2:

Actual Head Displacement: 1.1'

Depth of Transducer: 3.02' below static

File Name: MW-010-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0'

Depth of Transducer: 3.02'

File Name: MW-010-21

Notes:

Test 2:

Actual Head Displacement: 2.1'

Depth of Transducer: 3.01'

File Name: MW-010-22

Notes:

Slug Testing Sheet

Well ID: CFMW-011

Date: 7/17/17 & 7/18/17

Time: 1530 & 0830

DTW: 32.13 (32.35 - 7/18/17)

DTB: 52.79

Depth to Top of Screen: 42.79

Depth to Bottom of Screen: 52.79

Pneumatic or Mechanical Test Performed:

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.9'

Depth of Transducer below static water level: 3.03'

File Name: MW-011-11

Notes: pressure 15" H_2O

Test 2:

Actual Head Displacement: 0.5'

Depth of Transducer below static water level: 3.03'

File Name: MW011-12

Notes: leak created after first test (water down hole?)

Test 3: Head Δ 1.0 — oscillating
Depth: 3.0
Filename: MW011-13

Test 4: Head Δ: 0.9 oscillating
Depth: 3.0
Filename: MW011-14

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0

Depth of Transducer below static water level: 3.0

File Name: MW011-21

Notes: ~~Unable to apply pressure > 30" H_2O, can't perform 2 ft test~~

(SW) — Able to redo test
- oscillating
- underdampened

Test 2:

Actual Head Displacement: 2.0

Depth of Transducer below static water level: 3.0

File Name: MW-011-22

Notes: Some oscillations possibly underdampened

Slug Testing Sheet

Well ID: CFMW-D11G

Date: 7/18/17

Time: 930

DTW: 94.10

DTB: 159.31

Depth to Top of Screen: 169.31

Depth to Bottom of Screen: 169.31

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 3.00

File Name: MW11a-11

Notes: somewhat noisy recovery

Test 2:

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 3.00

File Name: MW11a-12

Notes: slightly noisy on recovery from drop in head

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.8

Depth of Transducer below static water level: 3.0

File Name: MW11a-21

Notes: noisy recovery pressure: 21" H_2O released @ 15.5" H_2O

Test 2:

Actual Head Displacement: 2.1

Depth of Transducer below static water level: 3.0

File Name: MW11a-22

Notes: some noise pres: 23" H_2O released: 21.7" H_2O

Test 3:

Head Displacement: 1.8

Depth of Transducer: 3.0

Filename: MW11a-23

noise in curve coming down

Slug Testing Sheet

Well ID: CFMW-012a

Date: 7/18/17

Time: 1040

DTW: 138.99

DTB: 213.41

Depth to Top of Screen: 203.41

Depth to Bottom of Screen: 213.41

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.1'

Depth of Transducer below static water level: 3.02'

File Name: MW12a-11

Notes: Oscillating + underdamped.

Test 2:

Actual Head Displacement: 1.1'

Depth of Transducer below static water level: 3.02'

File Name: MW12a-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.1'

Depth of Transducer below static water level: 3.02'

File Name: MW12a-21

Notes: Oscillating + underdamped.

Test 2:

Actual Head Displacement: 1.8'

Depth of Transducer below static water level: 3.02'

File Name: MW12a-22

Notes: Test 3:
Head Displac: 1.9'
Trans. Depth: 3.02'
File Name: MW12a-23

Slug Testing Sheet

Well ID: CFMW-016

Date: 7/20/17

Time: 08:15

DTW: 88.88

DTB: 97.83

Depth to Top of Screen: 87.83

Depth to Bottom of Screen: 97.83

Pneumatic or Mechanical Test Performed: Mechanical

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.05

Depth of Transducer below static water level: 7.0

File Name: MW16m-11

Notes: very little change in head produced.

Test 2:

Actual Head Displacement: 0.05

Depth of Transducer below static water level: 7.03

File Name: MW16m-12

Notes: Test 3.

head Δ: 0.1

Depth: 7.03

Filename: MW16m-13

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 0.1

Depth of Transducer below static water level: 7.0

File Name: MW16m-21

Notes: Test 3.

Head Δ: 0.1

Depth: 7.0

Filename: MW16m-23

Test 2:

Actual Head Displacement: 0.1

Depth of Transducer below static water level: 7.02

File Name: MW16m-22

Notes: Test 4.

Head Δ:

Depth: 7.02

Filename: MW16m-24

Slug Testing Sheet

Well ID: CFMW-016a

Date: 7/17/17

Time: 11:15

DTW: 87.59

DTB: 128.38

Depth to Top of Screen: 118.38

Depth to Bottom of Screen: 128.38

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.2'

Depth of Transducer below static water level: 3.02'

File Name: MW16a-11

Notes: transducer paused and removed from well before test.

Test 2:

Actual Head Displacement: 1.1'

Depth of Transducer below static water level: 3.02'

File Name: MW16a-12

Notes: Test3:
Head Displace: 1.1'
Trans Depth: 3.02'
File Name: MW16a-13

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0'

Depth of Transducer below static water level: 3.01'

File Name: MW16a-21

Notes:

Test 2:

Actual Head Displacement: 2.0'

Depth of Transducer below static water level: 3.01'

File Name: MW16a-22

Notes:

Slug Testing Sheet

Well ID: CFMW-018

Date: 07/10/17

Time: 1320

DTW: 126.55

DTB: 126.83

Depth to Top of Screen: 116.83

Depth to Bottom of Screen: 126.83

Pneumatic or Mechanical Test Performed:

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: _____

Depth of Transducer: _____

File Name: _____

Notes: No test was performed. Insufficient water.

Test 2:

Actual Head Displacement: _____

Depth of Transducer: _____

File Name: _____

Notes: _____

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: _____

Depth of Transducer: _____

File Name: _____

Notes: No test was performed. Insufficient water.

Test 2:

Actual Head Displacement: _____

Depth of Transducer: _____

File Name: _____

Notes: _____

Slug Testing Sheet

Well ID: CFMW-019a
Date: 7/17/17
Time: 14:20

DTW: 135.02
DTB: 223.01
Depth to Top of Screen: 213.01
Depth to Bottom of Screen: 223.01

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.1'
Depth of Transducer below static water level: 2.97'
File Name: MW019a-11

Notes: oscillation + underdamped
noise in recovery

Test 2:

Actual Head Displacement: 1.0'
Depth of Transducer below static water level: 2.97'
File Name: MW19a-12

Notes: less noise in Test 3 + 4
Test 3:
Head Displace: 1.0'
Trans. Depth: 2.97'
File Name: MW19a-13
Test 4:
1.0'
2.97
MW19a-14

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0'
Depth of Transducer below static water level: 2.97'
File Name: MW19a-21

Notes: a lot of noise in response curve
oscillation + underdamped
less noise in tests 3+4

Test 2:

Actual Head Displacement: 2.0'
Depth of Transducer below static water level: 2.97
File Name: MW19a-22

Notes: Test 3:
Head Displace: 1.9'
Trans. Depth: 2.97
File Name: MW19a-23
Test 4:
Head Displace: 1.9'
Trans. Depth: 2.97'
File Name: MW19a-24

Slug Testing Sheet

Well ID: CFMW-022

Date: 7/14/17

Time: 1700

DTW: 65.42

DTB: 83.30'

Depth to Top of Screen: 73.30'

Depth to Bottom of Screen: 83.30'

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.1

Depth of Transducer below static water level: 3.0

File Name: MW022-11

Notes: pres: 15" H_2O oscillating

Test 2:

Actual Head Displacement: 1.1

Depth of Transducer below static water level: 3.0

File Name: MW022-12

Notes: pres: 15" H_2O oscillating

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.9

Depth of Transducer below static water level: 3.0

File Name: MW022-21

Notes: pres: 25" H_2O oscillating

Test 2:

Actual Head Displacement: 1.8

Depth of Transducer below static water level: 3.0'

File Name: MW022-22

Notes: pres - 26" H_2O oscillating

Slug Testing Sheet

Well ID: CFMW-025a

Date: 7/18/17

Time: 15:30

DTW: 41.40

DTB: 98.28

Depth to Top of Screen: 88.28

Depth to Bottom of Screen: 98.28

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.6'

Depth of Transducer below static water level: 3.00'

File Name: MW25a-11

Notes:

Test 2:

Actual Head Displacement: 1.1'

Depth of Transducer below static water level: 2.94'

File Name: MW25a-12

Notes: Test 3:

Actual Head Displacement: 1.1'

Depth of Transducer below static: 2.93'

File Name: MW25a-13

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.1'

Depth of Transducer below static water level: 2.92'

File Name: MW-25a-21

Notes:

Test 2:

Actual Head Displacement: 2.0'

Depth of Transducer below static water level: 2.90

File Name: MW-25a-22

Notes:

Slug Testing Sheet

Well ID: CF MW-026

Date: 7/10/17

Time: 10 25

DTW: 34.06

DTB: 47.44

Depth to Top of Screen: 37.44

Depth to Bottom of Screen: 47.44

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Notes:

Actual Head Displacement: 0.9'

Depth of Transducer: 37.06 (3' below static)

File Name: MW026-11

Test 2:

Notes:

Actual Head Displacement: 1.0'

Depth of Transducer: 37.06 (3' below static)

File Name: MW026-12

Head Displacement of 2 feet

Test 1:

Notes:

Actual Head Displacement: 2.1'

Depth of Transducer: 37.06 (3' below static)

File Name: MW026-21

Test 2:

Notes:

Actual Head Displacement: 1.9'

Depth of Transducer: 37.06 (3' below static)

File Name: MW026-22

Slug Testing Sheet

Well ID: CFMW-027

Date: 7/17/17

Time: 10:35

DTW: 27.38

DTB: 48.60

Depth to Top of Screen: 38.60

Depth to Bottom of Screen: 48.60

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Notes: oscillating / underdamped

Actual Head Displacement: 1.0'

Depth of Transducer below static water level: 2.98'

File Name: MW027-11

Test 2:

Notes: oscillating / underdamped

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 2.98'

File Name: MW027-12

Head Displacement of 2 feet

Test 1:

Notes: oscillating / underdamped.

Actual Head Displacement: 1.9'

Depth of Transducer below static water level: 2.98'

File Name: MW027-21

Test 2:

Notes: oscillating / underdamped

Actual Head Displacement: 1.9'

Depth of Transducer below static water level: 2.98'

File Name: MW027-22

Slug Testing Sheet

Well ID: CFMW-028

Date: 7-12-17

Time: 11:20

DTW: 38.20'

DTB: 62.39

Depth to Top of Screen: 52.39'

Depth to Bottom of Screen: 62.39'

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.6

Depth of Transducer below static water level: 3.0

File Name: MW028-11

Notes: Slow return to baseline, did not drop sufficiently in head.

Test 2:

Actual Head Displacement: 1.1

Depth of Transducer below static water level: 3.0

File Name: MW028-12

Notes: Slow return to baseline and recovery

Test 3: Head Displacement: 1.1'
Transducer Depth: 3.0'
File Name: MW028-13

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0

Depth of Transducer below static water level: 3.0

File Name: MW028-21

Notes: Slow recovery to baseline.

Test 2:

Actual Head Displacement: ~~2.0~~ 2.8 (3.0)

Depth of Transducer below static water level: 3.0

File Name: MW028-22

Notes: " "

Slug Testing Sheet

Well ID: CFMW-028a

Date: 7-12-17

Time: 10:15

DTW: 38.03'

DTB: 122.31'

Depth to Top of Screen: 112.31'

Depth to Bottom of Screen: 122.31'

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.75

Depth of Transducer below static water level: 3.0

File Name: MW28a-11

Notes: Pressure not holding, coming down quickly, drop in head not easy to get to 1.0' displacement.

Test 2:

Actual Head Displacement:

Depth of Transducer below static water level: 3.0

File Name: MW28a-12

Notes:

Test # 3 — 1.1 ft / 3.0 / MW28a-13

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.7

Depth of Transducer below static water level: 3.0

File Name: MW28a-21

Notes: Pressure not holding, released valve when returned to baseline on curve.

Test 2:

Actual Head Displacement: 2.0

Depth of Transducer below static water level: 3.0

File Name: MW28a-22

Notes:

Test # 3
head displacement — 2.0
transducer depth — 3.0
Filename — MW28a-23

Slug Testing Sheet

Well ID: CFMW-029
Date: 7/17/17
Time: 10:00

DTW: 62.85
DTB: 78.16
Depth to Top of Screen: 68.16
Depth to Bottom of Screen: 78.16

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.9
Depth of Transducer below static water level: 2.96
File Name: MW029-11

Notes: pres: ~~23~~ 22" H_2O oscillating

Test 2:

Actual Head Displacement: 1.2
Depth of Transducer below static water level: 2.96
File Name: MW029-12

Notes: 23" H_2O pres. oscillating

Test 3: Head Δ: 1.1
Depth: 2.96
Filename: MW029-13

pres: 22.75 H_2O oscillating

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.8
Depth of Transducer below static water level: 2.96
File Name: MW029-21

Notes: pres: 41" H_2O oscillating

Test 2:

Actual Head Displacement: 2.0
Depth of Transducer below static water level: 2.96
File Name: MW029-22

Notes: pres. 41" H_2O - released pres @ 24" oscillating.

Test 3:
Head Displacement: 2.0
Depth of Transducer: 2.96
Filename: MW029-23

Notes: pressure: 41" H_2O - released pres @ 24" oscillating

Slug Testing Sheet

Well ID: CFMW-032

Date: 7/10/17

Time: 13:45

DTW: 44.94

DTB: 57.61

Depth to Top of Screen: 47.61

Depth to Bottom of Screen: 57.61

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.9'

Depth of Transducer: 3' below static water

File Name: MW032-11

Notes:

Test 2:

Actual Head Displacement: 1.0'

Depth of Transducer: 3' below static water

File Name: MW032-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.6'

Depth of Transducer: 3' below static water

File Name: MW032-21

Notes: complete 3rd 2ft displacement test because Test 1 is not representative.

Test 2:

Actual Head Displacement: 1.8'

Depth of Transducer: 3' below static water

File Name: MW032-22

Notes:

Test 3:

Actual head displacement: 1.9'

Depth of Transducers below static: 3'

File Name: MW032-23

Slug Testing Sheet

Well ID: CFMW-032a

Date: 7/21/17

Time: 13:30

DTW: 107.43

DTB: 206.50

Depth to Top of Screen: 196.50

Depth to Bottom of Screen: 206.50

Pneumatic or Mechanical Test Performed: Mechanical

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.0'

Depth of Transducer below static water level: 10.24'

File Name: MW32am011

Notes: very slow stabilization + recovery test was not completed due to time constraint.

Test 2:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes:

Test 2:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes:

Slug Testing Sheet

Well ID: CEMW-032a
Date: 7/25/17
Time: 0800

DTW: 107.81 (7/25) 107.96 (7/26)
DTB: 206.5
Depth to Top of Screen: 196.5
Depth to Bottom of Screen: 206.5

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.1'
Depth of Transducer below static water level: 3.02
File Name: MW32a-12

Notes: pressure - 20-21" H_2O ~2 hours pres. to stabilize before releasing 7/25/17

Test 2:

Actual Head Displacement: 1.1'
Depth of Transducer below static water level: 3.02
File Name: MW32a-13

Notes: ~1.5 hours to stabilize before releasing - End test after 8+ hours, recovered to ~2.80 ft. 7/26/17

Head Displacement of 2 feet

Test 1:

Actual Head Displacement:
Depth of Transducer below static water level:
File Name:

Notes:

Test 2:

Actual Head Displacement:
Depth of Transducer below static water level:
File Name:

Notes:

Slug Testing Sheet

Well ID: CEMW-033

Date: 7-14-17

Time: 12:00

DTW: 41.75

DTB: 63.62

Depth to Top of Screen: 53.62

Depth to Bottom of Screen: 63.62

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Notes: Under damped response

Actual Head Displacement: 0.95'

Depth of Transducer below static water level: 3.03'

File Name: MW033-11

Test 2:

Notes: Underdamped

Actual Head Displacement: 1.1'

Depth of Transducer below static water level: 3.03'

File Name: MW033-12

Head Displacement of 2 feet

Test 1:

Notes: Underdamped

Actual Head Displacement: 1.8'

Depth of Transducer below static water level: 3.04'

File Name: MW033-21

Test 2:

Notes: Test 3:

Head Displace 2.0'

Trans. Depth: 3.04'

File Name: MW033-23

Actual Head Displacement: 2.3'

Depth of Transducer below static water level: 3.04'

File Name: MW033-22

Slug Testing Sheet

Well ID: CFMW-034

Date: 7-14-17

Time: 12:30

DTW: 41.35

DTB: 62.44

Depth to Top of Screen: ~~[illegible]~~ 52.44

Depth to Bottom of Screen: 62.44

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Notes:

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 3.0

File Name: MW034-11

Test 2:

Notes:

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 3.0

File Name: MW034-12

Head Displacement of 2 feet

Test 1:

Notes:

Actual Head Displacement: 1.7

Depth of Transducer below static water level: 3.0

File Name: MW034-21

Test 2:

Notes: Test 3: ~~2.0~~ SW

Actual Head Displacement: 2.0

Depth of Transducer below static water level: 3.0

File Name: MW034-22

Head Displacement 2.0

Transducer Depth 3.0

Filename: MW034-23

Slug Testing Sheet

Well ID: CPMW-035

Date: 7-14-17

Time: 12:55

DTW: 40.48

DTB: 70.42

Depth to Top of Screen: 60.42

Depth to Bottom of Screen: 70.42

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.8

Depth of Transducer below static water level: ~~3.01~~ 2.96'

File Name: MW035-11

Notes:

Test 2:

Actual Head Displacement: 0.9

Depth of Transducer below static water level: 3.0

File Name: MW035-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.8

Depth of Transducer below static water level: 3.0

File Name: MW035-21

Notes: pres. 35" H_2O

Test 2:

Actual Head Displacement: 1.8'

Depth of Transducer below static water level: 3.0

File Name: MW035-22

Notes: pres. 38" H_2O

Slug Testing Sheet

Well ID: CFMW-037
Date: 7-13-17
Time: 15:45

DTW: 69.20'
DTB: 103.21
Depth to Top of Screen: 93.21
Depth to Bottom of Screen: 103.21

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Notes:

Actual Head Displacement: 1.2'
Depth of Transducer below static water level: ~~3.02'~~ 2.95'
File Name: MW-037-11

Test 2:

Notes:

Actual Head Displacement: 1.0'
Depth of Transducer below static water level: 3.07'
File Name: MW037-12

Head Displacement of 2 feet

Test 1:

Notes:

Actual Head Displacement: 2.4'
Depth of Transducer below static water level: 3.08'
File Name: MW037-21

7/14/17 0815

Test 2:

Notes: Test 3:
Head Displace: 2.2
Trans. Depth: 3.37
File Name: MW037-23

Actual Head Displacement: 3.0'
Depth of Transducer below static water level: 3.02'
File Name: MW037-22
pressure relief issue

~~Test~~

Test 3:
Head Δ
Depth -
Filename - MW 037

Slug Testing Sheet

Well ID: CFMW-038

Date: 7/19/17

Time: 10:52

DTW: 84.42

DTB: 106.76

Depth to Top of Screw: 96.76

Depth to Bottom of Screw: 106.76

Pneumatic or Mechanical Test Performed: Mechanical

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.2

Depth of Transducer below static water level: 16.0

File Name: MW38m-11

~~Notes~~ Test 3 Head Δ: 1.1

Depth: 16.0

Filename: MW38m-13

- oscillating

Test 2:

Actual Head Displacement: 0.8

Depth of Transducer below static water level: 16.0

File Name: MW38m-12

~~Notes~~ Test 4 Head Δ: 0.9

Depth: 16.0

Filename: MW38m-14

- oscillating

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.3

Depth of Transducer below static water level: 16.0

File Name: MW38m-21

~~Notes~~ Test 3. Head Δ. 1.8

Depth: 16.5

Filename: MW38m-23

- oscillating

Test 2:

Actual Head Displacement: 2.2

Depth of Transducer below static water level: 16.1

File Name: MW38m-22

~~Notes~~ Test 4 Head Δ:

Depth: 16.54

Filename: MW38m-24

- transducer cable stuck on slug rope

Slug Testing Sheet

Well ID: CFMW040
Date: 7/14/17
Time: 10:25

DTW: 79.30
DTB: 92.76
Depth to Top of Screen: 82.76
Depth to Bottom of Screen: 92.76

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.1
Depth of Transducer below static water level: 3.03
File Name: MW040 - 11

Notes:

Test 2:

Actual Head Displacement: 1.1
Depth of Transducer below static water level: 2.95
File Name: MW040 - 12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.65
Depth of Transducer below static water level: 2.95
File Name: MW040 - 21

Notes: Test 3
Head Displacement 2.5
Depth of Transducer 2.95
Filename: MW040 - 23

Test 2:

Actual Head Displacement: 1.8
Depth of Transducer below static water level: 2.95
File Name: MW040 - 22

Notes: Test 4.
Head Displacement: 2.1
Depth of Transducer: 2.95
Filename: MW040 - 24

Slug Testing Sheet

Well ID: CFMW-042

Date: 7/10/17

Time: 10:15

DTW: 49.17

DTB: 62.99

Depth to Top of Screen: 52.99

Depth to Bottom of Screen: 62.99

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.0'

Depth of Transducer: 3.02

File Name: MW042-11

Notes:

Test 2:

Actual Head Displacement: 1.0'

Depth of Transducer: 3.02

File Name: MW042-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.9'

Depth of Transducer: 3.02

File Name: MW042-21

Notes:

Test 2:

Actual Head Displacement: 1.75'

Depth of Transducer: 3.02

File Name: MW042-22

Notes:

Test 3:

Actual Head Displ 1.85'

Depth of Tr 3.015

Filename MW042-23

Ran additional tests to increase change in head.

Test 4:

Actual Head Displ 1.95'

Depth: 3.015

Filename MW042-24

Slug Testing Sheet

Well ID: EMW-043 **DTW:** 44.01

Date: 7/10/17 **DTB:** 62.01

Time: 9:20 **Depth to Top of Screen:** 52.01

Depth to Bottom of Screen: 62.01

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1: Notes:

Actual Head Displacement: 0.9'

Depth of Transducer: 47.0 (3' below static)

File Name: MW043-11

Test 2: Notes:

Actual Head Displacement: 1.0'

Depth of Transducer: 47.0 (3' below static)

File Name: MW043-12

Head Displacement of 2 feet

Test 1: Notes:

Actual Head Displacement: 1.8'

Depth of Transducer: 47.0 (3 below static)

File Name: MW043-21

Test 2: Notes:

Actual Head Displacement: 2.1'

Depth of Transducer: 47.0 (3' below static)

File Name: MW043-22

Test 3:

Head Displacement: 1.9'

Depth of Transducer: 47.0 (3' below static)

File Name: MW043-23

Notes: Third test was performed to more accurately reproduce 2 ft. head displacement.

Slug Testing Sheet

Well ID: CFMW-044a

Date: 7-12-16

Time: 15:55

DTW: 47.71

DTB: 112.94

Depth to Top of Screen: 102.94

Depth to Bottom of Screen: 112.94

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.7'

Depth of Transducer below static water level: ~~3.00~~ 2.95'

File Name: MW44a-11

Notes: Slow return to base line and very, very, very considerable noise not holding pressure during return to baseline

Test 2:

Actual Head Displacement: 1.0'

Depth of Transducer below static water level: 2.96

File Name: MW44a-12

Notes: Test3:

Head Displace: 0.8'

Trans Depth 2.99'

FileName: MW44a-13

→ pressure leaking at beginning caused issue w/ curve

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.9'

Depth of Transducer below static water level: 2.95'

File Name: MW44a-21

Notes:

Test 2:

Actual Head Displacement: 1.75'

Depth of Transducer below static water level: 2.95'

File Name: MW44a-22

Notes:

Slug Testing Sheet

Well ID: CFMW-045

Date: 7/10/17

Time: 1130

DTW: 76.95

DTB: 99.08

Depth to Top of Screen: 89.08

Depth to Bottom of Screen: 99.08

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.0 ft

Depth of Transducer: 3.00

File Name: MW045-11

Notes:

Test 2:

Actual Head Displacement: 0.9 ft

Depth of Transducer: 3.0

File Name: MW045-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0

Depth of Transducer: 3.0

File Name: MW045-21

Notes:

Test 2:

Actual Head Displacement: 2.0'

Depth of Transducer: 2.97'

File Name: MW045-22

Notes:

Slug Testing Sheet

Well ID: CFMW-045a

Date: 7/19/2017

Time: 12:19

DTW: 85.20

DTB: 161.29

Depth to Top of Screen: 150

Depth to Bottom of Screen: 160

Pneumatic or Mechanical Test Performed:

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.1

Depth of Transducer below static water level: 15.95

File Name: W45am-11

Notes: very slow recovery

Test 2:

Actual Head Displacement: 1.1

Depth of Transducer below static water level: 15.91

File Name: W45am-12

Notes: Slow recovery / return to baseline

Head Displacement of 2 feet

Test 1:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes: 2-ft test not performed due to recovery time exceeding 60 minutes

Test 2:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes:

Slug Testing Sheet

Well ID: CFMW-047

Date: 7/10/17

Time: 15:35

DTW: 96.83

DTB: 123.13

Depth to Top of Screen: 113.13

Depth to Bottom of Screen: 123.13

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.3'

Depth of Transducer: 3.0 below DTW

File Name: MW047-11

Notes:

Test 2:

Actual Head Displacement: 1.2'

Depth of Transducer: 3.0'

File Name: MW047-12

Notes: Test 3: * Retest to achieve change in head closer to 1 foot

1.1'

3.0'

MW-047-13

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.8'

Depth of Transducer: 3.0'

File Name: MW047-21

Notes:

Test 2:

Actual Head Displacement: 1.9'

Depth of Transducer: 3.0'

File Name: MW047-22

Notes:

7/18/17
101.13

Slug Testing Sheet

Well ID: CFMW-049a
Date: 7/17/17
Time: 09:00

DTW: 100.20 - changing
DTB: 151.13
Depth to Top of Screen: 141.13
Depth to Bottom of Screen: 151.13

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.9'
Depth of Transducer below static water level: 3.01'
File Name: MW49a-11

Notes: Test not performed at 09:00 due to changing water level ~~not~~ observed during cagging

Test 2:

Actual Head Displacement: 1.1'
Depth of Transducer below static water level: 3.00'
File Name: MW49a-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.8'
Depth of Transducer below static water level: 3.00'
File Name: MW49a-21

Notes: Test 3:
Head Displace: 2.1'
Trans Depth: 3.00'
File Name: MW49a-23

Test 2:

Actual Head Displacement: 2.2'
Depth of Transducer below static water level: 3.00'
File Name: MW49a-22

Notes:

Slug Testing Sheet

Well ID: CFMW-050

Date: 7/13/17

Time: 13:15

DTW: 102.02

DTB: 123.39

Depth to Top of Screen: 113.39

Depth to Bottom of Screen: 123.39

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Notes:

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 3.0

File Name: MW050-11

Test 2:

Notes:

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 3.0

File Name: MW050-12

Head Displacement of 2 feet

Test 1:

Notes:

Actual Head Displacement: 1.9

Depth of Transducer below static water level: 3.0

File Name: MW050-21

Test 2:

Notes:

Actual Head Displacement: 2.1

Depth of Transducer below static water level: 3.0

File Name: MW050-22

Slug Testing Sheet

Well ID: CFMW - 053a

Date: ~~7/10/17~~ 7/17/17

Time: ~~10:00~~ 0800

DTW: 85.81

DTB: 162.55

Depth to Top of Screen: 152.55

Depth to Bottom of Screen: 162.55

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.9

Depth of Transducer: 3.0

File Name: MW53a-11

Pres 15" H_2O

Notes: removed existing transducer from well to perform slug test. Pressure very slow to return to baseline. Released pressure before recovered

Test 2:

Actual Head Displacement: 1.0

Depth of Transducer: 3.05

File Name: MW53a-12

Pres 25" H_2O

Notes: well extremely slow to return to baseline Released pressure @ 8" H_2O (@ 3.07 ft) fell ~1 ft. quick to recover to ~3.05

Head Displacement of 2 feet

Test 1:

Actual Head Displacement:

Depth of Transducer:

File Name:

Notes:

Test 2:

Actual Head Displacement:

Depth of Transducer:

File Name:

Notes:

Slug Testing Sheet

Well ID: CF MW-054

Date: 7/11/17

Time: 0900

DTW: 71.95

DTB: 87.39

Depth to Top of Screen: 77.39

Depth to Bottom of Screen: 87.39

Pneumatic or Mechanical Test Performed: pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.0'

Depth of Transducer: 3.08' below static

File Name: MW054-11

Notes:

Test 2:

Actual Head Displacement: 1.1'

Depth of Transducer: ~~2.98'~~ 3.2' below static

File Name: MW054-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0'

Depth of Transducer: ~~2.98'~~ 3.26' below static

File Name: MW054-21

Notes: noise right after stabilization-water level dropped then recovered

Test 2:

Actual Head Displacement: 1.9'

Depth of Transducer: ~~2.98'~~ 3.3' below static

File Name: MW-054-22

Notes: noise during recovery to baseline

Test 3:

Head Displacement: 2.0'

Depth of Trans. below static: 3.32'

File Name: MW054-23

Slug Testing Sheet

Well ID: GFMW-056a

Date: 7/20/17

Time: 10:40

DTW: 70.67

DTB: 137.52

Depth to Top of Screen: 127.52

Depth to Bottom of Screen: 137.52

Pneumatic or Mechanical Test Performed: mechanical

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.95

Depth of Transducer below static water level: 8.03'

File Name: MW56gm11

Notes: extremely slow to recover to baseline (3.5 hrs)

Test 2: 7/27: pneumatic

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 3.0

File Name: MW56a-12

Notes: DTW: 71.34

Released pressure after 3 hours in order to allow sufficient time to rebound after drop in head.

Head Displacement of 2 feet

Test complete @ 1650. 7/27

Test 1:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes:

Test 2:

Actual Head Displacement:

Depth of Transducer below static water level:

File Name:

Notes:

Slug Testing Sheet

Well ID: CFMW-056b

Date: 7-12-17

Time: 0940

DTW: 28.97

DTB: 52.60

Depth to Top of Screen: 42.60

Depth to Bottom of Screen: 52.60

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.7'

Depth of Transducer below static water level: 3.03'

File Name: MW56b-11

Notes: completed third test because Test 1 did not achieve proper head displacement

Test 2:

Actual Head Displacement: 0.9'

Depth of Transducer below static water level: 3.03'

File Name: MW-56b-12

Notes: Test 3: Head Displace: 1.1' Depth of Trans: 3.03' File Name: MW56b-13

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.4'

Depth of Transducer below static water level: 3.03'

File Name: MW56b-21

Notes: completed 3rd test because Test 1 did not achieve proper head displacement

Test 2:

Actual Head Displacement: 2.0'

Depth of Transducer below static water level: 3.03'

File Name: MW-56b-22

Notes: Test 3: Head Displace: 2.1' Depth of Trans: 3.03' File Name: MW56b-23

Slug Testing Sheet

Well ID: CFMW-057a
Date: 07/20/17
Time: 09:45

DTW: 68.10
DTB: 140.41
Depth to Top of Screen: 130.41
Depth to Bottom of Screen: 140.41

68.75 (7/27).

Pneumatic or Mechanical Test Performed: Mechanical

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1 ft
Depth of Transducer below static water level: 8.03'
File Name: MW57am11

Notes:

Test 2:

Actual Head Displacement: 1 ft
Depth of Transducer below static water level: 8.03'
File Name: MW57am12

Notes: *Stabilization occurring at very slow rate, may need to complete overnight test.

tests not complete

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0
Depth of Transducer below static water level: 11.5 ft
File Name: CFMW-057a-MST

Notes: 7/27/17
0855 - -1.959 (begin)
1715 - -0.143
7/28 0830 - 0.4
7/31 0900 - 0.732
8/1 1700 - 0.706 — must be new baseline Begin 2nd test

Test 2:

Actual Head Displacement: 2.0
Depth of Transducer below static water level: 10.9 ft.
File Name: CFMW-057a-MST2

Notes:
Test 2 initial reading @ -1.975 ft
8/3 level at 0.09 - 1600
8/7 level at 0.259 - keep test running
8/9 level + 0.293 ft. = likely new baseline
Terminate test

Slug Testing Sheet

Well ID: CFMW-059

Date: 7/12/17

Time: 1415

DTW: 64.10

DTB: 92.66

Depth to Top of Screen: 82.66

Depth to Bottom of Screen: 92.66

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 1.0

Depth of Transducer below static water level: 3.0

File Name: MW059-11

Notes:

Test 2:

Actual Head Displacement: 1.1

Depth of Transducer below static water level: 3.0

File Name: MW059-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.0

Depth of Transducer below static water level: 3.0

File Name: MW059-21

Notes:

Test 2:

Actual Head Displacement: 2.0

Depth of Transducer below static water level: 3.0

File Name: MW059-22

Notes:

Slug Testing Sheet

Well ID: CFMW-059a

Date: 7/12/17

Time:

DTW: 66.70

DTB: 163.98

Depth to Top of Screen: 153.98

Depth to Bottom of Screen: 163.98

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.9'

Depth of Transducer below static water level: 3.00'

File Name: MW59a-11

Notes:

Test 2:

Actual Head Displacement: 1.00'

Depth of Transducer below static water level: 3.00'

File Name: MW59a-12

Notes:

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 2.00'

Depth of Transducer below static water level: 3.00'

File Name: MW59a-21

Notes:

Test 2:

Actual Head Displacement: 1.9'

Depth of Transducer below static water level: 3.00'

File Name: MW59a-22

Notes:

Slug Testing Sheet

Well ID: CFMW-061

Date: 7/13/17

Time: 14:45

DTW: 11.89

DTB: 26.02

Depth to Top of Screen: 16.02

Depth to Bottom of Screen: 26.02

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Notes: underdampened test

Actual Head Displacement: ~~0.9'~~ 1.1'

Depth of Transducer below static water level: 2.99'

File Name: MW061-11

Test 2:

Notes: underdampened response

Actual Head Displacement: 0.9'

Depth of Transducer below static water level: 2.99'

File Name: MW061-12

Head Displacement of 2 feet

Test 1:

Notes: Underdampened

Actual Head Displacement: 2.0'

Depth of Transducer below static water level: 2.99'

File Name: MW061-21

Test 2:

Notes: Under dampened

Actual Head Displacement: 1.8'

Depth of Transducer below static water level: 2.99'

File Name: MW061-22

Test 3: Head Displac: 1.9'

Transducer Depth: 2.99'

File Name: MW061-23

Underdampened

Slug Testing Sheet

Well ID: CFMW-064

Date: 7-13-17

Time: 14:00

DTW: 12.60

DTB: 32.92

Depth to Top of Screen: 22.92

Depth to Bottom of Screen: 32.92

Pneumatic or Mechanical Test Performed: Pneumatic

Head Displacement of 1 foot

Test 1:

Actual Head Displacement: 0.9

Depth of Transducer: 3.0

File Name: MW064-11

Notes: Pressure change, and return to baseline very quick.

Test 2:

Actual Head Displacement: 1.0

Depth of Transducer: 3.0

File Name: MW064-12

Notes: " "

Head Displacement of 2 feet

Test 1:

Actual Head Displacement: 1.9

Depth of Transducer: 3.0

File Name: MW064-21

Notes:

Test 2:

Actual Head Displacement: 2.0

Depth of Transducer: 3.0

File Name: MW064-22

Notes:

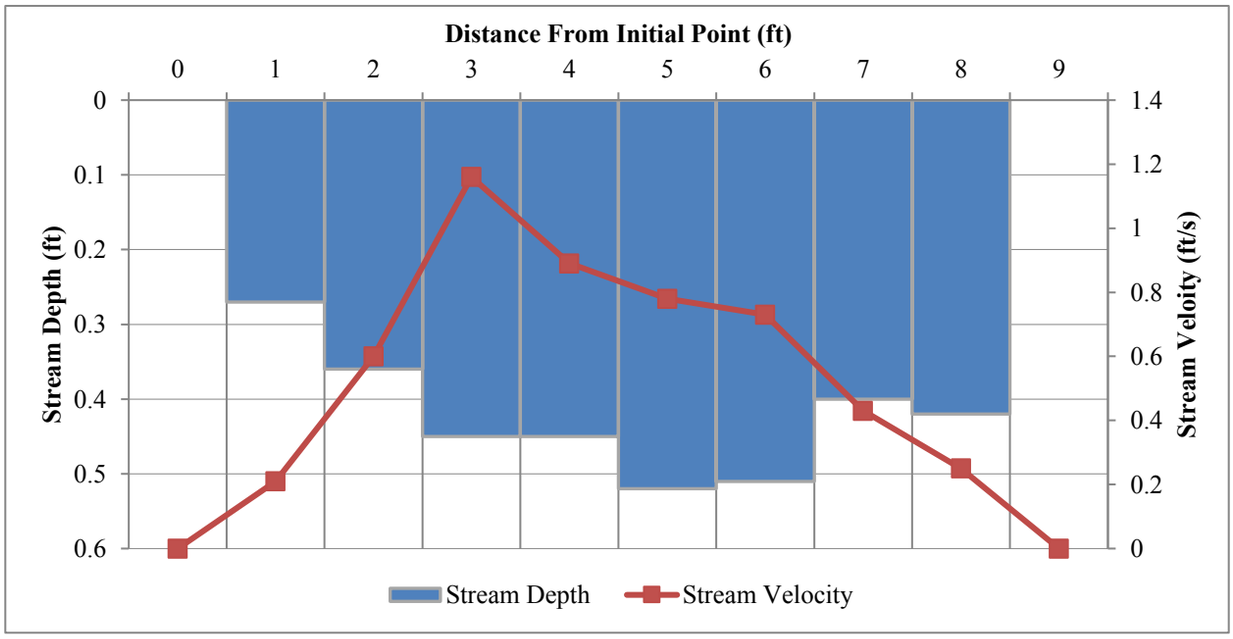
APPENDIX D

Surface Water Discharge Calculations

Appendix D. Surface Water Discharge Calculations - Pre-Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-009, CFAC
Date: 6/7/2016
Team: Amy Hoffmann, Sydney Ward

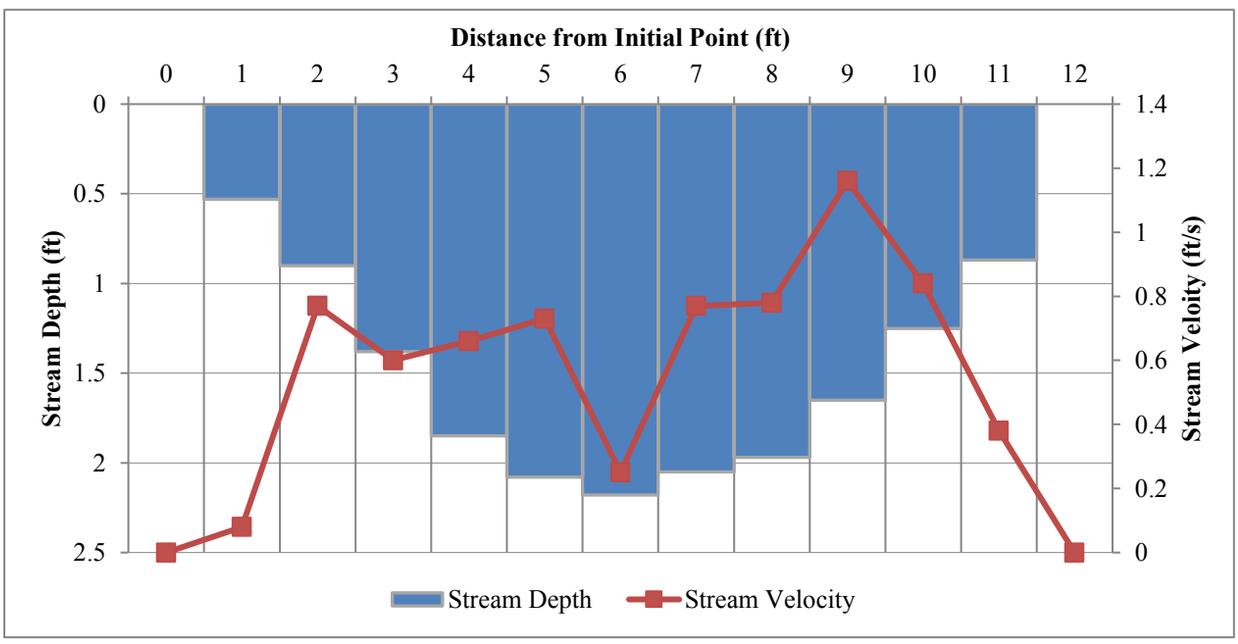
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0.5	0.00	0.00	Bank
2	1	0.27	--	0.21	1	0.27	0.057	
3	2	0.36	--	0.6	1	0.36	0.216	
4	3	0.45	--	1.16	1	0.45	0.522	
5	4	0.45	--	0.89	1	0.45	0.401	
6	5	0.52	--	0.78	1	0.52	0.406	
7	6	0.51	--	0.73	1	0.51	0.372	
8	7	0.4	--	0.43	1	0.40	0.292	
9	8	0.42	--	0.25	1	0.42	0.181	
10	9	0	--	0	0.5	0.00	0.000	Bank
					Sum	3.38	2.45	



Appendix D. Surface Water Discharge Calculations - Pre-Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-010, CFAC
Date: 6/7/2016
Team: Amy Hoffmann, Sydney Ward

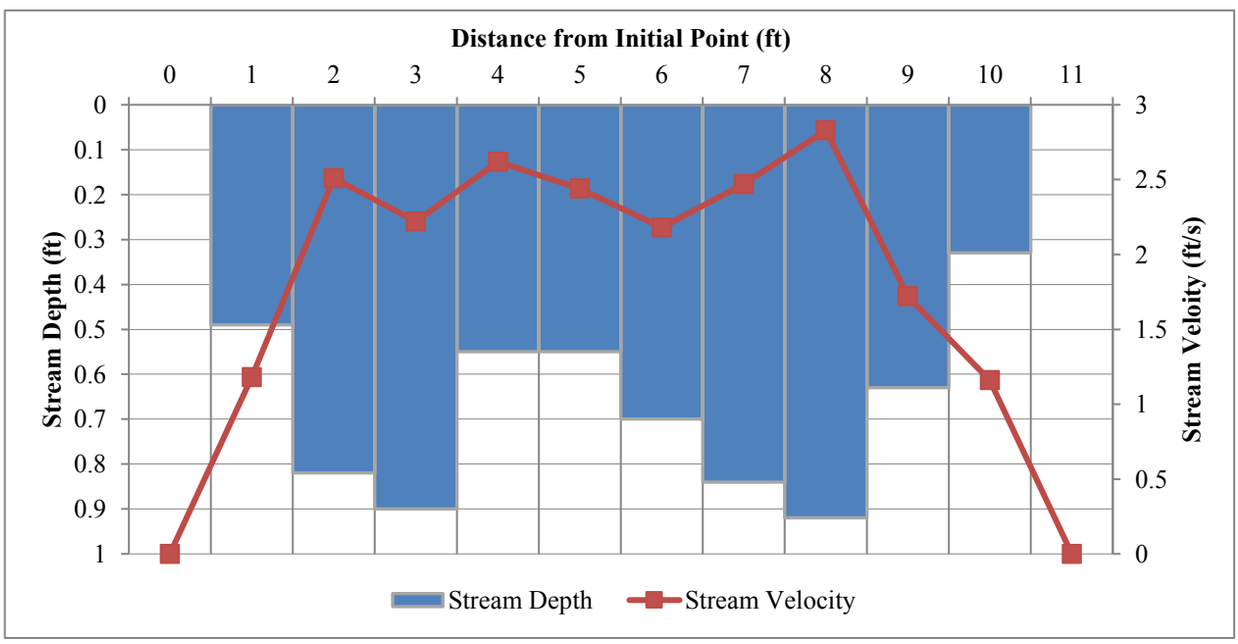
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0.5	0.00	0.000	Bank
2	1	0.53	--	0.08	1	0.53	0.042	
3	2	0.9	--	0.77	1	0.90	0.693	
4	3	1.38	--	0.6	1	1.38	0.828	
5	4	1.85	--	0.66	1	1.85	1.221	
6	5	2.08	--	0.73	1	2.08	1.518	
7	6	2.18	--	0.25	1	2.18	0.545	
8	7	2.05	--	0.77	1	2.05	1.579	
9	8	1.97	--	0.78	1	1.97	1.537	
10	9	1.65	--	1.16	1	1.65	1.914	
11	10	1.25	--	0.84	1	1.25	1.050	
12	11	0.87	--	0.38	1	0.87	0.331	
13	12	0	--	0	0.5	0.00	0.000	Bank
					Sum	16.71	11.26	



Appendix D. Surface Water Discharge Calculations - Pre-Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-011, CFAC
Date: 6/7/2016
Team: Amy Hoffmann, Sydney Ward

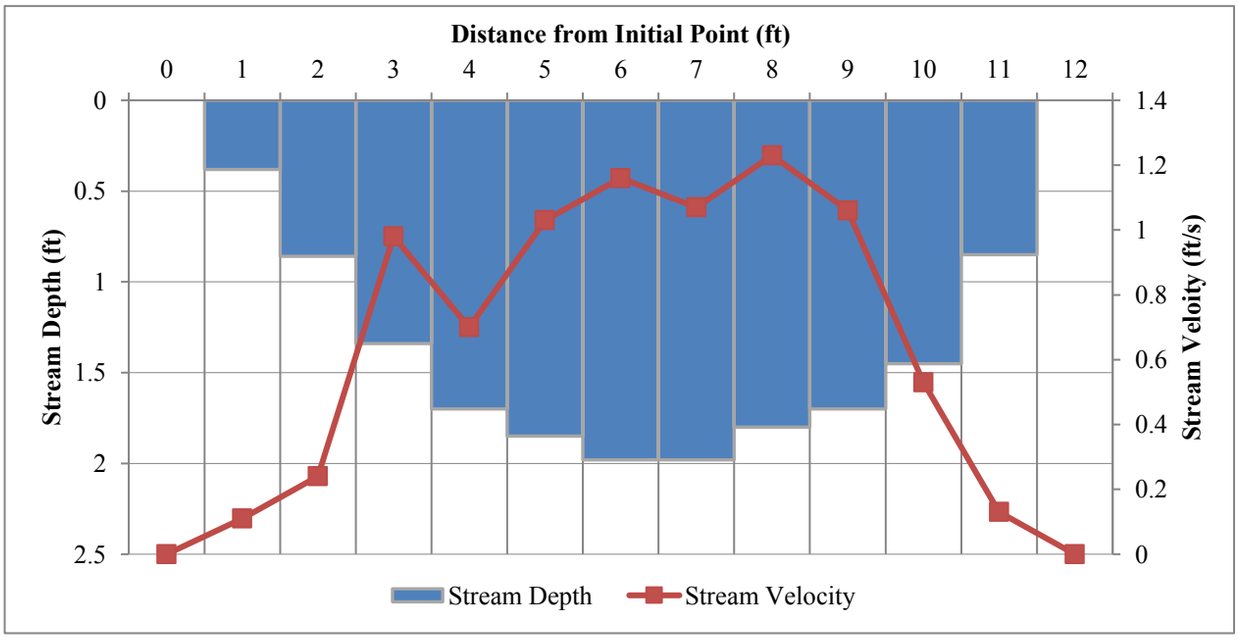
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0.5	0.00	0.000	Bank
2	1	0.49	--	1.18	1	0.49	0.578	
3	2	0.82	--	2.51	1	0.82	2.058	
4	3	0.9	--	2.22	1	0.90	1.998	
5	4	0.55	--	2.62	1	0.55	1.441	
6	5	0.55	--	2.44	1	0.55	1.342	
7	6	0.7	--	2.18	1	0.70	1.526	
8	7	0.84	--	2.47	1	0.84	2.075	
9	8	0.92	--	2.83	1	0.92	2.604	
10	9	0.63	--	1.72	1	0.63	1.084	
11	10	0.33	--	1.16	1	0.33	0.383	
12	11	0	--	0	0.5	0.00	0.000	Bank
					Sum	6.73	15.09	



Appendix D. Surface Water Discharge Calculations - Pre-Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-012, CFAC
Date: 6/7/2016
Team: Amy Hoffmann, Sydney Ward

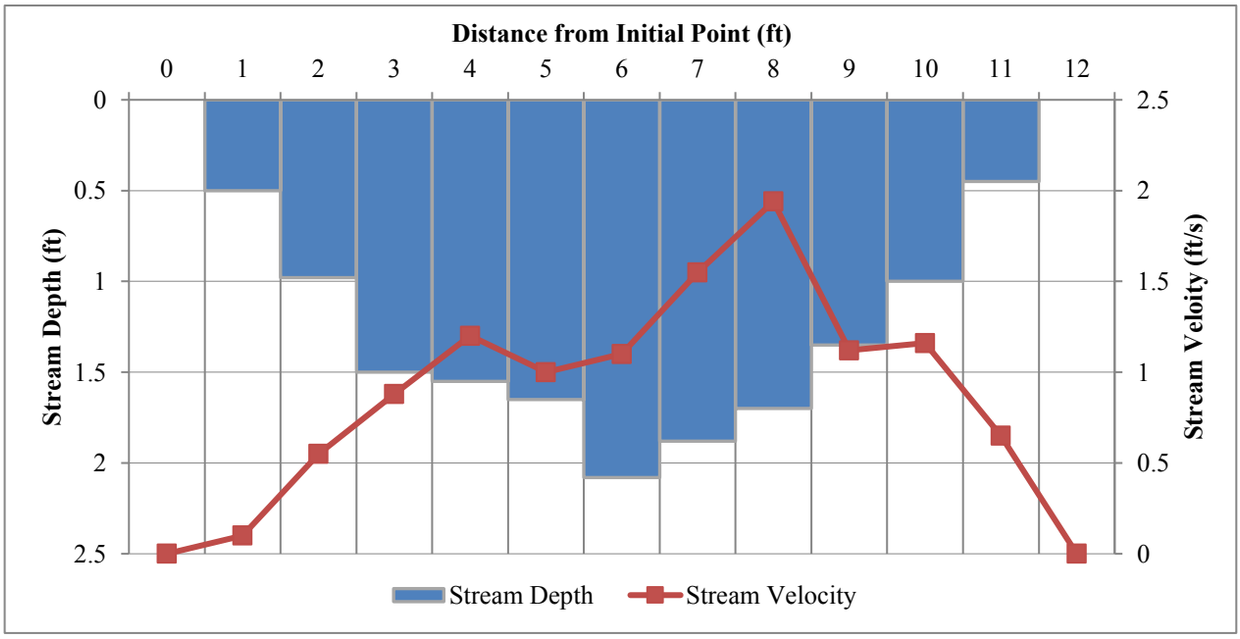
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0.5	0.00	0.000	Bank
2	1	0.38	--	0.11	1	0.38	0.042	
3	2	0.86	--	0.24	1	0.86	0.206	
4	3	1.34	--	0.98	1	1.34	1.313	
5	4	1.7	--	0.7	1	1.70	1.190	
6	5	1.85	--	1.03	1	1.85	1.906	
7	6	1.98	--	1.16	1	1.98	2.297	
8	7	1.98	--	1.07	1	1.98	2.119	
9	8	1.8	--	1.23	1	1.80	2.214	
10	9	1.7	--	1.06	1	1.70	1.802	
11	10	1.45	--	0.53	1	1.45	0.769	
12	11	0.85	--	0.13	1	0.85	0.111	
13	12	0	--	0	0.5	0.00	0.000	Bank
					Sum	15.89	13.97	



Appendix D. Surface Water Discharge Calculations - Pre-Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-013, CFAC
Date: 6/7/2016
Team: Amy Hoffmann, Sydney Ward

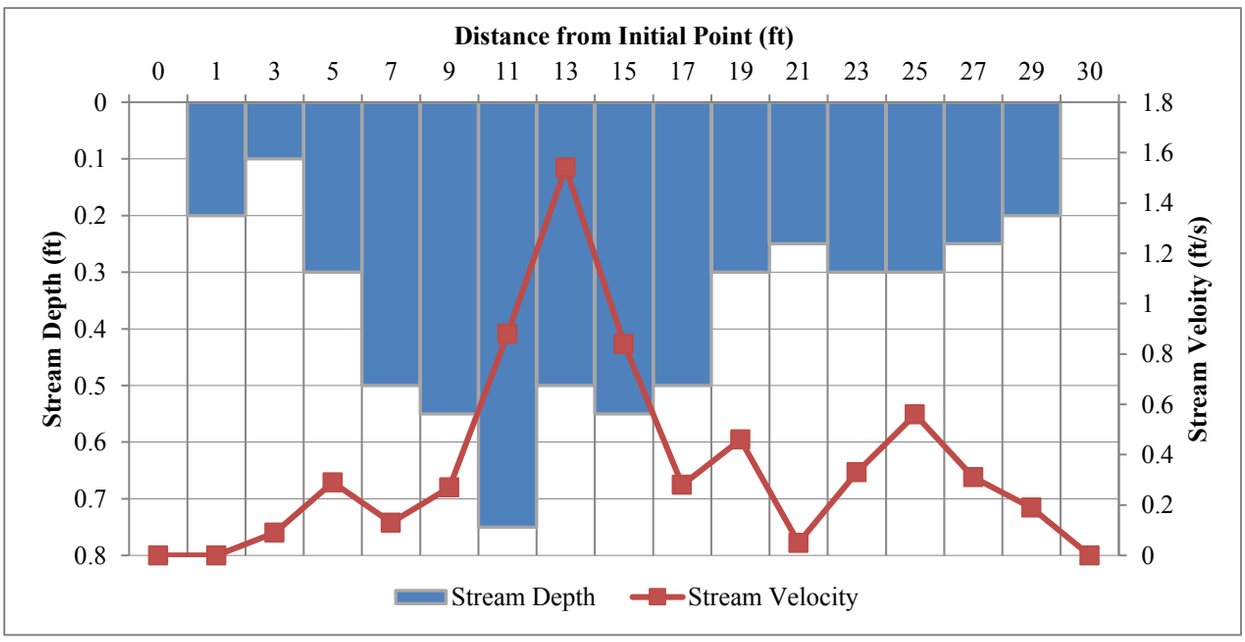
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0.5	0.00	0.000	Bank
2	1	0.5	--	0.1	1	0.50	0.050	
3	2	0.98	--	0.55	1	0.98	0.539	
4	3	1.5	--	0.88	1	1.50	1.320	
5	4	1.55	--	1.2	1	1.55	1.860	
6	5	1.65	--	1	1	1.65	1.650	
7	6	2.08	--	1.1	1	2.08	2.288	
8	7	1.88	--	1.55	1	1.88	2.914	
9	8	1.7	--	1.94	1	1.70	3.298	
10	9	1.35	--	1.12	1	1.35	1.512	
11	10	1	--	1.16	1	1.00	1.160	
12	11	0.45	--	0.65	1	0.45	0.293	
13	12	0	--	0	0.5	0.00	0.000	Bank
					Sum	14.64	16.88	



Appendix D. Surface Water Discharge Calculations - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-014, CFAC
Date: 8/30/2016
Team: Amy Hoffmann, Sydney Ward

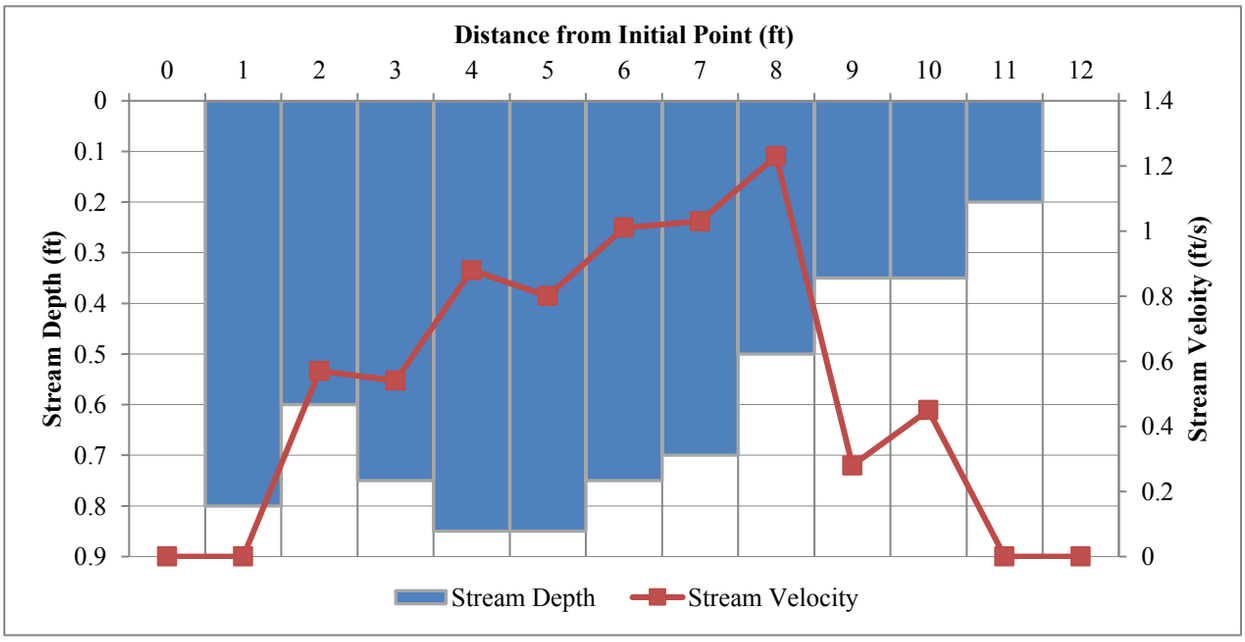
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.2	--	0	1	0.20	0.000	
3	3	0.1	--	0.09	2	0.20	0.018	
4	5	0.3	--	0.29	2	0.60	0.174	
5	7	0.5	--	0.13	2	1.00	0.130	
6	9	0.55	--	0.27	2	1.10	0.297	
7	11	0.75	--	0.88	2	1.50	1.320	
8	13	0.5	--	1.54	2	1.00	1.540	
9	15	0.55	--	0.84	2	1.10	1.694	
10	17	0.5	--	0.28	2	1.00	0.840	
11	19	0.3	--	0.46	2	0.60	0.168	
12	21	0.25	--	0.05	2	0.50	0.230	
13	23	0.3	--	0.33	2	0.60	0.030	
14	25	0.3	--	0.56	2	0.60	0.198	
15	27	0.25	--	0.31	2	0.50	0.280	
16	29	0.2	--	0.19	1.5	0.30	0.168	
17	30	0	--	0	0.5	0.00	0.000	Bank
					Sum	10.80	7.09	



Appendix D. Surface Water Discharge Calculations - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-015, CFAC
Date: 8/29/2016
Team: Amy Hoffmann, Sydney Ward

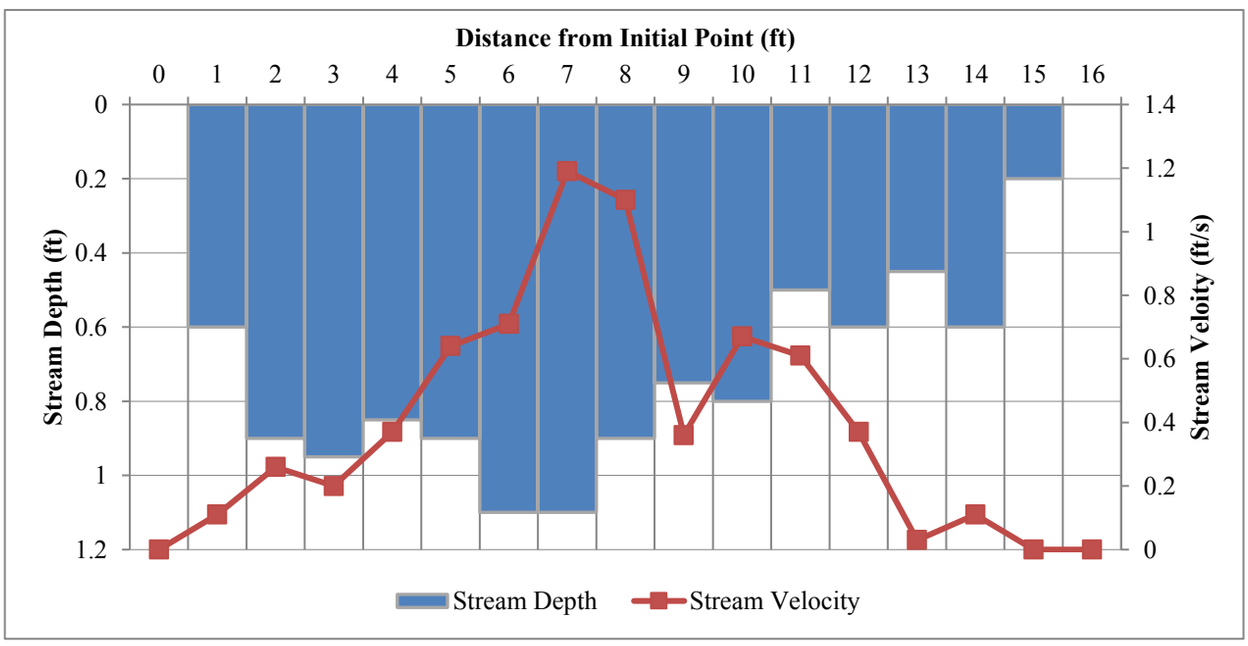
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.8	--	0	1	0.80	0.000	
3	2	0.6	--	0.57	1	0.60	0.342	
4	3	0.75	--	0.54	1	0.75	0.405	
5	4	0.85	--	0.88	1	0.85	0.748	
6	5	0.85	--	0.8	1	0.85	0.680	
7	6	0.75	--	1.01	1	0.75	0.758	
8	7	0.7	--	1.03	1	0.70	0.721	
9	8	0.5	--	1.23	1	0.50	0.615	
10	9	0.35	--	0.28	1	0.35	0.098	
11	10	0.35	--	0.45	1	0.35	0.158	
12	11	0.2	--	0	1	0.20	0.000	
13	12	0	--	0	0.5	0.00	0.000	Bank
					Sum	6.70	4.52	



Appendix D. Surface Water Discharge Calculations - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-016, CFAC
Date: 8/29/2016
Team: Amy Hoffmann, Sydney Ward

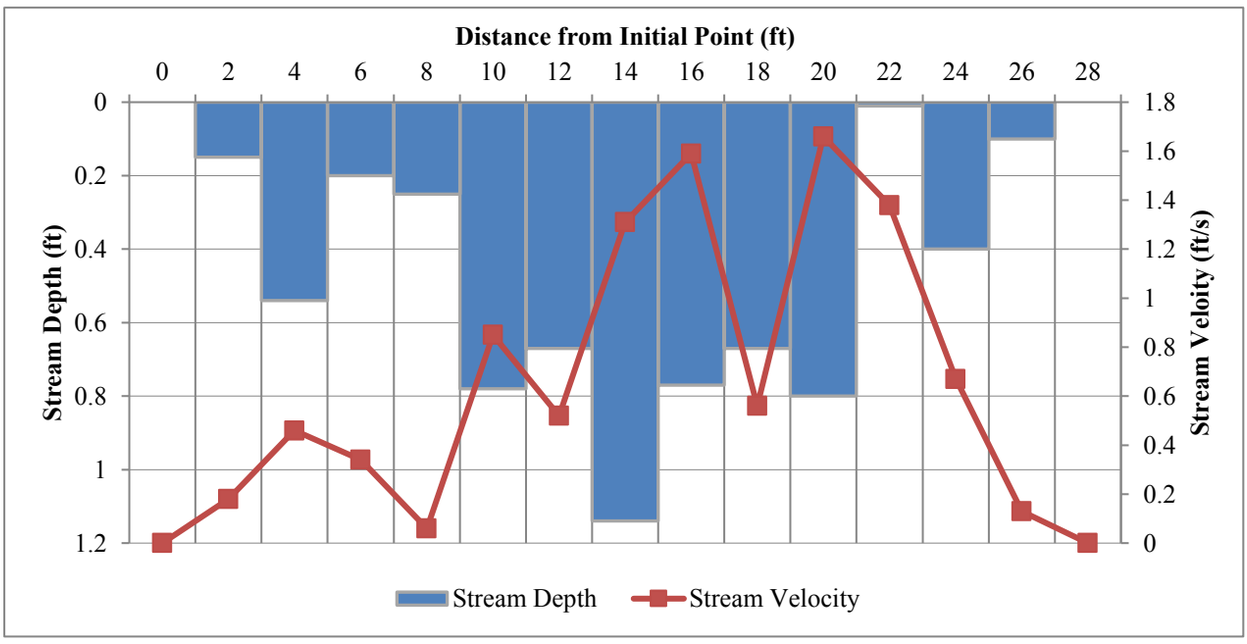
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0.5	0.00	0.000	Bank
2	1	0.6	--	0.11	1	0.60	0.066	
3	2	0.9	--	0.26	1	0.90	0.234	
4	3	0.95	--	0.2	1	0.95	0.190	
5	4	0.85	--	0.37	1	0.85	0.315	
6	5	0.9	--	0.64	1	0.90	0.576	
7	6	1.1	--	0.71	1	1.10	0.781	
8	7	1.1	--	1.19	1	1.10	1.309	
9	8	0.9	--	1.1	1	0.90	0.990	
10	9	0.75	--	0.36	1	0.75	0.270	
11	10	0.8	--	0.67	1	0.80	0.536	
12	11	0.5	--	0.61	1	0.50	0.305	
13	12	0.6	--	0.37	1	0.60	0.222	
14	13	0.45	--	0.03	1	0.45	0.014	
15	14	0.6	--	0.11	1	0.60	0.066	
16	15	0.2	--	0	1	0.20	0.000	
17	16	0	--	0	0.5	0.00	0.000	Bank
					Sum	11.20	5.87	



Appendix D. Surface Water Discharge Calculations - Round 2
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-014, CFAC
Date: 11/30/2016
Team: MaryBeth Lyons, Sydney Ward

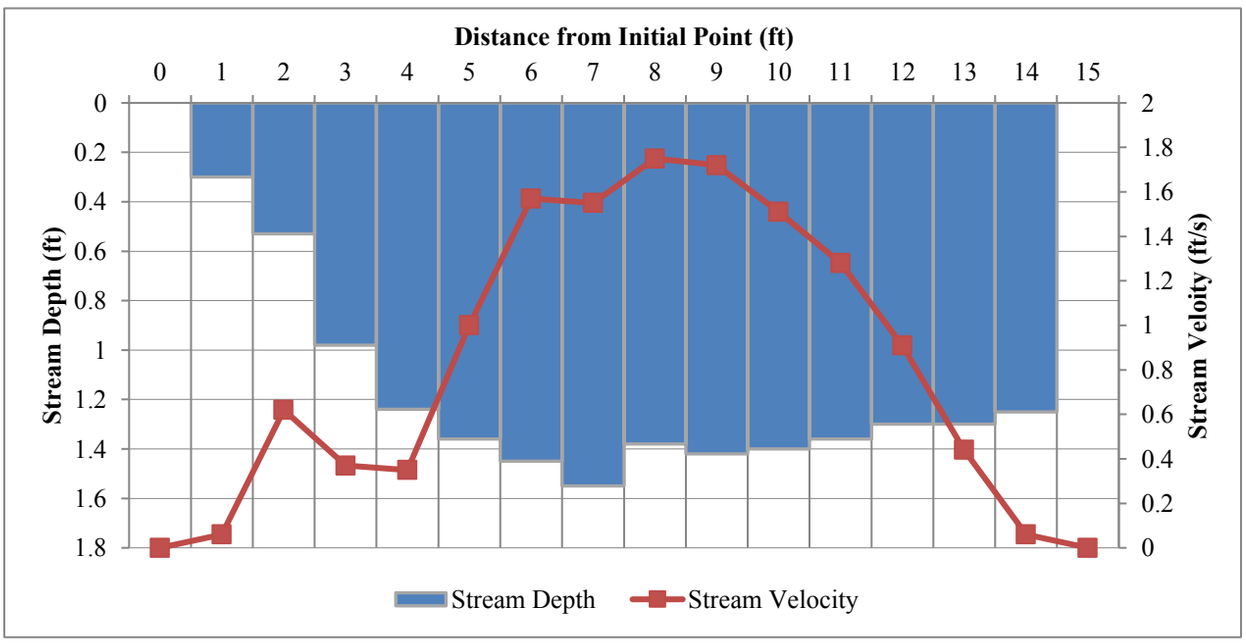
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	2	0.15	--	0.18	1	0.15	0.027	
3	4	0.54	--	0.46	2	1.08	0.497	
4	6	0.2	--	0.34	2	0.40	0.136	
5	8	0.25	--	0.06	2	0.50	0.030	
6	10	0.78	--	0.85	2	1.56	1.326	
7	12	0.67	--	0.52	2	1.34	0.697	
8	14	1.14	--	1.31	2	2.28	2.987	
9	16	0.77	--	1.59	2	1.54	2.017	
10	18	0.67	--	0.56	2	1.34	2.131	
11	20	0.8	--	1.66	2	1.60	0.896	
12	22	0.01	--	1.38	2	0.02	0.033	
13	24	0.4	--	0.67	2	0.80	1.104	
14	26	0.1	--	0.13	2	0.20	0.134	
15	28	0	--	0	1	0.00	0.000	Bank
					Sum	12.81	12.01	



Appendix D. Surface Water Discharge Calculations - Round 2
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-015, CFAC
Date: 11/30/2016
Team: MaryBeth Lyons, Sydney Ward

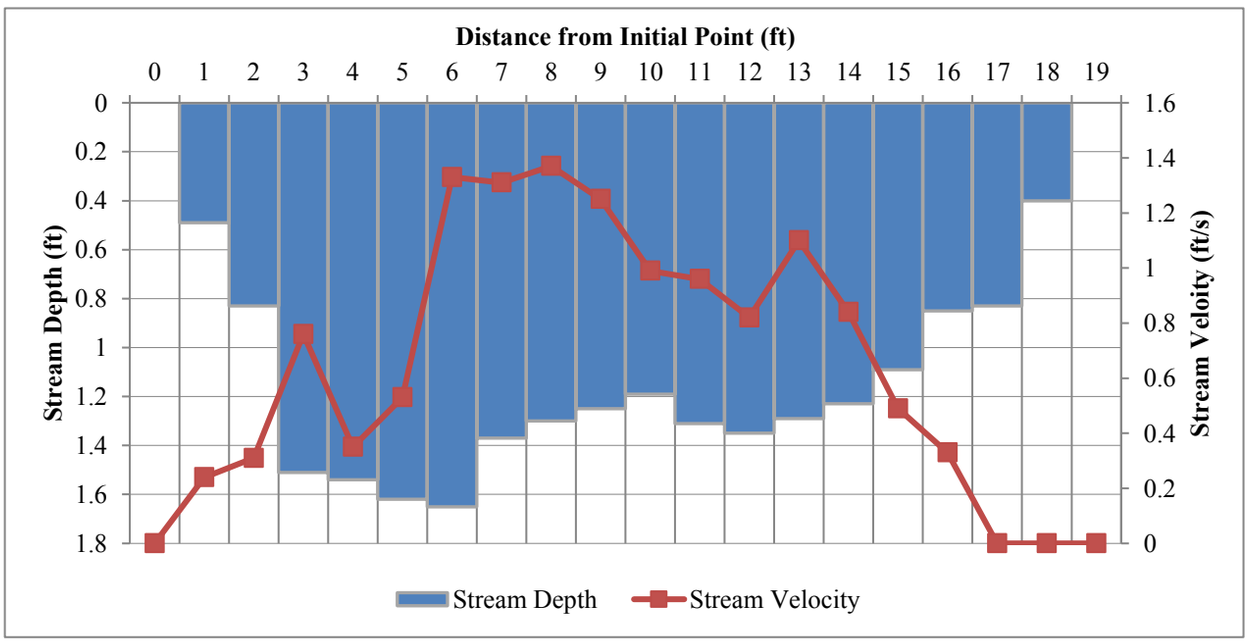
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.3	--	0.06	1	0.30	0.018	
3	2	0.53	--	0.62	1	0.53	0.329	
4	3	0.98	--	0.37	1	0.98	0.363	
5	4	1.24	--	0.35	1	1.24	0.434	
6	5	1.36	--	1	1	1.36	1.360	
7	6	1.45	--	1.57	1	1.45	2.277	
8	7	1.55	--	1.55	1	1.55	2.403	
9	8	1.38	--	1.75	1	1.38	2.415	
10	9	1.42	--	1.72	1	1.42	2.442	
11	10	1.4	--	1.51	1	1.40	2.114	
12	11	1.36	--	1.28	1	1.36	1.741	
13	12	1.3	--	0.91	1	1.30	1.183	
14	13	1.3	--	0.44	1	1.30	0.572	
15	14	1.25	--	0.06	1	1.25	0.075	
16	15	0	--	0	0.5	0.00	0.000	Bank
					Sum	16.82	17.72	



Appendix D. Surface Water Discharge Calculations - Round 2
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-016, CFAC
Date: 11/30/2016
Team: MaryBeth Lyons, Sydney Ward

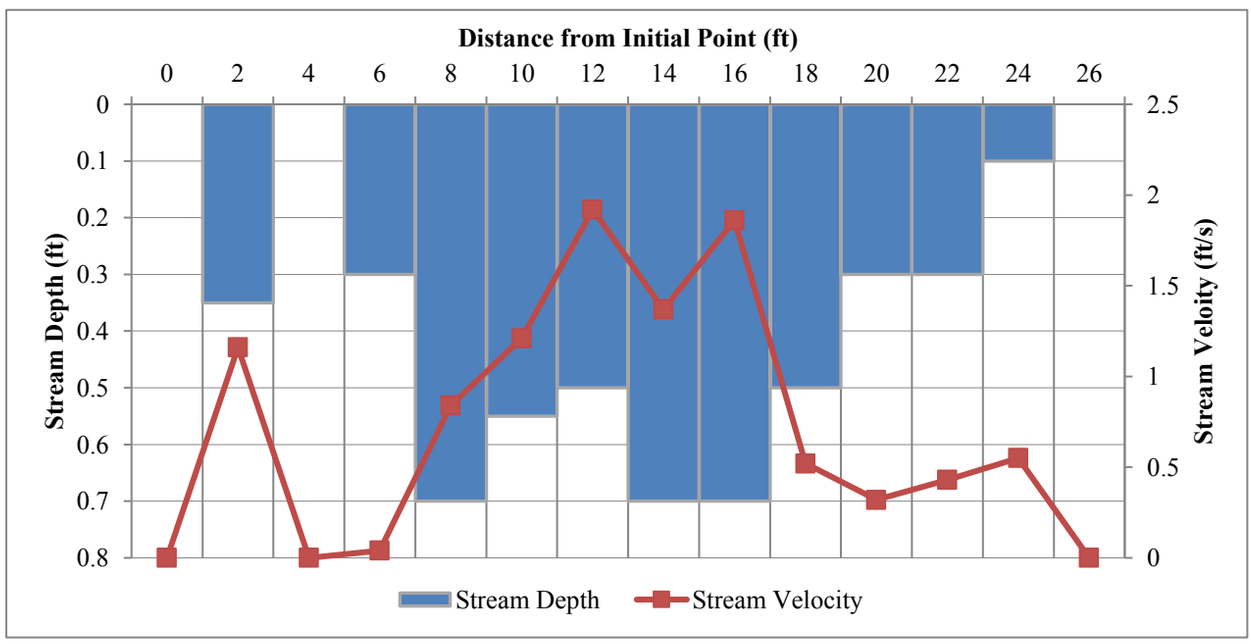
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0.5	0.00	0.000	Bank
2	1	0.49	--	0.24	1	0.49	0.118	
3	2	0.83	--	0.31	1	0.83	0.257	
4	3	1.51	--	0.76	1	1.51	1.148	
5	4	1.54	--	0.35	1	1.54	0.539	
6	5	1.62	--	0.53	1	1.62	0.859	
7	6	1.65	--	1.33	1	1.65	2.195	
8	7	1.37	--	1.31	1	1.37	1.795	
9	8	1.3	--	1.37	1	1.30	1.781	
10	9	1.25	--	1.25	1	1.25	1.563	
11	10	1.19	--	0.99	1	1.19	1.178	
12	11	1.31	--	0.96	1	1.31	1.258	
13	12	1.35	--	0.82	1	1.35	1.107	
14	13	1.29	--	1.1	1	1.29	1.419	
15	14	1.23	--	0.84	1	1.23	1.033	
16	15	1.09	--	0.49	1	1.09	0.534	
17	16	0.85	--	0.33	1	0.85	0.281	
18	17	0.83	--	0	1	0.83	0.000	
19	18	0.4	--	0	1	0.40	0.000	
20	19	0	--	0	0.5	0.00	0.000	Bank
					Sum	21.10	17.06	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-014, CFAC
Date: 3/13/2017
Team: Doug Ferraiolo, Sydney Ward

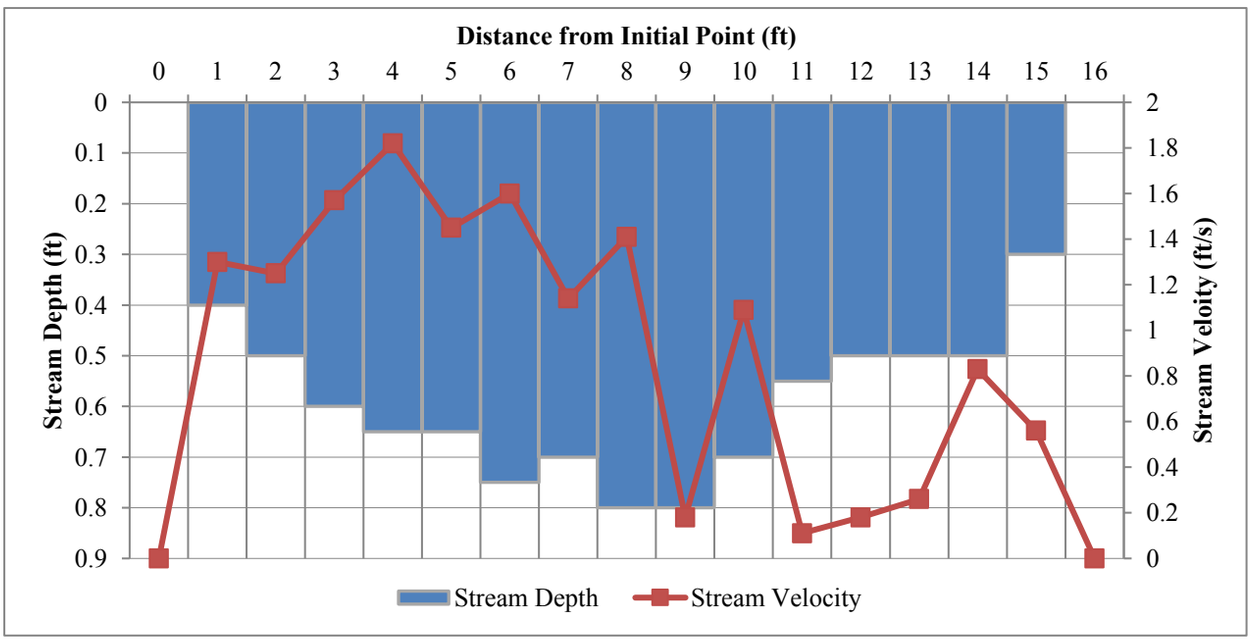
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	1	0.00	0.000	Bank
2	2	0.35	--	1.16	2	0.70	0.812	
3	4	0	--	0	2	0.00	0.000	
4	6	0.3	--	0.04	2	0.60	0.024	
5	8	0.7	--	0.84	2	1.40	1.176	
6	10	0.55	--	1.21	2	1.10	1.331	
7	12	0.5	--	1.92	2	1.00	1.920	
8	14	0.7	--	1.37	2	1.40	1.918	
9	16	0.7	--	1.86	2	1.40	2.604	
10	18	0.5	--	0.52	2	1.00	0.520	
11	20	0.3	--	0.32	2	0.60	0.192	
12	22	0.3	--	0.43	2	0.60	0.258	
13	24	0.1	--	0.55	2	0.20	0.110	
14	26	0	--	0	1	0.00	0.000	Bank
					Sum	10.00	10.87	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-015, CFAC
Date: 3/13/2017
Team: Doug Ferraiolo, Sydney Ward

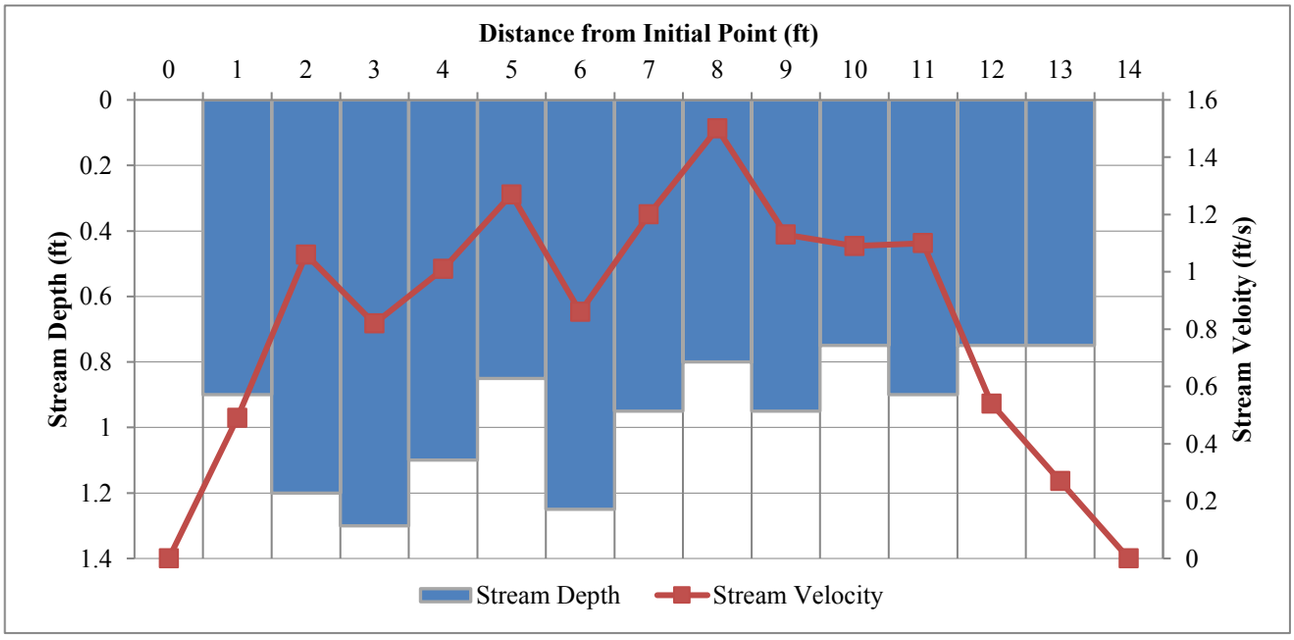
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.4	--	1.3	1	0.40	0.520	
3	2	0.5	--	1.25	1	0.50	0.625	
4	3	0.6	--	1.57	1	0.60	0.942	
5	4	0.65	--	1.82	1	0.65	1.183	
6	5	0.65	--	1.45	1	0.65	0.943	
7	6	0.75	--	1.6	1	0.75	1.200	
8	7	0.7	--	1.14	3	2.10	2.394	
9	8	0.8	--	1.41	3	2.40	3.384	
10	9	0.8	--	0.18	3	2.40	0.432	
11	10	0.7	--	1.09	3	2.10	2.289	
12	11	0.55	--	0.11	3	1.65	0.182	
13	12	0.5	--	0.18	1	0.50	0.090	
14	13	0.5	--	0.26	1	0.50	0.130	
15	14	0.5	--	0.83	1	0.50	0.415	
16	15	0.3	--	0.56	1	0.30	0.168	
17	16	0	--	0	0.5	0.00	0.000	Bank
					Sum	16.00	14.90	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-016, CFAC
Date: 3/13/2017
Team: Doug Ferraiolo, Sydney Ward

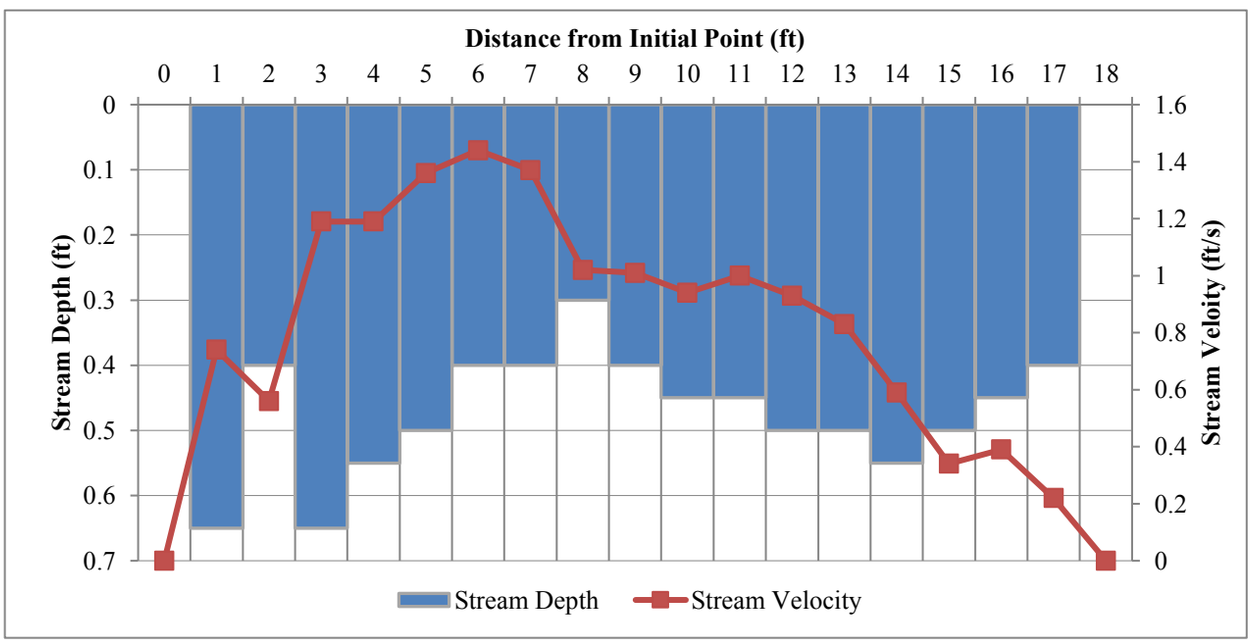
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0.5	0.00	0.000	Bank
2	1	0.9	--	0.49	1	0.90	0.441	
3	2	1.2	--	1.06	1	1.20	1.272	
4	3	1.3	--	0.82	1	1.30	1.066	
5	4	1.1	--	1.01	1	1.10	1.111	
6	5	0.85	--	1.27	1	0.85	1.080	
7	6	1.25	--	0.86	1	1.25	1.075	
8	7	0.95	--	1.2	1	0.95	1.140	
9	8	0.8	--	1.5	1	0.80	1.200	
10	9	0.95	--	1.13	1	0.95	1.074	
11	10	0.75	--	1.09	1	0.75	0.818	
12	11	0.9	--	1.1	1	0.90	0.990	
13	12	0.75	--	0.54	1	0.75	0.405	
14	13	0.75	--	0.27	1	0.75	0.203	
15	14	0	--	0	0.5	0.00	0.000	Bank
					Sum	12.45	11.87	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-025, CFAC
Date: 3/13/2017
Team: Doug Ferraiolo, Sydney Ward

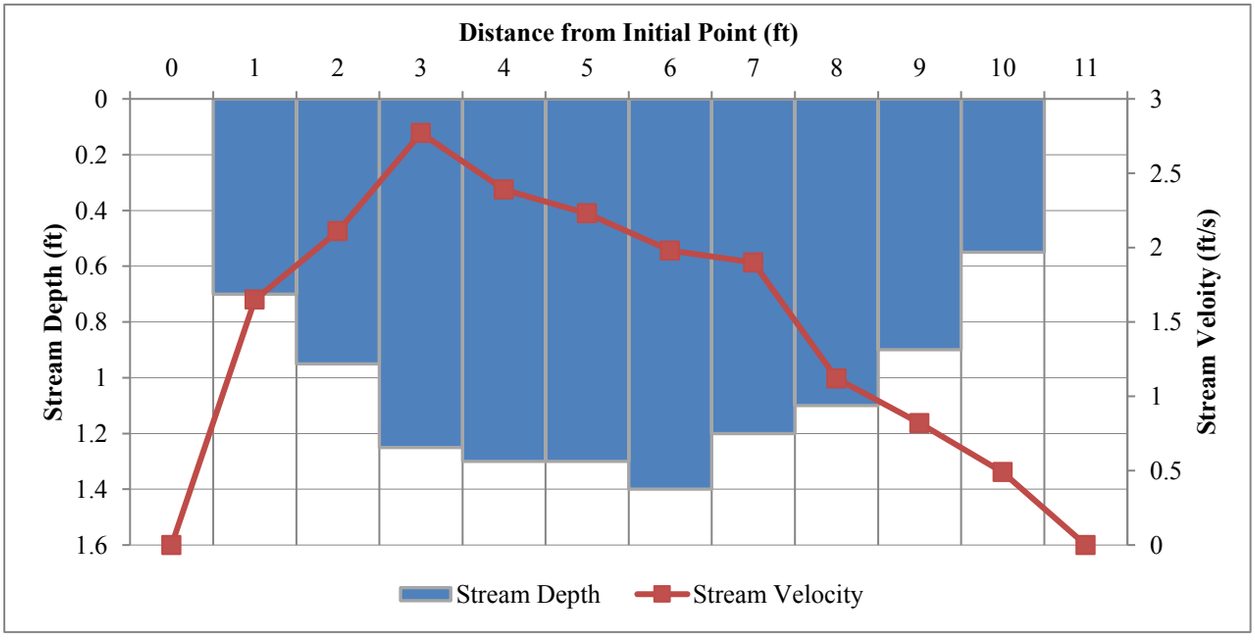
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0		0	0	0.00	0.000	Bank
2	1	0.65		0.74	0.5	0.33	0.241	
3	2	0.4		0.56	1	0.40	0.224	
4	3	0.65		1.19	1	0.65	0.774	
5	4	0.55		1.19	1	0.55	0.655	
6	5	0.5		1.36	1	0.50	0.680	
7	6	0.4		1.44	1	0.40	0.576	
8	7	0.4		1.37	1	0.40	0.548	
9	8	0.3		1.02	1	0.30	0.411	
10	9	0.4		1.01	1	0.40	0.408	
11	10	0.45		0.94	1	0.45	0.455	
12	11	0.45		1	1	0.45	0.423	
13	12	0.5		0.93	1	0.50	0.500	
14	13	0.5		0.83	1	0.50	0.465	
15	14	0.55		0.59	1	0.55	0.457	
16	15	0.5		0.34	1	0.50	0.295	
17	16	0.45		0.39	1	0.45	0.153	
18	17	0.4		0.22	1	0.40	0.156	
19	18	0		0	0.5	0.00	0.000	Bank
					Sum	7.73	7.42	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-009, CFAC
Date: 4/4/2017
Team: Doug Ferraiolo, MaryBeth Lyons

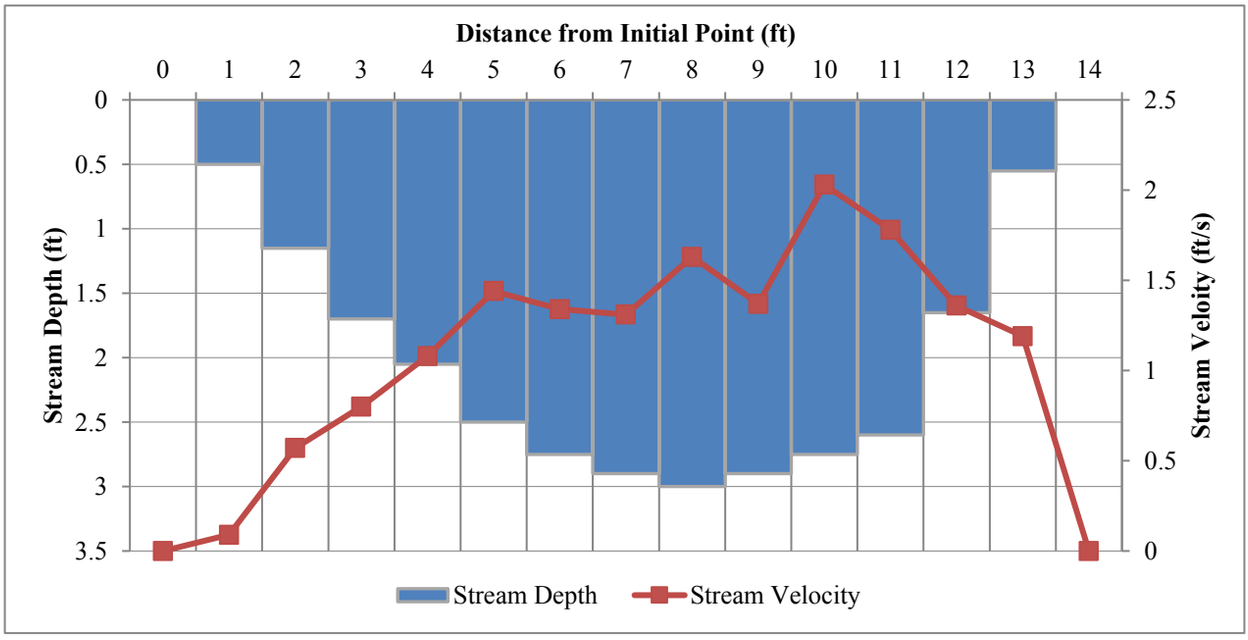
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.7	--	1.65	0.5	0.35	0.578	
3	2	0.95	--	2.11	1	0.95	2.005	
4	3	1.25	--	2.77	1	1.25	3.463	
5	4	1.3	--	2.39	1	1.30	3.107	
6	5	1.3	--	2.23	1	1.30	2.899	
7	6	1.4	--	1.98	1	1.40	2.772	
8	7	1.2	--	1.9	1	1.20	2.280	
9	8	1.1	--	1.12	1	1.10	2.090	
10	9	0.9	--	0.82	1	0.90	1.008	
11	10	0.55	--	0.49	1	0.55	0.451	
12	11	0	--	0	0.5	0.00	0.000	Bank
					Sum	10.30	20.65	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-010, CFAC
Date: 4/4/2017
Team: Doug Ferraiolo, MaryBeth Lyons

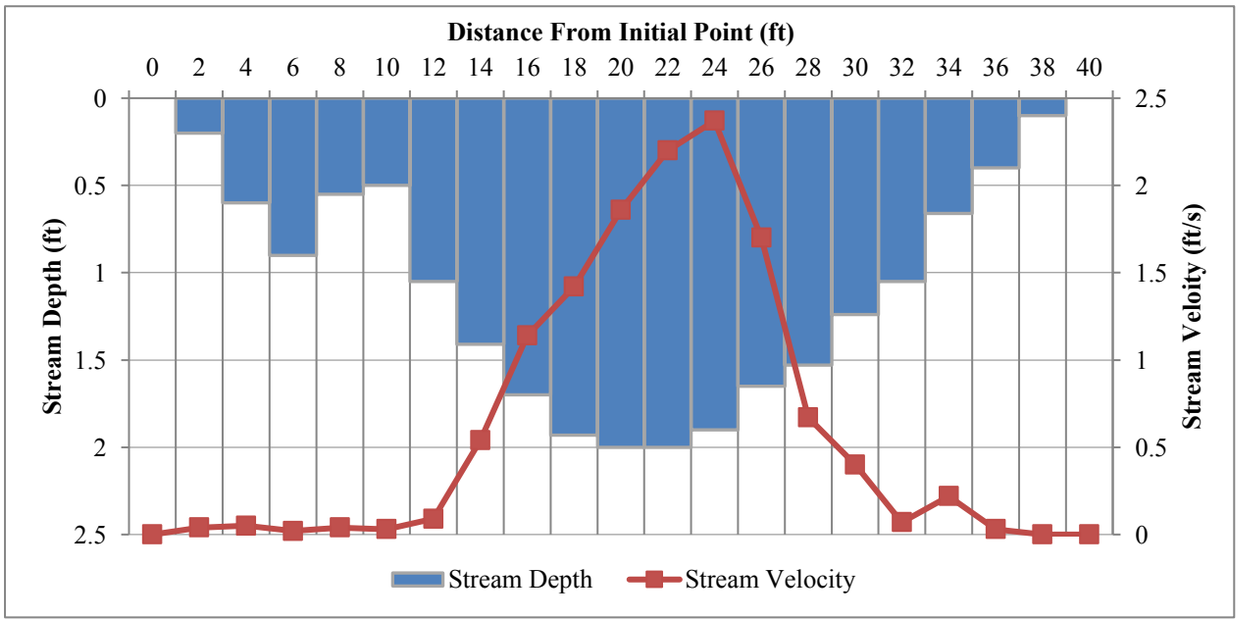
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.5	--	0.09	0.5	0.25	0.023	
3	2	1.15	--	0.57	1	1.15	0.656	
4	3	1.7	--	0.8	1	1.70	1.360	
5	4	2.05	--	1.08	1	2.05	2.214	
6	5	2.5	--	1.44	1	2.50	3.600	
7	6	2.75	--	1.34	1	2.75	3.685	
8	7	2.9	--	1.31	1	2.90	3.799	
9	8	3	--	1.63	1	3.00	3.930	
10	9	2.9	--	1.37	1	2.90	4.727	
11	10	2.75	--	2.03	1	2.75	3.768	
12	11	2.6	--	1.78	1	2.60	5.278	
13	12	1.65	--	1.36	1	1.65	2.937	
14	13	0.55	--	1.19	1	0.55	0.748	
15	14	0	--	0	0.5	0.00	0.000	Bank
					Sum	26.75	36.72	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-011, CFAC
Date: 4/4/2017
Team: Doug Ferraiolo, MaryBeth Lyons

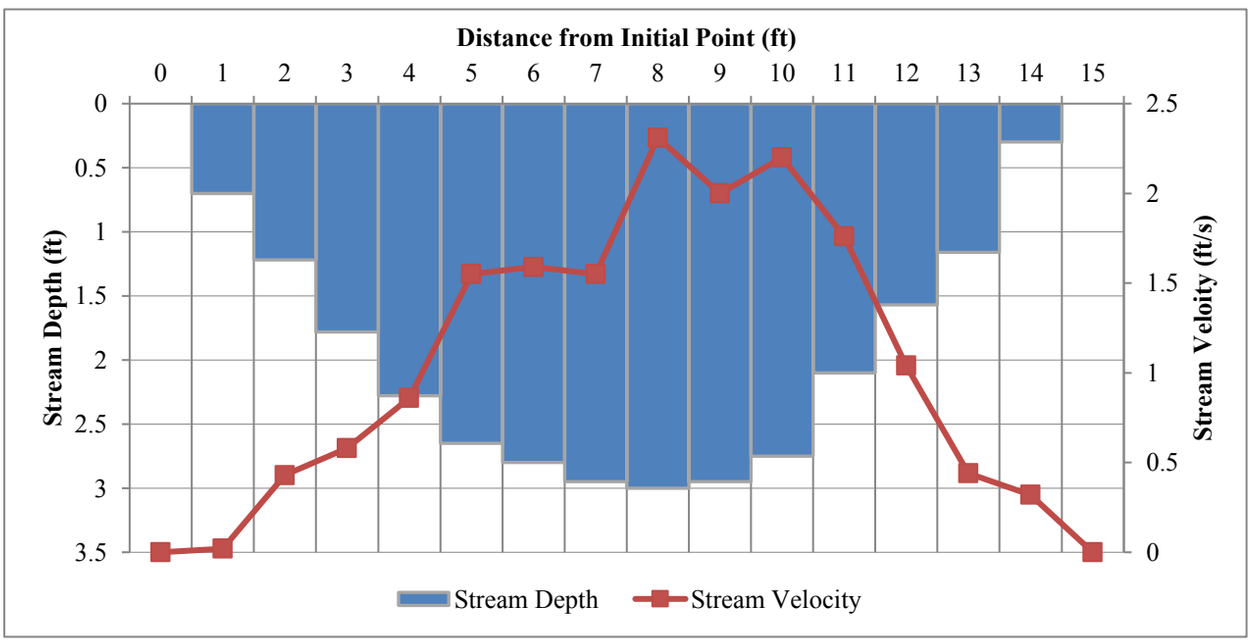
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.00	Bank
2	2	0.2	--	0.04	1	0.20	0.008	
3	4	0.6	--	0.05	2	1.20	0.060	
4	6	0.9	--	0.02	2	1.80	0.036	
5	8	0.55	--	0.04	2	1.10	0.044	
6	10	0.5	--	0.03	2	1.00	0.030	
7	12	1.05	--	0.09	2	2.10	0.189	
8	14	1.41	--	0.54	2	2.82	1.523	
9	16	1.7	--	1.14	2	3.40	1.836	
10	18	1.93	--	1.42	2	3.86	4.400	
11	20	2	--	1.86	2	4.00	5.680	
12	22	2	--	2.2	2	4.00	7.440	
13	24	1.9	--	2.37	2	3.80	8.360	
14	26	1.65	--	1.7	2	3.30	7.821	
15	28	1.53	--	0.67	2	3.06	5.202	
16	30	1.24	--	0.4	2	2.48	1.662	
17	32	1.05	--	0.07	2	2.10	0.840	
18	34	0.66	--	0.22	2	1.32	0.092	
19	36	0.4	--	0.03	2	0.80	0.176	
20	38	0.1	--	0	2	0.20	0.006	
21	40	0	--	0	1	0.00	0.000	Bank
					Sum	42.54	45.41	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-012, CFAC
Date: 4/4/2017
Team: Doug Ferraiolo, MaryBeth Lyons

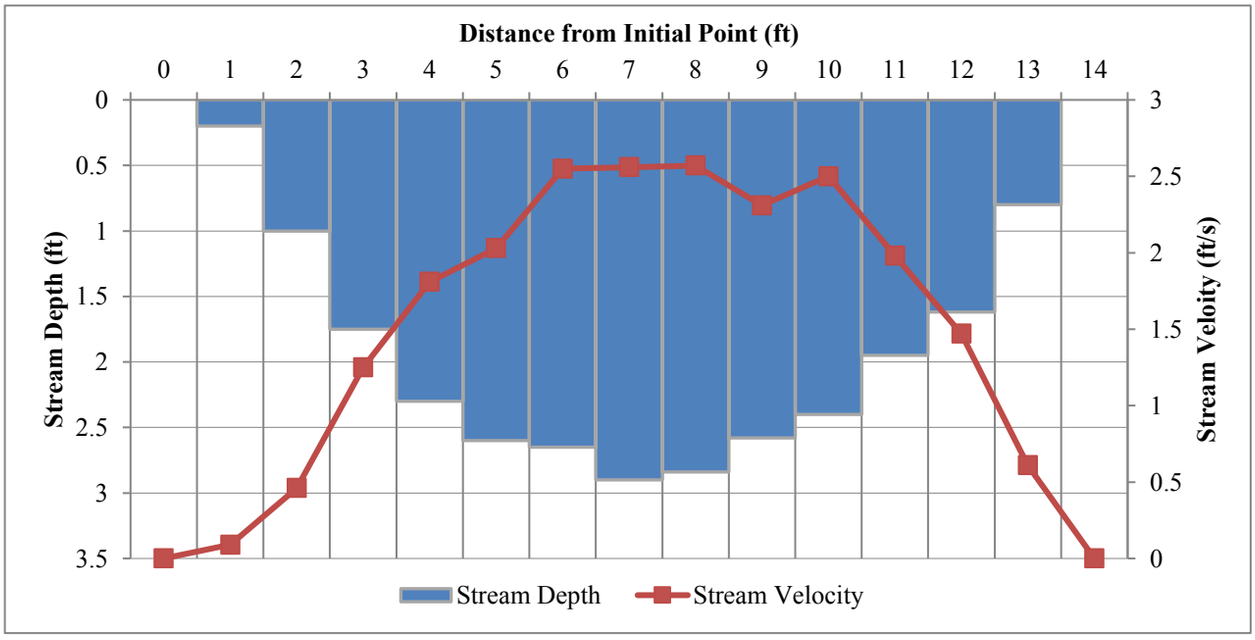
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.7	--	0.02	0.5	0.35	0.007	
3	2	1.22	--	0.43	1	1.22	0.525	
4	3	1.78	--	0.58	1	1.78	1.032	
5	4	2.28	--	0.86	1	2.28	1.961	
6	5	2.65	--	1.55	1	2.65	4.108	
7	6	2.8	--	1.59	1	2.80	4.452	
8	7	2.95	--	1.55	1	2.95	4.573	
9	8	3	--	2.31	1	3.00	4.650	
10	9	2.95	--	2	1	2.95	6.815	
11	10	2.75	--	2.2	1	2.75	5.500	
12	11	2.1	--	1.76	1	2.10	4.620	
13	12	1.57	--	1.04	1	1.57	2.763	
14	13	1.16	--	0.44	1	1.16	1.206	
15	14	0.3	--	0.32	1	0.30	0.132	
16	15	0	--	0	0.5	0.00	0.000	Bank
					Sum	27.86	42.34	



Appendix D. Surface Water Discharge Calculations - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-013, CFAC
Date: 4/4/2017
Team: Doug Ferraiolo, MaryBeth Lyons

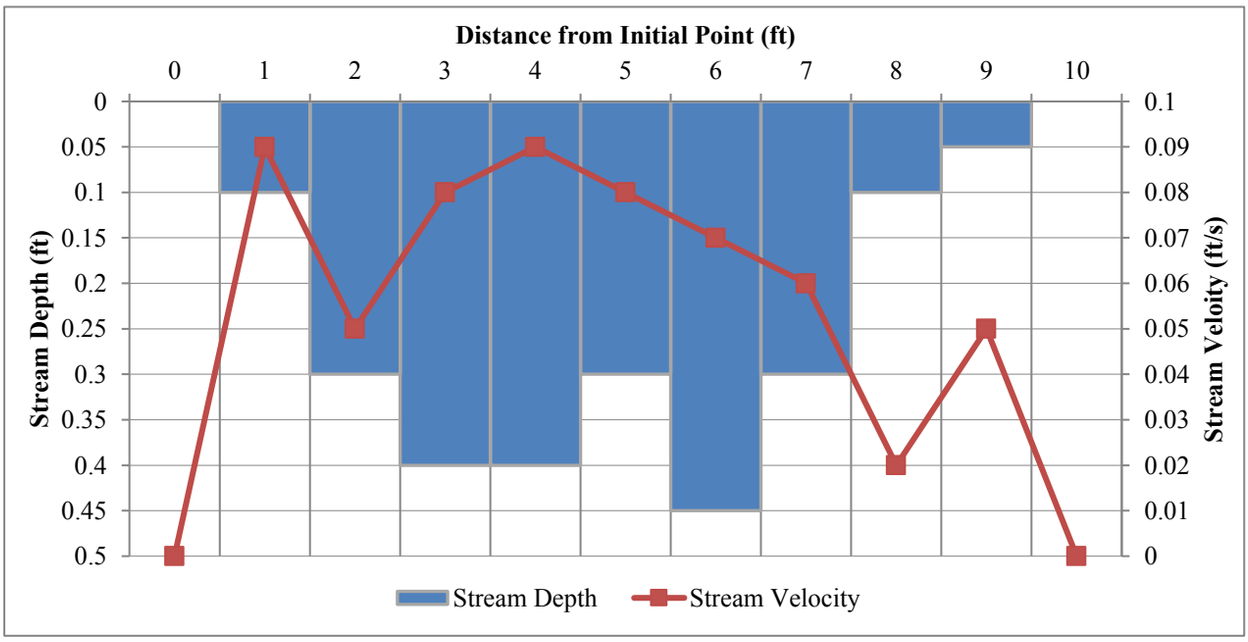
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.2	--	0.09	0.5	0.10	0.009	
3	2	1	--	0.46	1	1.00	0.460	
4	3	1.75	--	1.25	1	1.75	2.188	
5	4	2.3	--	1.81	1	2.30	4.163	
6	5	2.6	--	2.03	1	2.60	5.278	
7	6	2.65	--	2.55	1	2.65	6.758	
8	7	2.9	--	2.56	1	2.90	7.424	
9	8	2.84	--	2.57	1	2.84	7.270	
10	9	2.58	--	2.31	1	2.58	6.631	
11	10	2.4	--	2.5	1	2.40	5.544	
12	11	1.95	--	1.98	1	1.95	4.875	
13	12	1.62	--	1.47	1	1.62	3.208	
14	13	0.8	--	0.61	1	0.80	1.176	
15	14	0	--	0	0.5	0.00	0.000	Bank
					Sum	25.49	54.98	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-009, CFAC
Date: 6/12/2017
Team: Doug Ferraiolo, Alessandro Sindoni

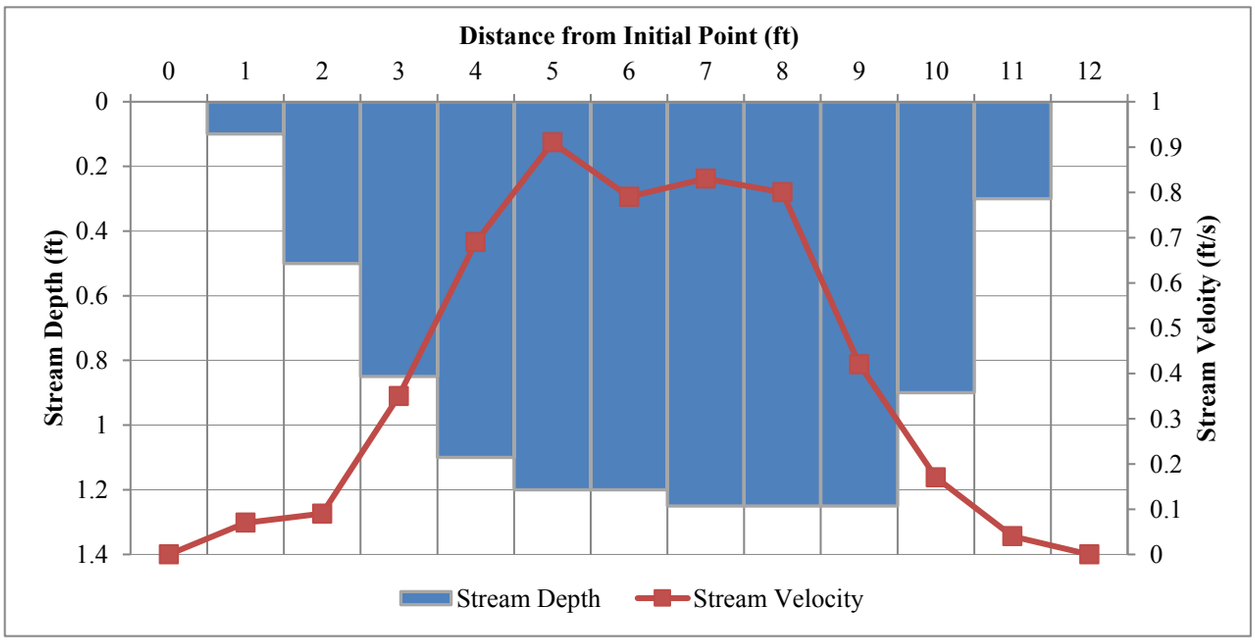
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.1	--	0.09	0.5	0.05	0.005	
3	2	0.3	--	0.05	1	0.30	0.015	
4	3	0.4	--	0.08	1	0.40	0.032	
5	4	0.4	--	0.09	1	0.40	0.036	
6	5	0.3	--	0.08	1	0.30	0.024	
7	6	0.45	--	0.07	1	0.45	0.032	
8	7	0.3	--	0.06	1	0.30	0.018	
9	8	0.1	--	0.02	1	0.10	0.002	
10	9	0.05	--	0.05	1	0.05	0.003	
11	10	0	--	0	0.5	0.00	0.000	Bank
					Sum	2.35	0.17	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-010, CFAC
Date: 6/12/2017
Team: Doug Ferraiolo, Alessandro Sindoni

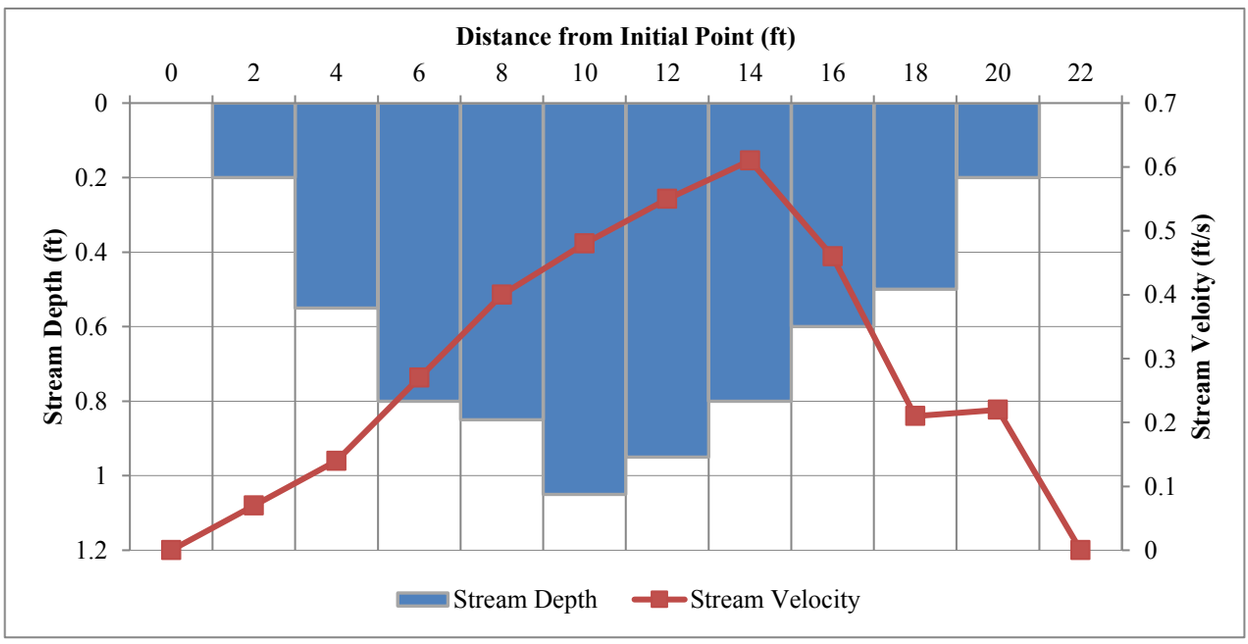
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.1	--	0.07	0.5	0.05	0.004	
3	2	0.5	--	0.09	1	0.50	0.045	
4	3	0.85	--	0.35	1	0.85	0.298	
5	4	1.1	--	0.69	1	1.10	0.759	
6	5	1.2	--	0.91	1	1.20	1.092	
7	6	1.2	--	0.79	1	1.20	0.948	
8	7	1.25	--	0.83	1	1.25	1.038	
9	8	1.25	--	0.8	1	1.25	1.000	
10	9	1.25	--	0.42	1	1.25	0.525	
11	10	0.9	--	0.17	1	0.90	0.153	
12	11	0.3	--	0.04	1	0.30	0.012	
13	12	0	--	0	0.5	0.00	0.000	Bank
					Sum	9.85	5.87	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-011, CFAC
Date: 6/12/2017
Team: Doug Ferraiolo, Alessandro Sindoni

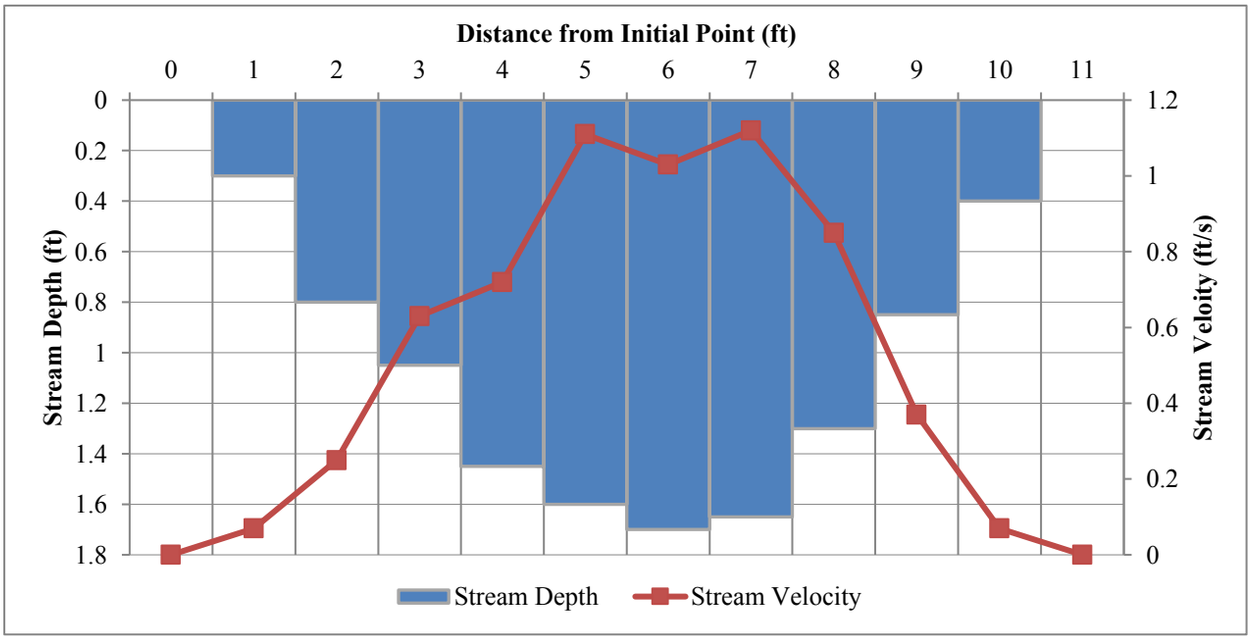
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	2	0.2	--	0.07	1	0.20	0.014	
3	4	0.55	--	0.14	2	1.10	0.154	
4	6	0.8	--	0.27	2	1.60	0.432	
5	8	0.85	--	0.4	2	1.70	0.680	
6	10	1.05	--	0.48	2	2.10	1.008	
7	12	0.95	--	0.55	2	1.90	1.045	
8	14	0.8	--	0.61	2	1.60	0.976	
9	16	0.6	--	0.46	2	1.20	0.552	
10	18	0.5	--	0.21	2	1.00	0.210	
11	20	0.2	--	0.22	2	0.40	0.088	
12	22	0	--	0	1	0.00	0.000	Bank
					Sum	12.80	5.16	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-012, CFAC
Date: 6/12/2017
Team: Doug Ferraiolo, Alessandro Sindoni

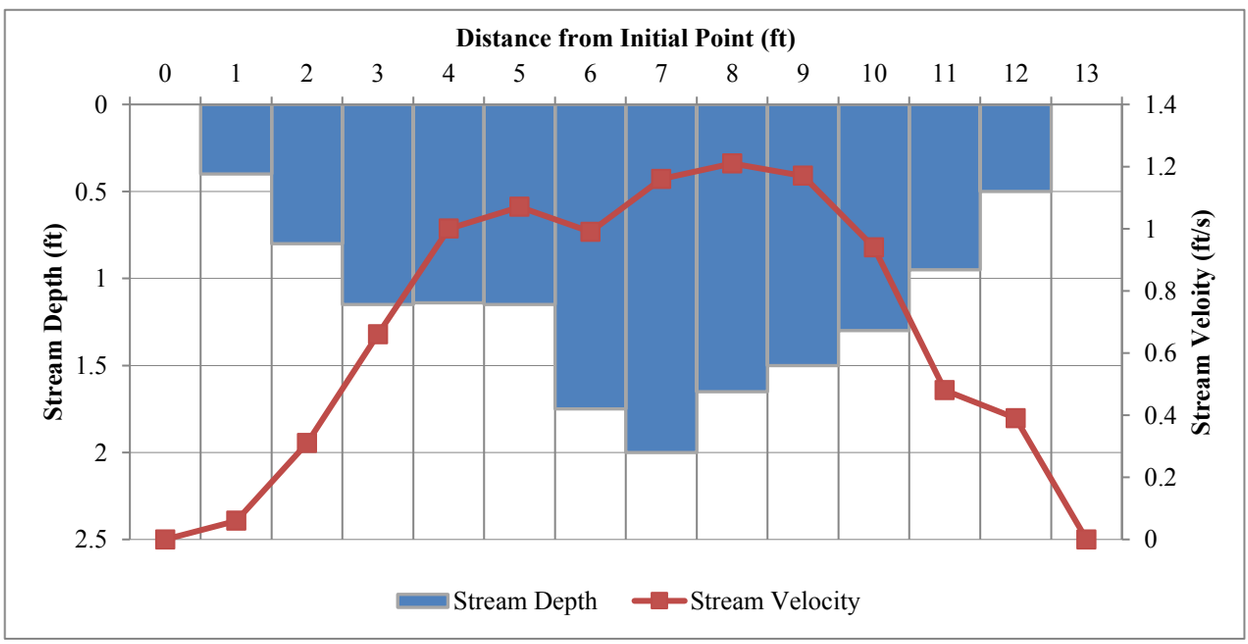
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.3	--	0.07	0.5	0.15	0.011	
3	2	0.8	--	0.25	1	0.80	0.200	
4	3	1.05	--	0.63	1	1.05	0.662	
5	4	1.45	--	0.72	1	1.45	1.044	
6	5	1.6	--	1.11	1	1.60	1.776	
7	6	1.7	--	1.03	1	1.70	1.751	
8	7	1.65	--	1.12	1	1.65	1.848	
9	8	1.3	--	0.85	1	1.30	1.105	
10	9	0.85	--	0.37	1	0.85	0.315	
11	10	0.4	--	0.07	1	0.40	0.028	
12	11	0	--	0	0.5	0.00	0.000	Bank
					Sum	10.95	8.74	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-013, CFAC
Date: 6/13/2017
Team: Doug Ferraiolo, Alessandro Sindoni

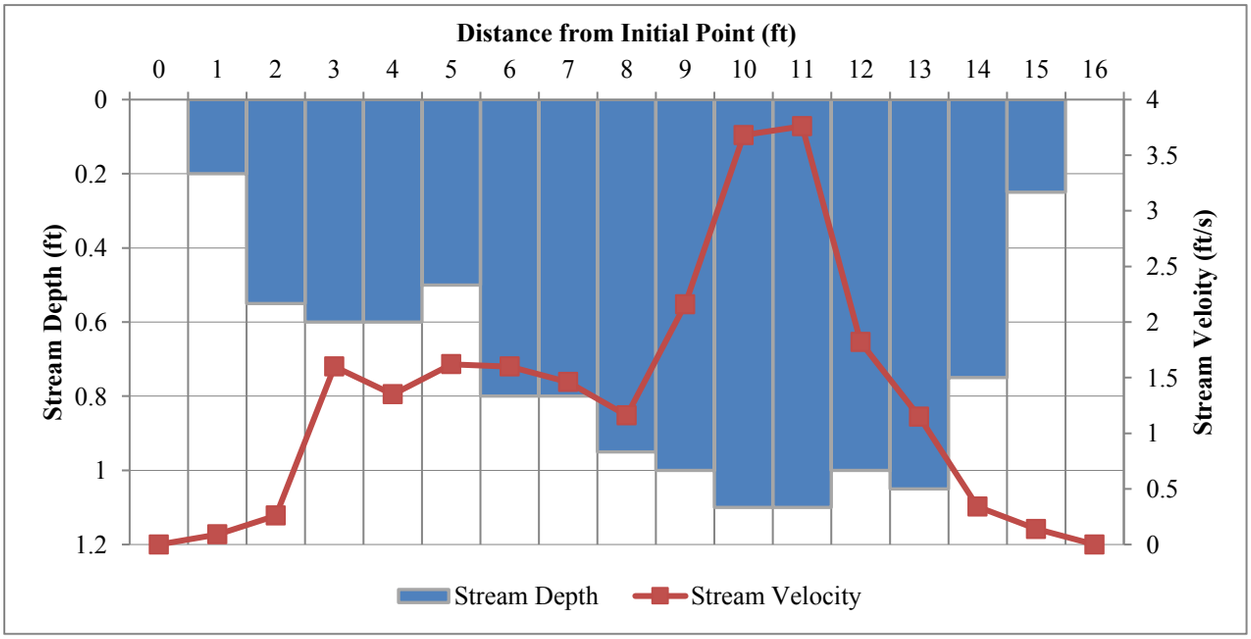
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.4	--	0.06	0.5	0.20	0.012	
3	2	0.8	--	0.31	1	0.80	0.248	
4	3	1.15	--	0.66	1	1.15	0.759	
5	4	1.14	--	1	1	1.14	1.140	
6	5	1.15	--	1.07	1	1.15	1.231	
7	6	1.75	--	0.99	1	1.75	1.733	
8	7	2	--	1.16	1	2.00	2.320	
9	8	1.65	--	1.21	1	1.65	1.997	
10	9	1.5	--	1.17	1	1.50	1.755	
11	10	1.3	--	0.94	1	1.30	1.222	
12	11	0.95	--	0.48	1	0.95	0.456	
13	12	0.5	--	0.39	1	0.50	0.195	
14	13	0	--	0	0.5	0.00	0.000	Bank
					Sum	14.09	13.07	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-014, CFAC
Date: 6/13/2017
Team: Doug Ferraiolo, Alessandro Sindoni

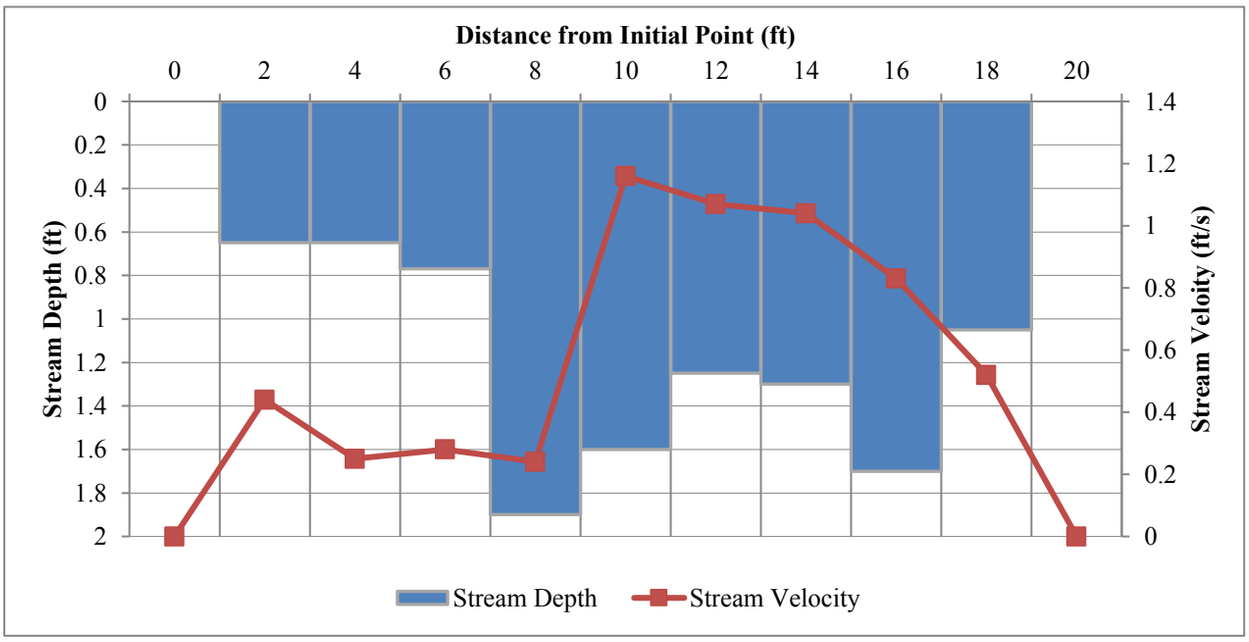
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.2	--	0.09	0.5	0.10	0.009	
3	2	0.55	--	0.26	1	0.55	0.143	
4	3	0.6	--	1.6	1	0.60	0.960	
5	4	0.6	--	1.35	1	0.60	0.810	
6	5	0.5	--	1.62	1	0.50	0.810	
7	6	0.8	--	1.6	1	0.80	1.280	
8	7	0.8	--	1.46	1	0.80	1.168	
9	8	0.95	--	1.16	1	0.95	1.102	
10	9	1	--	2.16	1	1.00	2.160	
11	10	1.1	--	3.68	1	1.10	4.048	
12	11	1.1	--	3.76	1	1.10	4.136	
13	12	1	--	1.82	1	1.00	1.820	
14	13	1.05	--	1.15	1	1.05	1.208	
15	14	0.75	--	0.34	1	0.75	0.255	
16	15	0.25	--	0.14	1	0.25	0.035	
17	16	0	--	0	0.5	0.00	0.000	Bank
					Sum	11.15	19.94	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-015, CFAC
Date: 6/13/2017
Team: Doug Ferraiolo, Alessandro Sindoni

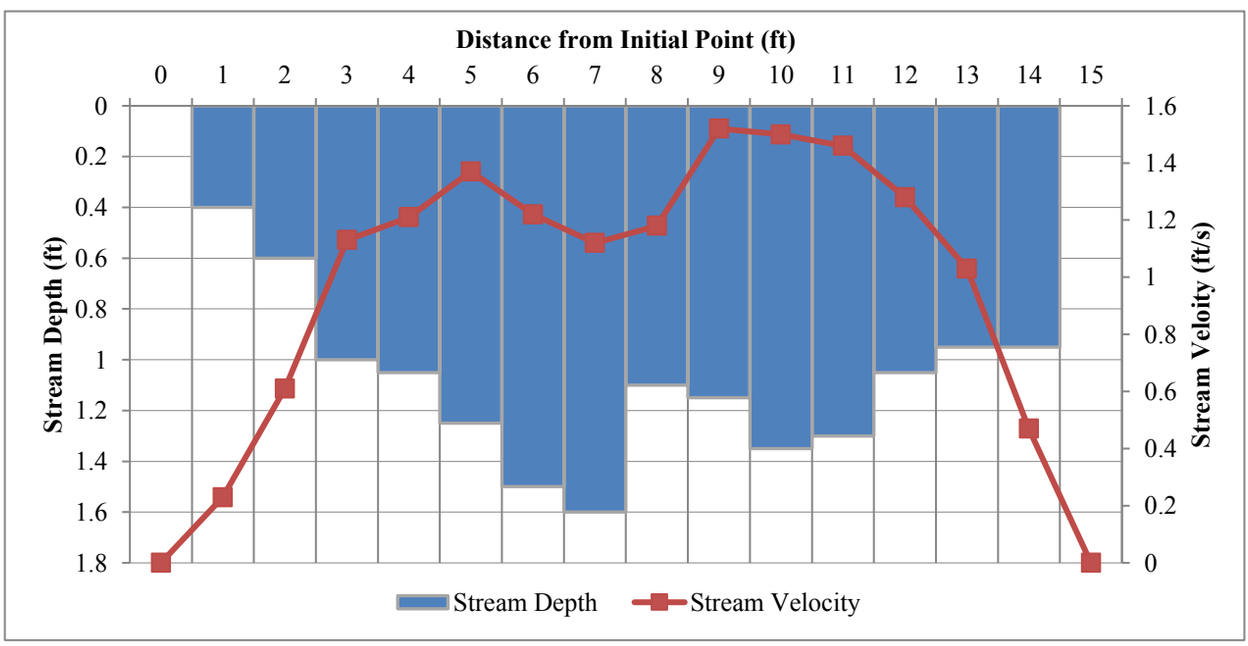
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	2	0.65	--	0.44	1	0.65	0.286	
3	4	0.65	--	0.25	2	1.30	0.325	
4	6	0.77	--	0.28	2	1.54	0.431	
5	8	1.9	--	0.24	2	3.80	0.912	
6	10	1.6	--	1.16	2	3.20	3.712	
7	12	1.25	--	1.07	2	2.50	2.675	
8	14	1.3	--	1.04	2	2.60	2.704	
9	16	1.7	--	0.83	2	3.40	2.822	
10	18	1.05	--	0.52	1	1.05	0.546	
11	20	0	--	0	0	0.00	0.000	Bank
					Sum	20.04	14.41	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-016, CFAC
Date: 6/13/2017
Team: Doug Ferraiolo, Alessandro Sindoni

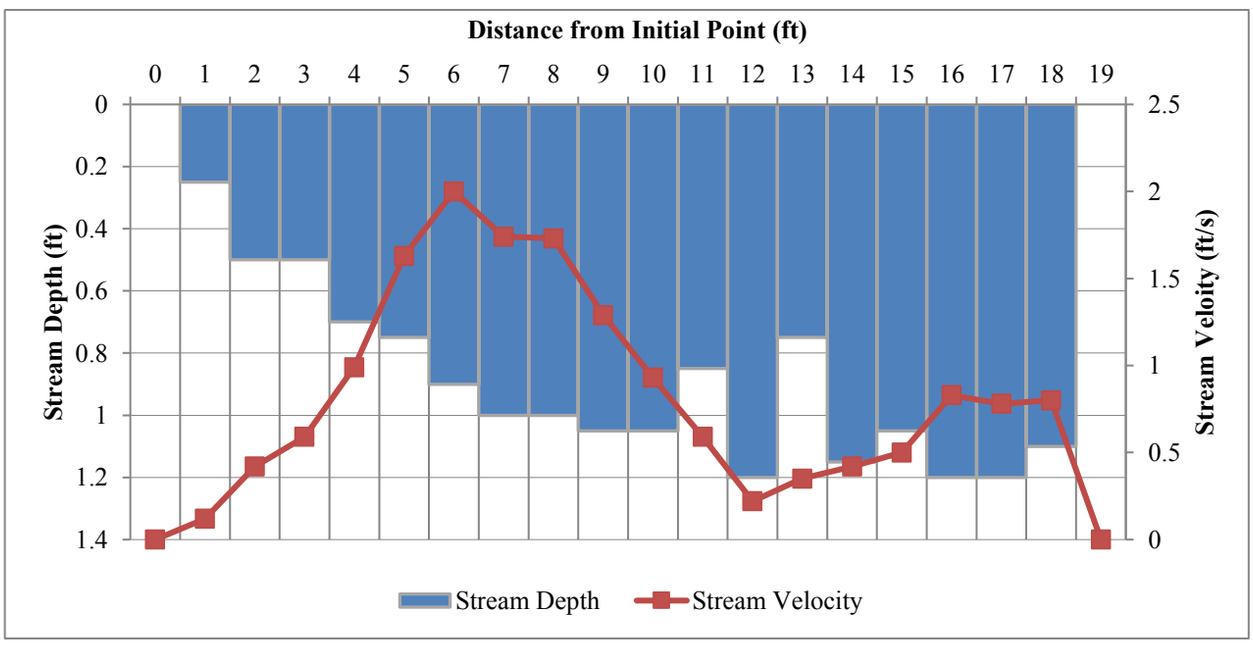
Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.4	--	0.23	0.5	0.20	0.046	
3	2	0.6	--	0.61	1	0.60	0.366	
4	3	1	--	1.13	1	1.00	1.130	
5	4	1.05	--	1.21	1	1.05	1.271	
6	5	1.25	--	1.37	1	1.25	1.713	
7	6	1.5	--	1.22	1	1.50	1.830	
8	7	1.6	--	1.12	1	1.60	1.792	
9	8	1.1	--	1.18	1	1.10	1.298	
10	9	1.15	--	1.52	1	1.15	1.748	
11	10	1.35	--	1.5	1	1.35	2.025	
12	11	1.3	--	1.46	1	1.30	1.898	
13	12	1.05	--	1.28	1	1.05	1.344	
14	13	0.95	--	1.03	1	0.95	0.979	
15	14	0.95	--	0.47	1	0.95	0.447	
16	15	0	--	0	0.5	0.00	0.000	Bank
					Sum	15.05	17.89	



Appendix D. Surface Water Discharge Calculations - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Station Name: CFSWP-025, CFAC
Date: 6/13/2017
Team: Doug Ferraiolo, Alessandro Sindoni

Sample Number	Distance from Initial Point (ft)	Depth of Water (ft)	Meter Depth Above Stream Bottom (ft)	Velocity (ft/s)	Width (ft)	Area (ft2)	Discharge (cfs)	
1	0	0	--	0	0	0.00	0.000	Bank
2	1	0.25	--	0.12	0.5	0.13	0.015	
3	2	0.5	--	0.42	1	0.50	0.210	
4	3	0.5	--	0.59	1	0.50	0.295	
5	4	0.7	--	0.99	1	0.70	0.693	
6	5	0.75	--	1.63	1	0.75	1.223	
7	6	0.9	--	2	1	0.90	1.800	
8	7	1	--	1.74	1	1.00	1.740	
9	8	1	--	1.73	1	1.00	1.730	
10	9	1.05	--	1.29	1	1.05	1.355	
11	10	1.05	--	0.93	1	1.05	0.977	
12	11	0.85	--	0.59	1	0.85	0.502	
13	12	1.2	--	0.22	1	1.20	0.264	
14	13	0.75	--	0.35	1	0.75	0.263	
15	14	1.15	--	0.42	1	1.15	0.483	
16	15	1.05	--	0.5	1	1.05	0.525	
17	16	1.2	--	0.83	1	1.20	0.996	
18	17	1.2	--	0.78	1	1.20	0.936	
19	18	1.1	--	0.8	1	1.10	0.880	
20	19	0	--	0	0.5	0.00	0.000	Bank
					Sum	16.08	14.88	



APPENDIX E

Executed Record of Modification Forms

Record of Modification

Phase 1 Site Characterization Sampling and Analysis Plan Field Activities
Columbia Fall Aluminum Company RI/FS
Phase 1 SAP MOD #8

Instructions to Requester: **Submit to Roux RI Manager or Roux RI/FS Project Manager**
Roux RI Manager will maintain legible copies in a binder that can be accessed by personnel.

Project Work Plan/QAPP (check one):

[X] 2015 Phase 1 SAP

[ ] SOP (Title, # and approval date): _____

Requester: Michael Ritorto, RI Manager Date: 8/30/2016

Applicable section of SAP/SOP:

SAP Section 4.9: Surface Water and Sediment Sampling

Description of Modification:

Selected surface water and sediment sample locations within the Flathead River will be sampled via boat. When sampling from the boat, a ponar dredge sampling device and/or other hand tools will be utilized to collect the sample in accordance with Roux SOP 5.2 that was provided in the Phase I SAP. The boat and captain will be provided by Kennedy/Jenks Consulting (Whitefish, Montana). Kennedy/Jenks Consulting is new subcontractor to the project and will be working as a subcontractor to Roux Associates.

During use of the boat, Roux Associates and Kennedy/Jenks personnel will implement safe boating practices including use of a personal flotation devices and spotting of sampling personnel while sampling. Additionally, all personnel involved with the sampling will review the Job Hazard Analysis for boating activities provided by Kennedy/Jenks (see attached). A tailgate meeting will also be held before the boating event and potential hazards and mitigative actions will be discussed.

Rationale for Modifications / Potential Implications of Modifications:

During the initial site reconnaissance, several surface water and sediment sample locations along the Flathead River were deemed inaccessible by foot due to the presence of forested areas and limited bank/shoreline for traversing. Use of a boat to access some of the sampling locations will provide easier and safer access to the sampling locations. The boat will also allow Roux Associates personnel the evaluate the sampling locations prior to sample collection and evaluate potential locations where sediment is present, if any.

Duration of Modification (Check one):

[X] Temporary

Date(s) 8/30/2016

Sample Numbers CFSW/CFSD 001 through 008 and 017

[ ] Permanent (Proposed Text Modification Section)

Effective Date: _____

Proposed Text Modifications in Associated Document:

Data Quality Indicator (check one) – Please reference definitions on next page for direction on selecting data quality indicators:

[ ] **Not Applicable** [ ] **Reject** [ ] **Low Bias** [ ] **Estimate** [ ] **High Bias** [X] **No Bias**

Roux Project Manager Approval: Michael Ritorto Date: 8/30/2016

(Roux RI/FS Project Manager or designate)

EPA Review and Approval: Mike Cirian Date: 9/7/2016

(USEPA RPM or designate)

DATA QUALITY INDICATOR DEFINITIONS

Reject – Samples associated with this modification form are not useable. The conditions outlined in the modification form adversely affect the associated sample to such a degree that the data are not reliable.

Low Bias – Samples associated with this modification form are useable, but results are likely to be biased low. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated low.

Estimate – Samples associated with this modification form are useable, but results should be considered approximations. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimates.

High Bias – Samples associated with this modification form are useable, but results are likely to be biased high. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated high.

No Bias – Samples associated with this modification form are useable as reported. The conditions outlined in the modification form suggest that associated sample data are reliable as reported.

Record of Modification

Phase 1 Site Characterization Sampling and Analysis Plan Field Activities
Columbia Fall Aluminum Company RI/FS
Phase 1 SAP MOD #9

Instructions to Requester: **Submit to Roux RI Manager or Roux RI/FS Project Manager**
Roux RI Manager will maintain legible copies in a binder that can be accessed by personnel.

Project Work Plan/QAPP (check one):

[X] 2015 Phase 1 SAP

[ ] SOP (Title, # and approval date): _____

Requester: Michael Ritorto, RI Manager Date: 3/2/2017

Applicable section of SAP/SOP:

SAP Section 4.8 and 4.9: Groundwater and Surface Water Sampling

Description of Modification:

During the Phase I Site Characterization sampling event scheduled to begin in March 2017 (Sampling Round 3), selected surface water and groundwater samples will be analyzed for free cyanide via USEPA laboratory method 9016. These analyses are in addition to the total cyanide analyses that are included as part of the original scope of work.

Free cyanide analysis will be completed on samples from 46 monitoring wells and 5 surface water locations during the sampling event. These locations have been selected based on the sampling results of Round 1 and 2 for total cyanide analysis. At each of these locations, total cyanide was detected above the method detection limit in one or both of the first two rounds of sampling (September and November 2016).

Rationale for Modifications / Potential Implications of Modifications:

The various screening levels utilized to evaluate the Phase I Site Characterization data are based upon exposure to free cyanide. Thus, with the use of the total cyanide data, any potential for effects due to cyanide exposure is likely overestimated as free cyanide would only comprise a fraction, if any, of the total cyanide present. The analysis of free cyanide in the groundwater and surface water samples as proposed will further facilitate a better understanding of Site conditions.

Duration of Modification (Check one):

[X] Temporary

Date(s) 3/2/2017

Sample Numbers Affected:

CFMW-001	CFMW-015	CFMW-028a	CFMW-042	CFMW-050
CFMW-002	CFMW-016a	CFMW-029	CFMW-043	CFMW-053
CFMW-003	CFMW-019	CFMW-031	CFMW-044	CFMW-054
CFMW-003a	CFMW-020	CFMW-032	CFMW-044a	CFMW-056a
CFMW-007	CFMW-021	CFMW-033	CFMW-044b	CFMW-061
CFMW-008a	CFMW-022	CFMW-034	CFMW-045	CFMW-064
CFMW-010	CFMW-023	CFMW-035	CFMW-045a	CFSWP-003
CFMW-011	CFMW-026	CFMW-037	CFMW-047	CFSWP-004
CFMW-012	CFMW-027	CFMW-038	CFMW-049	CFSWP-005
CFMW-014	CFMW-028	CFMW-040	CFMW-049a	CFSWP-006
CFSWP-014	CFSWP-015	CFSWP-020		

[ ] Permanent (Proposed Text Modification Section)
Effective Date: _____

Proposed Text Modifications in Associated Document:

NA

Data Quality Indicator (check one) – Please reference definitions on next page for direction on selecting data quality indicators:

[ ] **Not Applicable** [ ] **Reject** [ ] **Low Bias** [ ] **Estimate** [ ] **High Bias** [X] **No Bias**

Roux Project Manager Approval: Michael Ritorto Date: 3/2/2017
(Roux RI/FS Project Manager or designate)

EPA Review and Approval: Mike Cirian Date: 6-14-17
(USEPA RPM or designate)

DATA QUALITY INDICATOR DEFINITIONS

Reject – Samples associated with this modification form are not useable. The conditions outlined in the modification form adversely affect the associated sample to such a degree that the data are not reliable.

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High Bias – Samples associated with this modification form are useable, but results are likely to be biased high. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated high.

No Bias – Samples associated with this modification form are useable as reported. The conditions outlined in the modification form suggest that associated sample data are reliable as reported.

Record of Modification

Phase 1 Site Characterization Sampling and Analysis Plan Field Activities
Columbia Fall Aluminum Company RI/FS
Phase 1 SAP MOD #11

Instructions to Requester: **Submit to Roux RI Manager or Roux RI/FS Project Manager**
Roux RI Manager will maintain legible copies in a binder that can be accessed by personnel.

Project Work Plan/QAPP (check one):

[X] 2015 Phase 1 SAP

[ ] SOP (Title, # and approval date): _____

Requester: Michael Ritorto, RI Manager Date: June 12, 2017

Applicable section of SAP/SOP:

There is not an applicable section of the SAP/SOP because Slug Testing was not discussed in the Phase I SAP.

Description of Modification:

Roux Associates will complete slug tests at monitoring wells distributed across the Site. Pneumatic slug tests will be conducted on the new 2-inch diameter wells installed as part of the Phase I Site Characterization. For a pneumatic test to be conducted, the entire length of screen of the monitoring well must be submerged beneath the level of standing water in well. Mechanical slug tests will be conducted on the newly installed wells with partially submerged screens. Based upon water levels measured in July and August 2016, it is anticipated that approximately 38 of the 44 newly installed wells will be tested using the pneumatic method, and 6 of the 44 newly installed wells will be tested using the mechanical method; however, the final determination of wells to be tested will be made based upon water levels at the time the testing is to be performed.

Pneumatic slug tests will be conducted within the casing of each well using compressed air as the displacing (slug) volume. The water column within the well casing will be depressed by increasing the air pressure in the casing above the water column. When the water level is depressed to a predetermined level and the air pressure stabilized within the test interval, the air pressure within the well casing will be rapidly released. The instantaneous release of air pressure from the well casing will initiate a pneumatic slug withdrawal test, which will be recorded using a pressure transducer and a data logger. All tests will be conducted in accordance with the procedures outlined in the SOP titled "Standard Operating Procedure 4.8 for Conducting a Pneumatic Slug Test."

Mechanical slug tests will be conducted within the casing of each well using a solid cylinder (slug). Due

to the fact that mechanical slug tests are being performed on water table wells, the testing will be limited to "slug-out" tests. As part of the "slug-out test", the water column within the well casing will be decreasing by rapidly removing the solid slug from the water column. All changes in water levels will be recorded using a pressure transducer and a data logger. All tests will be conducted in accordance with the procedures outlined in the SOP titled "Standard Operating Procedure 4.9 for Conducting a Mechanical Slug Test."

At each location, the test will be conducted with an approximate 1-foot displacement. The test will be repeated at each well using 1-foot displacement to determine the reproducibility of the data. If water levels return to static or near static conditions within one hour, another test will be conducted using an approximate 2-foot displacement.

Data analysis to determine hydraulic conductivity values for each test will be performed using a combination of Excel, Aqtesolv or Geoprobe Slug Test Analysis software, and Win-Situ software. Following completion of testing and analysis, a report will be prepared to describe the tests and the data evaluation methods, and to summarize the test results. All data analysis procedures, including decision making processes, will be conducted in accordance with the procedures outlined in the SOP titled "Standard Operating Procedure 4.10 for "Analyzing Slug Test Data."

Rationale for Modifications / Potential Implications of Modifications:

The slug testing program will be performed to evaluate the *in situ* permeability contrast between various hydrogeologic units beneath the site. The slug tests will generate data that will be used to determine the hydraulic conductivity at each well as part of the ongoing Phase 1 Site Characterization program. The hydraulic conductivity data from each tested well will be added to the overall Phase I Site Characterization dataset and used for evaluation of groundwater flow beneath the Site.

Duration of Modification (Check one):

[ ] Temporary
Date(s) _____
Sample Numbers _____

[X] Permanent (Proposed Text Modification Section)
Effective Date: June 12, 2017

Proposed Text Modifications in Associated Document:

This form serves to document the change as described above, no document revisions are proposed.

Data Quality Indicator (check one) – Please reference definitions on next page for direction on selecting data quality indicators:

[ ] **Not Applicable** [ ] **Reject** [ ] **Low Bias** [ ] **Estimate** [ ] **High Bias** [X] **No Bias**

Roux Project Manager Approval: Michael Ritorto Date: June 12, 2017

(Roux RI/FS Project Manager or designate)

EPA Review and Approval: Mike Cirian Date: 6-14-17

(USEPA RPM or designate)

DATA QUALITY INDICATOR DEFINITIONS

Reject – Samples associated with this modification form are not useable. The conditions outlined in the modification form adversely affect the associated sample to such a degree that the data are not reliable.

Low Bias – Samples associated with this modification form are useable, but results are likely to be biased low. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated low.

Estimate – Samples associated with this modification form are useable, but results should be considered approximations. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimates.

High Bias – Samples associated with this modification form are useable, but results are likely to be biased high. The conditions outlined in the modification form suggest that associated sample data are reliable, but estimated high.

No Bias – Samples associated with this modification form are useable as reported. The conditions outlined in the modification form suggest that associated sample data are reliable as reported.

APPENDIX F

Investigation Derived
Waste Water Manifests and Sample Results

Table F1. Volatile Organic Compounds in IDW Purge Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
				Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
				Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 UJ	0.23 U	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 UJ	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	3.8 J	2.2 UJ	2.2 U	19
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	2.3 J
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.88 J
Acetone	--	--	1400	ug/l	21	11 J-	24	45
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.21 J
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 UJ	0.18 U	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.89 J
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 UJ	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 UJ	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 UJ	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U

Table F1. Volatile Organic Compounds in IDW Purge Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
				Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
				Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 U	0.14 U	0.14 U
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	4.5 J
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.91 J
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	2.9
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 UT
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Table F2. Semivolatile Organic Compounds in IDW Purge Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
				Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
				Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.1 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.93 U	0.93 U	0.93 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.69 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.91 U	0.91 U	0.91 U	2 J
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 U	2.4 U	2.4 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.88 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.74 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.88 U	0.88 U	0.88 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.65 U	0.65 U	0.65 U	0.65 U
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.59 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.88 U	0.88 U	0.88 U	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1 U	1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.82 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2 U	2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.76 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.73 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.96 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.7 U	4.7 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.88 U	0.88 U	0.88 U	0.88 U
Acenaphthylene	--	--	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U
Acetophenone	--	--	190	ug/l	1 U	1 U	1 U	1 U

Table F2. Semivolatile Organic Compounds in IDW Purge Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
				Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
				Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
Anthracene	2100	--	180	ug/l	0.57 U	0.57 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.77 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.86 U	0.86 U	0.86 U	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.55 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.16 U	0.16 UT	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.44 U	0.44 UT	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.75 U	0.75 U	0.75 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.18 U	0.18 UT	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.69 U	0.69 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.12 U	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	1.4 BJ	0.72 U	0.72 U	4.2
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.6 U	0.6 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	--	--	--	ug/l	0.85 U	0.85 U	0.85 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.67 U	0.67 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.09 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.85 U	0.85 U	0.85 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.98 U	0.98 U	0.98 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	1.1 BJ	0.82 U	0.82 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.69 U	0.69 U	0.69 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.72 U	0.72 U	0.72 U	0.72 U
Fluorene	1100	--	29	ug/l	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.76 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.09 U	0.09 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.67 U	0.67 U	0.67 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.8 U	0.8 U	0.8 U	0.8 U

Table F2. Semivolatile Organic Compounds in IDW Purge Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
				Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
				Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.83 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.74 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 U	2.2 U	2.2 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U
Phenol	300	--	580	ug/l	0.41 U	0.41 U	0.41 U	150
Pyrene	830	--	12	ug/l	0.83 U	0.83 U	0.83 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Table F3. Metals in IDW Purge Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
				Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
				Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
Aluminum	--	--	2000	ug/l	283	474	504	548
Antimony	6	6	0.78	ug/l	0.76 U	0.62 J	0.93 J	0.86 J
Arsenic	10	10	0.052	ug/l	0.71 U	0.64 U	0.82 J	1.5 J
Barium	1000	2000	380	ug/l	95.5	132	111	87.7
Beryllium	4	4	2.5	ug/l	0.29 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.72 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	55200	71900	63300	42800
Chromium	100	100	0.035	ug/l	14.2	11.9	10.5	3.2 J
Cobalt	--	--	0.6	ug/l	1.5 U	1.3 U	1.3 U	1.6 J
Copper	1300	1300	80	ug/l	2.2 J	3.2 J	3 J	13.6
Cyanide, Reactive	--	--	--	mg/l	NA	NA	NA	25 U
Cyanide, Total	200	200	0.15	ug/l	18.7	27.8	22.7	59.6
Iron	--	--	1400	ug/l	130	44.7 J	42.4 U	1370
Lead	15	15	15	ug/l	0.44 U	0.38 U	0.38 U	1 J
Magnesium	--	--	--	ug/l	322	228	83.4 J	8750
Manganese	--	--	43	ug/l	3 U	2.5 U	2.5 U	70.6
Mercury	2	2	0.063	ug/l	0.14 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.6 U	1.4 U	1.4 U	3.4 J
Potassium	--	--	--	ug/l	10500	11000	10700	3610
Selenium	50	50	10	ug/l	0.79 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.5 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	39600	45600	43900	24700
Thallium	2	2	0.02	ug/l	0.31 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	5.8	4.9	5.5	3 J
Zinc	2000	--	600	ug/l	7.9 J	7 U	7 U	35.9

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Table F4. General Chemistry in IDW Purge Water
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
				Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
				Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
Alkalinity	--	--	--	ug/l	141000	173000	163000	135000
Corrosivity	--	--	--	ph units	NA	NA	11.9	7.4
Fluoride	4000	4000	80	ug/l	1510 D	1700	1420	509 T
Hardness as calcium carbonate	--	--	--	ug/l	152000	178000	164000	164000
Ignitability	--	--	--	deg f	NA	NA	0 U	0 U
pH	--	--	--	ph units	NA	NA	11.9	7.4

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs
T - LCS or LCSD is outside acceptance limits

Table F5. Volatile Organic Compounds in IDW Purge Water Leachate
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

		Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
		Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
		Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	TCLP	Unit				
1,1,1-Trichloroethane	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	--	ug/l	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	700	ug/l	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	--	ug/l	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	--	ug/l	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	--	ug/l	0.23 U	0.23 UJ	0.23 U	0.23 U
1,2-Dichlorobenzene	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	500	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	--	ug/l	0.18 U	0.18 UJ	0.18 U	0.18 U
1,3-Dichlorobenzene	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	7500	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	200000	ug/l	3.8 J	2.2 UJ	2.2 U	19
2-Hexanone	--	ug/l	0.72 U	0.72 U	0.72 U	2.3 J
4-Bromofluorobenzene	--	ug/l	50	59	48	53
4-Methyl-2-pentanone (MIBK)	--	ug/l	0.63 U	0.63 U	0.63 U	0.88 J
Acetone	--	ug/l	21	11 J-	24	45
Benzene	500	ug/l	0.09 U	0.09 U	0.09 U	0.21 J
Bromoform	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	--	ug/l	0.18 U	0.18 UJ	0.18 U	0.18 U
Carbon disulfide	--	ug/l	0.22 U	0.22 U	0.22 U	0.89 J
Carbon tetrachloride	500	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100000	ug/l	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	ug/l	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	ug/l	0.37 U	0.37 UJ	0.37 U	0.37 U
Chloroform	6000	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	--	ug/l	0.22 U	0.22 UJ	0.22 U	0.22 U
cis-1,2-Dichloroethene	--	ug/l	0.26 U	0.26 UJ	0.26 U	0.26 U
cis-1,3-Dichloropropene	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	--	ug/l	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	--	ug/l	0.14 U	0.14 U	0.14 U	0.14 U
Ethylbenzene	--	ug/l	0.3 U	0.3 U	0.3 U	0.3 U

Table F5. Volatile Organic Compounds in IDW Purge Water Leachate
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

		Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
		Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
		Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	TCLP	Unit				
Ethylene Dibromide	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	ug/l	0.58 U	0.58 U	0.58 U	4.5 J
Methyl tert-butyl ether	--	ug/l	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	--	ug/l	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	ug/l	0.28 U	0.28 U	0.28 U	0.91 J
o-Xylene	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	--	ug/l	0.17 U	0.17 U	0.17 U	0.17 U
Tetrachloroethene	700	ug/l	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	--	ug/l	0.25 U	0.25 U	0.25 U	2.9
trans-1,2-Dichloroethene	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 UT
Trichloroethene	500	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	--	ug/l	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	200	ug/l	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of USEPA Regulatory Levels (mg/L)

Table F6. Semivolatile Organic Compounds in IDW Purge Water Leachate
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

		Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
		Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
		Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	WG_TCLP	Unit				
1,1'-Biphenyl	--	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	--	ug/l	0.43 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane	--	ug/l	3.1 U	3.1 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	--	ug/l	0.93 U	0.93 U	0.93 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	ug/l	0.69 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	400000	ug/l	0.49 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	2000	ug/l	0.53 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	--	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	--	ug/l	0.91 U	0.91 U	0.91 U	2 J
2,4-Dinitrophenol	--	ug/l	2.4 U	2.4 U	2.4 U	2.4 U
2,4-Dinitrotoluene	130	ug/l	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	--	ug/l	0.88 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	--	ug/l	0.61 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	--	ug/l	0.74 U	0.74 U	0.74 U	0.74 U
2-Fluorobiphenyl	--	ug/l	62	62	51	82
2-Methylnaphthalene	--	ug/l	0.88 U	0.88 U	0.88 U	0.88 U
2-Methylphenol	200000	ug/l	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U
2-Nitrophenol	--	ug/l	0.59 U	0.59 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	ug/l	0.88 U	0.88 U	0.88 U	0.88 U
3,3'-Dichlorobenzidine	--	ug/l	1 U	1 U	1 U	1 U
3-Nitroaniline	--	ug/l	0.82 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-methylphenol	--	ug/l	2 U	2 U	2 U	2 U
4-Bromophenyl phenyl ether	--	ug/l	1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	--	ug/l	0.76 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	--	ug/l	0.73 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl phenyl ether	--	ug/l	0.96 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	--	ug/l	0.48 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	--	ug/l	4.7 U	4.7 U	4.7 U	4.7 U
Acenaphthene	--	ug/l	0.88 U	0.88 U	0.88 U	0.88 U
Acenaphthylene	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U
Acetophenone	--	ug/l	1 U	1 U	1 U	1 U
Anthracene	--	ug/l	0.57 U	0.57 U	0.57 U	0.57 U
Atrazine	--	ug/l	0.77 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	--	ug/l	0.86 U	0.86 U	0.86 U	0.86 U

Table F6. Semivolatile Organic Compounds in IDW Purge Water Leachate
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

		Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
		Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
		Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	WG_TCLP	Unit				
1,1'-Biphenyl	--	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	--	ug/l	0.43 U	0.43 U	0.43 U	0.43 U
Benzo[a]anthracene	--	ug/l	0.55 U	0.55 U	0.55 U	0.55 U
Benzo[a]pyrene	--	ug/l	0.16 U	0.16 U	0.16 UT	0.16 U
Benzo[b]fluoranthene	--	ug/l	0.44 U	0.44 U	0.44 UT	0.44 U
Benzo[g,h,i]perylene	--	ug/l	0.75 U	0.75 U	0.75 U	0.75 U
Benzo[k]fluoranthene	--	ug/l	0.18 U	0.18 U	0.18 UT	0.18 U
Bis(2-chloroethoxy)methane	--	ug/l	0.69 U	0.69 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	--	ug/l	1.4 BJ	0.72 U	0.72 U	4.2
Butyl benzyl phthalate	--	ug/l	0.6 U	0.6 U	0.6 U	0.6 U
Caprolactam	--	ug/l	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	--	ug/l	0.85 U	0.85 U	0.85 U	0.85 U
Chrysene	--	ug/l	0.67 U	0.67 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	--	ug/l	0.09 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	--	ug/l	0.85 U	0.85 U	0.85 U	0.85 U
Diethyl phthalate	--	ug/l	1 U	1 U	1 U	1 U
Dimethyl phthalate	--	ug/l	0.98 U	0.98 U	0.98 U	0.98 U
Di-n-butyl phthalate	--	ug/l	1.1 BJ	0.82 U	0.82 U	0.82 U
Di-n-octyl phthalate	--	ug/l	0.69 U	0.69 U	0.69 U	0.69 U
Fluoranthene	--	ug/l	0.72 U	0.72 U	0.72 U	0.72 U
Fluorene	--	ug/l	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	130	ug/l	0.47 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	500	ug/l	0.76 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	--	ug/l	0.61 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	3000	ug/l	0.09 U	0.09 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	--	ug/l	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	--	ug/l	0.67 U	0.67 U	0.67 U	0.67 U
Naphthalene	--	ug/l	0.8 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	2000	ug/l	0.49 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	--	ug/l	0.83 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	--	ug/l	0.74 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	100000	ug/l	2.2 U	2.2 U	2.2 U	2.2 U
Phenanthrene	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U
Phenol	--	ug/l	0.41 U	0.41 U	0.41 U	150

Table F6. Semivolatile Organic Compounds in IDW Purge Water Leachate
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

		Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
		Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
		Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	WG_TCLP	Unit				
1,1'-Biphenyl	--	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	--	ug/l	0.43 U	0.43 U	0.43 U	0.43 U
Pyrene	--	ug/l	0.83 U	0.83 U	0.83 U	0.83 U

Bolding indicates an exceedance of USEPA Regulatory Levels (mg/L)

Table F7. Metals in IDW Purge Water Leachate
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

		Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
		Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
		Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	WG_TCLP	Unit				
Aluminum	--	ug/l	283	474	504	548
Antimony	--	ug/l	0.76 U	0.62 J	0.93 J	0.86 J
Arsenic	5000	ug/l	0.71 U	0.64 U	0.82 J	1.5 J
Barium	100000	ug/l	95.5	132	111	87.7
Beryllium	--	ug/l	0.29 U	0.24 U	0.24 U	0.24 U
Cadmium	1000	ug/l	0.72 U	0.71 U	0.71 U	0.71 U
Calcium	--	ug/l	55200	71900	63300	42800
Chromium	5000	ug/l	14.2	11.9	10.5	3.2 J
Cobalt	--	ug/l	1.5 U	1.3 U	1.3 U	1.6 J
Copper	--	ug/l	2.2 J	3.2 J	3 J	13.6
Cyanide, Reactive	--	mg/l	NA	NA	NA	25 U
Cyanide, Total	--	ug/l	18.7	27.8	22.7	59.6
Iron	--	ug/l	130	44.7 J	42.4 U	1370
Lead	5000	ug/l	0.44 U	0.38 U	0.38 U	1 J
Magnesium	--	ug/l	322	228	83.4 J	8750
Manganese	--	ug/l	3 U	2.5 U	2.5 U	70.6
Mercury	200	ug/l	0.14 U	0.17 U	0.17 U	0.17 U
Nickel	--	ug/l	1.6 U	1.4 U	1.4 U	3.4 J
Potassium	--	ug/l	10500	11000	10700	3610
Selenium	1000	ug/l	0.79 U	0.73 U	0.73 U	0.73 U
Silver	5000	ug/l	1.5 U	1.3 U	1.3 U	1.3 U
Sodium	--	ug/l	39600	45600	43900	24700
Thallium	--	ug/l	0.31 U	0.26 U	0.26 U	0.26 U
Vanadium	--	ug/l	5.8	4.9	5.5	3 J
Zinc	--	ug/l	7.9 J	7 U	7 U	35.9

Bolding indicates an exceedance of USEPA Regulatory Levels (mg/L)

Table F8. General Chemistry in IDW Purge Water Leachate
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

		Sample Location	CFWC-001-WG	CFWC-002-WG	CFWC-003-WG	CFWC-004-WG
		Sample Date	8/19/2016	9/22/2016	11/28/2016	6/30/2017
		Sample Designation	CFWC-001-WCL	CFWC-002-WCL	CFWC-003-WCL	CFWC-004-WCL
Parameter	WG_TCLP	Unit				
Alkalinity	--	ug/l	141000	173000	163000	135000
Corrosivity	--	ph units	NA	NA	11.9	7.4
Fluoride	--	ug/l	1510 D	1700	1420	509 T
Hardness as calcium carbonate	--	ug/l	152000	178000	164000	164000
Ignitability	--	deg f	NA	NA	0 U	0 U
pH	--	ph units	NA	NA	11.9	7.4

Bolding indicates an exceedance of USEPA Regulatory Levels (mg/L)

Chemical Waste Management Of The No[illegible]west

17629 Cedar Springs Lane
Arlington, Oregon 97812
541-454-2643
EPA I.D.# ORDO89452353

LOAD NO. 4A 100G w/o 8.8G

MANIFEST DOC. NO.

INBOUND
T/D: 15:15:02 2017-10-05
ID: 456777 TRK ID: 2074
42220 lb G

OUTBOUND
T/D: 15:53:39 2017-10-05
ID: 456777 TRK ID: 2074
42220 lb G
24360 lb PI
17860 lb N

NET 8.93 TONS

2030 G

GENERATOR

903-ARLINGTON_OR

456777

NON-HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of 1	3. Emergency Response Phone	4. Waste Tracking Number
			[illegible]	117808

GENERATOR

5. Generator's Name and Mailing Address: [illegible] 59912

Generator's Site Address (if different than mailing address):

Generator's Phone:

6. Transporter 1 Company Name: [illegible]

U.S. EPA ID Number: [illegible]

7. Transporter 2 Company Name:

U.S. EPA ID Number:

8. Designated Facility Name and Site Address: ~~[illegible]~~ [illegible] Waste 18177 [illegible] 17812

U.S. EPA ID Number:

Facility's Phone:

9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
1. [illegible]	1	TT	2000	G
2.				
3.				
4.				

13. Special Handling Instructions and Additional Information: [illegible] Profile [illegible] ~~17[illegible]~~ 2030G

14. **GENERATOR'S/OFFEROR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Steve Wright

Signature: [illegible]

Month 9 Day 8 Year 17

INT'L

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:

Transporter Signature (for exports only): Date leaving U.S.:

TRANSPORTER

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: [illegible]

Signature: [illegible]

Month 9 Day 8 Year 17

Transporter 2 Printed/Typed Name:

Signature:

Month Day Year

DESIGNATED FACILITY

17. Discrepancy

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator)

U.S. EPA ID Number

Facility's Phone:

17c. Signature of Alternate Facility (or Generator)

Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name: [illegible]

Signature: [illegible]

Month [illegible] Day [illegible] Year [illegible]

COPY

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number

2. Page 1 of 1

3. Emergency Response Phone 800535[illegible]

4. Waste Tracking Number 117808

5. Generator's Name and Mailing Address
Columbia Falls Aluminum Company
2000 Aluminum Dr
Columbia Falls MT 59912
Generator's Phone:

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name
NRC Environmental Services
U.S. EPA ID Number CAR000030104

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
Columbia Ridge LANDFILL
18177 Cedar Springs LANE
ARLington OR 97812
Facility's Phone:
U.S. EPA ID Number

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	
1.	MATERIAL NOT Regulated By D.O.T. (DRILLING mud & Rinsate)	1	TT	2000	G	
2.						
3.						
4.						

13. Special Handling Instructions and Additional Information
1) Non Regulated By DOT

14. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: STEVE WRIGHT
Signature: Steve Wright
Month 9 Day 8 Year 17

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Ty Cuggus
Signature:
Month 9 Day 8 Year 17
Transporter 2 Printed/Typed Name:
Signature:
Month Day Year

17. Discrepancy
17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
17b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:
17c. Signature of Alternate Facility (or Generator)
Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a
Printed/Typed Name
Signature
Month Day Year

GENERATOR — INT'L — TRANSPORTER — DESIGNATED FACILITY

456777

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number
2. Page 1 of 1
3. Emergency Response Phone: 800 33 SPILL
4. Waste Tracking Number: 117808

5. Generator's Name and Mailing Address
Columbia Falls Aluminum Company
2000 Aluminum Dr
Columbia Falls MT 59912
Generator's Phone:

Generator's Site Address (if different than mailing address)

6. Transporter 1 Company Name: NRC Environmental Services
U.S. EPA ID Number: CAR000003014

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
~~Columbia Ridge LANDFILL~~ chemical Waste
18177 Cedar Springs Lane
Arlington OR 97812
Facility's Phone:
U.S. EPA ID Number

9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
1. MATERIAL NOT Regulated By D.O.T, (Drilling mud & Rinsate)	1	TT	2000	G
2.				
3.				
4.				

13. Special Handling Instructions and Additional Information
1) Non Regulated By DOT Profile OR 335215
~~17860~~ 2030G

14. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: STEVE WRIGHT
Signature: Steve Wright
Month 9 Day 8 Year 17

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only):
Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: TY CUPPLES
Signature:
Month 9 Day 8 Year 17
Transporter 2 Printed/Typed Name
Signature
Month Day Year

17. Discrepancy
17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
17b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:
17c. Signature of Alternate Facility (or Generator)
Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a
Printed/Typed Name: Dawn Dunlap
Signature:
Month 10 Day 15 Year 17

GENERATOR — INT'L — TRANSPORTER — DESIGNATED FACILITY

169-BLS-C 6 10497 (Rev. 9/09)

DESIGNATED FACILITY TO GENERATOR

***24 HOUR EMERGENCY RESPONSE, CALL (877) 577-2669 ***

Stericycle®
Environmental Solutions

SHIPPING PAPER

Lading Manifest: 500842-17

	DELIVERY DATE 5/11/17 — JOB # 2768656
SHIPPER / CUSTOMER: Columbia Falls Aluminum Compan y	POINT OF CONTACT: Steve Wright
ADDRESS: 2000 Aluminum Dr	PHONE #: (406)892-8211
CITY, STATE, ZIP: COLUMBIA FALLS MT 59912	
CARRIER / TRANSPORTER: NRC ENVIRONMENTAL SERVICES	PHONE #: (510)749-1390
CONSIGNEE / FACILITY: CHEMICAL WASTE MANAGEMENT OF T	POINT OF CONTACT:
ADDRESS: 17629 Cedar Springs Lane	PHONE #: (541)454-2643
CITY, STATE, ZIP: ARLINGTON , OR 97812-9709	

HM	US DOT Description *(Including Proper Shipping Name, Hazard Class, and ID Number)*	Containers No.	Containers Type	Total Quantity	UOM
A	MATERIAL NOT REGULATED BY DOT (NON-HAZARDOUS)	1	TT	4500	G
B					
C					
D					

Special Handling Instruction and Additional Information:

a) DR333862-00 - NON-HAZARDOUS WASTE LIQUID - DIR01 (1)

Placards Provided YES_____ NO X

SHIPPER'S CERTIFICATION: "I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations." I also certify that all times listed above are true and correct.

		MONTH	DAY	YEAR
(SHIPPER) PRINT OR TYPE NAME: X Steve Wright	SIGNATURE: X Steve Wright	5	11	17
(CARRIER/TRANSPORTER) PRINT OR TYPE NAME: X Ty Jones	SIGNATURE: X	5	11	17
(CONSIGNEE/FACILITY) PRINT OR TYPE NAME: X	SIGNATURE: X			

CONSIGNEE

2017

453290

***24 HOUR EMERGENCY RESPONSE, CALL (877) 577-2669 ***

Stericycle®
Environmental Solutions

SHIPPING PAPER

Lading Manifest: 500842-17

	DELIVERY DATE 5/11/17 — JOB # 2768656
SHIPPER / CUSTOMER: Columbia Falls Aluminum Compan y	POINT OF CONTACT: Steve Wright
ADDRESS: 2000 Aluminum Dr	PHONE #: (406)892-8211
CITY, STATE, ZIP: COLUMBIA FALLS MT 59912	
CARRIER / TRANSPORTER: NRC ENVIRONMENTAL SERVICES	PHONE #: (510)749-1390
CONSIGNEE / FACILITY: CHEMICAL WASTE MANAGEMENT OF T	POINT OF CONTACT
ADDRESS: 17629 Cedar Springs Lane	PHONE #: (541)454-2643
CITY, STATE, ZIP: ARLINGTON , OR 97812-9709	

HM	US DOT Description *(Including Proper Shipping Name, Hazard Class, and ID Number)*	Containers No.	Containers Type	Total Quantity	UOM
A	MATERIAL NOT REGULATED BY DOT (NON-HAZARDOUS)	1	TT	4500	G
B					
C					
D					

Special Handling Instruction and Additional Information:

a) DR333862-00 - NON-HAZARDOUS WASTE LIQUID - DIR01 (1)

46009

Placards Provided YES_____ NO ✓

SHIPPER'S CERTIFICATION: "I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations." I also certify that all times listed above are true and correct.

		MONTH	DAY	YEAR
(SHIPPER) PRINT OR TYPE NAME: x STEVE WRIGHT	SIGNATURE: x Steve Wright	5	11	17
(CARRIER/TRANSPORTER) PRINT OR TYPE NAME: x Ty Cupples	SIGNATURE: x [illegible]	5	11	17
(CONSIGNEE/FACILITY) PRINT OR TYPE NAME: x Dana West	SIGNATURE: x Dana West	5	12	17

CONSIGNEE

5/14

***24 HOUR EMERGENCY RESPONSE, CALL (877) 577-2669 ***

Stericycle®
Environmental Solutions

453411

SHIPPING PAPER

Lading Manifest: 500844-17

	DELIVERY DATE / JOB # 2768656
SHIPPER / CUSTOMER: Columbia Falls Aluminum Compan y	POINT OF CONTACT: Steve Wright
ADDRESS: 2000 Aluminum Dr	PHONE #: (406)892-8211
CITY, STATE, ZIP: COLUMBIA FALLS MT 59912	
CARRIER / TRANSPORTER: NRC ENVIRONMENTAL SERVICES	PHONE #: (510)749-1390
CONSIGNEE / FACILITY: CHEMICAL WASTE MANAGEMENT OF T	POINT OF CONTACT
ADDRESS: 17629 Cedar Springs Lane	PHONE #: (541)454-2643
CITY, STATE, ZIP: ARLINGTON , OR 97812-9709	

HM	US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	Containers No.	Containers Type	Total Quantity	UOM
A	MATERIAL NOT REGULATED BY DOT (NON-HAZARDOUS)	2000	TT		G
B					
C					
D					

Special Handling Instruction and Additional Information:

a) OR333862-00 - NON-HAZARDOUS WASTE LIQUID - DIR01 (2)

2039.G

Placards Provided YES_____ NO_____

SHIPPER'S CERTIFICATION: "I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations." I also certify that all times listed above are true and correct.

(SHIPPER) PRINT OR TYPE NAME: X Stacy Sander	SIGNATURE: X Stacy Sander	MONTH 5	DAY 16	YEAR 17
(CARRIER/TRANSPORTER) PRINT OR TYPE NAME: X NRC	SIGNATURE: X Stacy Sander	MONTH 5	DAY 16	YEAR 17
(CONSIGNEE/FACILITY) PRINT OR TYPE NAME: X Patti Brandt	SIGNATURE: X Patti Brandt	MONTH 05	DAY 17	YEAR 17

CONSIGNEE

5/30

WASTE MANAGEMENT

CWM OF THE NORTHWEST
Federal EPA ID: ORD089452353
17629 CEDAR SPRINGS LANE
ARLINGTON, OR 97812

COLUMBIA FALLS ALUMINUM CO
ATTN: MANIFEST SECTION
MTD057561763
2000 ALUMINUM DR
COLUMBIA FALLS MT 59912

CERTIFICATE OF DISPOSAL

CWM OF THE NORTHWEST, EPA ID: ORD089452353, has received waste material from COLUMBIA FALLS ALUMINUM CO on 05/12/17 as described on Shipping Document number 500842-17.

Profile Number: OR333862
CWM Tracking ID: 45329001
Process: EVAPORATION
Disposal Date: 05/12/17

I certify, on behalf of the above listed treatment facility, that to the best of my knowledge, the above-described waste was managed in compliance with all applicable laws, regulations, permits and licenses on the date listed above.

CWMNW RECORDS DEPARTMENT
Certificate # 219988
05/30/17

NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number

2. Page 1 of

3. Emergency Response Phone

4. Waste Tracking Number

5. Generator's Name and Mailing Address
Columbia Falls Aluminum Company
2000 Aluminum Dr Columbia Falls MT 59912

Generator's Site Address (if different than mailing address)
Contact ~~Steve Wright~~

Generator's Phone:

6. Transporter 1 Company Name
MRC Environmental Services

U.S. EPA ID Number

7. Transporter 2 Company Name

U.S. EPA ID Number

8. Designated Facility Name and Site Address
~~Waste Man~~ Chemical Waste Management
17629 Cedar Springs Lane Arlington OR 97812-9709

U.S. EPA ID Number

Facility's Phone:

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
1.	Not Regulated By DOT Water	1	TT	2000	G
2.					
3.					
4.					

13. Special Handling Instructions and Additional Information

14. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Generator's/Offeror's Printed/Typed Name: STEVE WRIGHT
Signature: Steve Wright
Month 5 Day 16 Year 17

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Stacy Spender
Signature: Stacy Spender
Month 05 Day 16 Year 17

Transporter 2 Printed/Typed Name
Signature
Month Day Year

17. Discrepancy

17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

17b. Alternate Facility (or Generator)

U.S. EPA ID Number

Facility's Phone:

17c. Signature of Alternate Facility (or Generator)

Month Day Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a

Printed/Typed Name
Signature
Month Day Year

GENERATOR | INT'L | TRANSPORTER | DESIGNATED FACILITY

***24 HOUR EMERGENCY RESPONSE, CALL (877) 577-2669 *** .

Stericycle®
Environmental Solutions

SHIPPING PAPER

Lading Manifest: 636071-17

DELIVERY DATE	JOB 2880343
SHIPPER / CUSTOMER: Columbia Falls Aluminum Compan y	POINT OF CONTACT: Steve Wright
ADDRESS: 2000 Aluminum Dr	PHONE #: (406)892-8211
CITY, STATE, ZIP: COLUMBIA FALLS MT 59912	
CARRIER / TRANSPORTER: NRC ENVIRONMENTAL SERVICES	PHONE #: (510)749-1390
CONSIGNEE / FACILITY: CHEMICAL WASTE MANAGEMENT OF T	POINT OF CONTACT
ADDRESS: 17629 Cedar Springs Lane	PHONE #: (541)454-2643
CITY, STATE, ZIP: ARLINGTON , OR 97812-9709	

HM	US DOT Description *(Including Proper Shipping Name, Hazard Class, and ID Number)*	Containers No.	Containers Type	Total Quantity	UOM
A	MATERIAL NOT REGULATED BY DOT (NON-HAZARDOUS)		TT	31250	G
B					
C					
D					

Special Handling Instruction and Additional Information:

a) OR333862-00 - NON-HAZARDOUS WASTE LIQUID - DIR01 (1)

Placards Provided YES_____ NO_____

SHIPPER'S CERTIFICATION: "I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations." I also certify that all times listed above are true and correct.

		MONTH	DAY	YEAR
(SHIPPER) PRINT OR TYPE NAME: X STEVE WRIGHT	SIGNATURE: X Steve Wright	8	17	17
(CARRIER/TRANSPORTER) PRINT OR TYPE NAME: X Stacy Spencer	SIGNATURE: X Stacy Spencer	8	17	17
(CONSIGNEE/FACILITY) PRINT OR TYPE NAME: X	SIGNATURE: X			

CONSIGNEE

455426

***24 HOUR EMERGENCY RESPONSE, CALL (877) 577-2669 ***

Stericycle®
Environmental Solutions

SHIPPING PAPER

Lading Manifest: 636071-17

DELIVERY DATE	JOB 2880343
SHIPPER / CUSTOMER: Columbia Falls Aluminum Compan y	POINT OF CONTACT: Steve Wright
ADDRESS: 2000 Aluminum Dr	PHONE #: (406)892-8211
CITY, STATE, ZIP: COLUMBIA FALLS MT 59912	
CARRIER / TRANSPORTER: NRC ENVIRONMENTAL SERVICES	PHONE #: (510)749-1390
CONSIGNEE / FACILITY: CHEMICAL WASTE MANAGEMENT OF T	POINT OF CONTACT
ADDRESS: 17629 Cedar Springs Lane	PHONE #: (541)454-2643
CITY, STATE, ZIP: ARLINGTON , OR 97812-9709	

HM	US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	Containers No.	Containers Type	Total Quantity	UOM
A	MATERIAL NOT REGULATED BY DOT (NON-HAZARDOUS)		TT	3135 gal	G
B					
C					
D					

Special Handling Instruction and Additional Information:

a) DR333862-00 - NON-HAZARDOUS WASTE LIQUID - DIR01 (1)

(8.3sg) 3224 G
26760 P
13.38 T

Placards Provided YES_____ NO_____

SHIPPER'S CERTIFICATION: "I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations." I also certify that all times listed above are true and correct.

		MONTH	DAY	YEAR
(SHIPPER) PRINT OR TYPE NAME: X STEVE WRIGHT	SIGNATURE: X Steve Wright	8	17	17
(CARRIER/TRANSPORTER) PRINT OR TYPE NAME: X Stacy Spencer	SIGNATURE: X Stacy Spencer	8	17	17
(CONSIGNEE/FACILITY) PRINT OR TYPE NAME: X Paula Hammack	SIGNATURE: X [illegible]	8	18	17

8-25

CONSIGNEE

APPENDIX G

Groundwater Laboratory Analytical Data Tables – Rounds 1 through 4

1. VOCs in Groundwater
2. SVOCs in Groundwater
3. Metals in Groundwater
4. General Chemistry in Groundwater

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-002	CFMW-002	CFMW-002	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-007	CFMW-007	CFMW-007	CFMW-007
				Sample Date	09/12/2016	03/24/2017	06/27/2017	09/14/2016	12/09/2016	03/22/2017	06/27/2017	09/21/2016	12/12/2016	03/28/2017	06/19/2017
				Sample Designation	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	3.8	3.2	3.7	3.3	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 UJ	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.71 J	0.95 J	0.88 J	0.8 J	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 UJ
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 UJ	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 UJ
Bromomethane	10	--	0.75	ug/l	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 UJ
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-002	CFMW-002	CFMW-002	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-007	CFMW-007	CFMW-007	CFMW-007
				Sample Date	09/12/2016	03/24/2017	06/27/2017	09/14/2016	12/09/2016	03/22/2017	06/27/2017	09/21/2016	12/12/2016	03/28/2017	06/19/2017
				Sample Designation	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.38 J	0.26 J	0.41 J	0.44 J	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.76 J	0.62 J	0.58 J	0.72 J	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011
				Sample Date	09/15/2016	12/16/2016	03/28/2017	06/28/2017	09/12/2016	12/15/2016	03/24/2017	06/27/2017	09/13/2016	12/08/2016	03/27/2017
				Sample Designation	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 UJ	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.3 J	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	8.3	3.2 J	7.6	13	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.15 J	0.16 J	0.17 J	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 UJ	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011
				Sample Date	09/15/2016	12/16/2016	03/28/2017	06/28/2017	09/12/2016	12/15/2016	03/24/2017	06/27/2017	09/13/2016	12/08/2016	03/27/2017
				Sample Designation	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.42 J	0.32 J	0.27 J	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-011	CFMW-011	CFMW-012	CFMW-012	CFMW-012	CFMW-012	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-015
				Sample Date	06/28/2017	06/28/2017	09/12/2016	12/14/2016	03/22/2017	06/23/2017	09/12/2016	12/15/2016	03/29/2017	06/27/2017	09/12/2016
				Sample Designation	CFMW-011-GW	CFMW-DUP15-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-015-GW
				Sample Type	N	FD	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 UJ	0.19 U	0.19 U	0.19 UJ	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 UJ	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 UJ	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	1.1 UJ	3.6 J	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 UJ	0.26 UJ	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 UJ	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 UJ	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-011	CFMW-011	CFMW-012	CFMW-012	CFMW-012	CFMW-012	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-015
				Sample Date	06/28/2017	06/28/2017	09/12/2016	12/14/2016	03/22/2017	06/23/2017	09/12/2016	12/15/2016	03/29/2017	06/27/2017	09/12/2016
				Sample Designation	CFMW-011-GW	CFMW-DUP15-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-015-GW
				Sample Type	N	FD	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.16 J	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-015	CFMW-015	CFMW-015	CFMW-016	CFMW-016	CFMW-016	CFMW-017	CFMW-017	CFMW-018	CFMW-018	CFMW-019
				Sample Date	12/15/2016	03/29/2017	06/27/2017	03/28/2017	03/28/2017	06/29/2017	03/28/2017	06/26/2017	03/28/2017	06/20/2017	09/12/2016
				Sample Designation	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-017-GW	CFMW-017-GW	CFMW-018-GW	CFMW-018-GW	CFMW-019-GW
				Sample Type	N	N	N	N	FD	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 UJ	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 UJ
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 UJ	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 UJ	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	1.8	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-015	CFMW-015	CFMW-015	CFMW-016	CFMW-016	CFMW-016	CFMW-017	CFMW-017	CFMW-018	CFMW-018	CFMW-019
				Sample Date	12/15/2016	03/29/2017	06/27/2017	03/28/2017	03/28/2017	06/29/2017	03/28/2017	06/26/2017	03/28/2017	06/20/2017	09/12/2016
				Sample Designation	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-017-GW	CFMW-017-GW	CFMW-018-GW	CFMW-018-GW	CFMW-019-GW
				Sample Type	N	N	N	N	FD	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.56 J+
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 UJ	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-019	CFMW-019	CFMW-019	CFMW-020	CFMW-020	CFMW-020	CFMW-020	CFMW-021	CFMW-021	CFMW-021	CFMW-021
				Sample Date	12/15/2016	03/29/2017	06/29/2017	09/20/2016	12/13/2016	03/21/2017	06/26/2017	09/12/2016	12/14/2016	03/29/2017	06/26/2017
				Sample Designation	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 UJ	0.28 U	0.28 U	0.28 U	0.28 UJ
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 UJ	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 UJ	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-019	CFMW-019	CFMW-019	CFMW-020	CFMW-020	CFMW-020	CFMW-020	CFMW-021	CFMW-021	CFMW-021	CFMW-021
				Sample Date	12/15/2016	03/29/2017	06/29/2017	09/20/2016	12/13/2016	03/21/2017	06/26/2017	09/12/2016	12/14/2016	03/29/2017	06/26/2017
				Sample Designation	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.29 J	0.5 J	0.54 J	0.12 U	0.12 U	0.12 U	0.12 U	0.18 J	0.12 U	0.69 J	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 UJ	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-025b	CFMW-025b	CFMW-025B
				Sample Date	09/13/2016	12/09/2016	03/28/2017	06/26/2017	09/21/2016	12/19/2016	03/21/2017	06/27/2017	09/13/2016	12/07/2016	03/20/2017
				Sample Designation	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-25B-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 UJ	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 UJ	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 UJ	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 UJ
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 UJ
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 UJ
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 UJ	0.14 U	0.14 UJ	0.14 U	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 UJ
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-025b	CFMW-025b	CFMW-025B
				Sample Date	09/13/2016	12/09/2016	03/28/2017	06/26/2017	09/21/2016	12/19/2016	03/21/2017	06/27/2017	09/13/2016	12/07/2016	03/20/2017
				Sample Designation	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-25B-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-025b	CFMW-026	CFMW-026	CFMW-026	CFMW-026	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028
				Sample Date	06/22/2017	09/13/2016	12/05/2016	03/20/2017	06/22/2017	09/13/2016	12/14/2016	03/27/2017	06/26/2017	09/13/2016	12/05/2016
				Sample Designation	CFMW-025b-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-028-GW	CFMW-028-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 UJ	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U
Benzene	5	5	0.46	ug/l	0.13 J	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 UJ	0.18 U	0.18 UJ	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 UJ	0.18 UJ	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 UJ	0.22 U	0.22 U	0.22 UJ	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 UJ	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 UJ	0.14 UJ	0.14 U	0.14 UJ	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 UJ	0.14 UJ	0.14 U
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-025b	CFMW-026	CFMW-026	CFMW-026	CFMW-026	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028
				Sample Date	06/22/2017	09/13/2016	12/05/2016	03/20/2017	06/22/2017	09/13/2016	12/14/2016	03/27/2017	06/26/2017	09/13/2016	12/05/2016
				Sample Designation	CFMW-025b-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-028-GW	CFMW-028-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.21 J	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-028	CFMW-028	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031	CFMW-031	CFMW-031
				Sample Date	03/20/2017	06/26/2017	09/13/2016	09/13/2016	12/14/2016	03/24/2017	06/26/2017	09/15/2016	12/09/2016	03/21/2017	06/21/2017
				Sample Designation	CFMW-028-GW	CFMW-028-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW
				Sample Type	N	N	N	FD	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 UJ	0.28 U	0.28 U	0.28 U	0.28 U	0.28 UJ	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 UJ	0.18 UJ	0.18 UJ	0.18 UJ	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 UJ	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 UJ	0.14 UJ	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 UJ	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 UJ
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-028	CFMW-028	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031	CFMW-031	CFMW-031
				Sample Date	03/20/2017	06/26/2017	09/13/2016	09/13/2016	12/14/2016	03/24/2017	06/26/2017	09/15/2016	12/09/2016	03/21/2017	06/21/2017
				Sample Designation	CFMW-028-GW	CFMW-028-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW
				Sample Type	N	N	N	FD	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-031	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-033	CFMW-033	CFMW-033	CFMW-033	CFMW-034
				Sample Date	06/21/2017	09/15/2016	12/13/2016	03/27/2017	06/20/2017	06/20/2017	09/15/2016	12/06/2016	03/21/2017	06/19/2017	09/14/2016
				Sample Designation	CFMW-DUP13-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-DUP12-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-034-GW
				Sample Type	FD	N	N	N	N	FD	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.55	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-031	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-033	CFMW-033	CFMW-033	CFMW-033	CFMW-034
				Sample Date	06/21/2017	09/15/2016	12/13/2016	03/27/2017	06/20/2017	06/20/2017	09/15/2016	12/06/2016	03/21/2017	06/19/2017	09/14/2016
				Sample Designation	CFMW-DUP13-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-DUP12-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-034-GW
				Sample Type	FD	N	N	N	N	FD	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.16 J	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-034	CFMW-034	CFMW-034	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-037
				Sample Date	12/13/2016	03/21/2017	06/19/2017	09/14/2016	12/13/2016	03/21/2017	06/20/2017	09/16/2016	12/08/2016	03/23/2017	06/20/2017
				Sample Designation	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 UJ
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 UJ
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.37 J	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 UJ
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.59	0.21 U	0.21 U	0.21 U	0.51	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-034	CFMW-034	CFMW-034	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-037
				Sample Date	12/13/2016	03/21/2017	06/19/2017	09/14/2016	12/13/2016	03/21/2017	06/20/2017	09/16/2016	12/08/2016	03/23/2017	06/20/2017
				Sample Designation	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 UJ
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-043
				Sample Date	09/14/2016	12/09/2016	03/24/2017	06/27/2017	09/14/2016	12/13/2016	03/30/2017	06/20/2017	09/14/2016	06/20/2017	09/13/2016
				Sample Designation	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-042-GW	CFMW-042-GW	CFMW-043-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 UJ	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 UJ	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 UJ	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 U	0.37 UJ	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 UJ	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-043
				Sample Date	09/14/2016	12/09/2016	03/24/2017	06/27/2017	09/14/2016	12/13/2016	03/30/2017	06/20/2017	09/14/2016	06/20/2017	09/13/2016
				Sample Designation	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-042-GW	CFMW-042-GW	CFMW-043-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.14 J	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 UJ	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-043	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b
				Sample Date	12/14/2016	03/20/2017	06/21/2017	09/15/2016	12/09/2016	03/28/2017	06/21/2017	09/19/2016	12/19/2016	03/24/2017	06/23/2017
				Sample Designation	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 UJ	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 UJ	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.28 J	0.25 U	0.25 U	0.25 UJ
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	5.3	1.1 U	1.1 U	4.9 J	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 UJ	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 UJ	0.18 U	0.18 UJ
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 UJ	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 UJ	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 UJ	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	3.1	3.5 J	0.81 J	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 UJ	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-043	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b
				Sample Date	12/14/2016	03/20/2017	06/21/2017	09/15/2016	12/09/2016	03/28/2017	06/21/2017	09/19/2016	12/19/2016	03/24/2017	06/23/2017
				Sample Designation	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049	CFMW-049
				Sample Date	09/15/2016	12/14/2016	03/23/2017	06/28/2017	09/14/2016	12/15/2016	03/23/2017	06/21/2017	09/21/2016	12/15/2016	12/15/2016
				Sample Designation	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-049-GW	CFMW-049-GW	CFMW-DUP6-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	FD
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 UJ	0.23 UJ	0.23 UJ
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 UJ	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 UJ	2.8 J	1.1 U	10	1.1 UJ	3.2 J	1.1 U	1.1 U	1.1 UJ	1.1 UJ
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	3	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 UJ	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 UJ	0.58 U	0.58 UJ	0.58 U	0.58 UJ	0.58 UJ
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.51 J	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049	CFMW-049
				Sample Date	09/15/2016	12/14/2016	03/23/2017	06/28/2017	09/14/2016	12/15/2016	03/23/2017	06/21/2017	09/21/2016	12/15/2016	12/15/2016
				Sample Designation	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-049-GW	CFMW-049-GW	CFMW-DUP6-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	FD
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	2.2	0.66 J	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 UJ
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-049	CFMW-049	CFMW-050	CFMW-050	CFMW-050	CFMW-050	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054
				Sample Date	03/23/2017	06/21/2017	09/19/2016	12/15/2016	03/23/2017	06/21/2017	09/14/2016	12/12/2016	06/28/2017	09/14/2016	12/12/2016
				Sample Designation	CFMW-049-GW	CFMW-049-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-054-GW	CFMW-054-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 UJ	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	3 J	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 UJ	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 UJ	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 UJ	0.58 U	0.58 UJ	0.58 U	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-049	CFMW-049	CFMW-050	CFMW-050	CFMW-050	CFMW-050	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054
				Sample Date	03/23/2017	06/21/2017	09/19/2016	12/15/2016	03/23/2017	06/21/2017	09/14/2016	12/12/2016	06/28/2017	09/14/2016	12/12/2016
				Sample Designation	CFMW-049-GW	CFMW-049-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-054-GW	CFMW-054-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.14 J	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 UJ	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-054	CFMW-054	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFMW-064	CFMW-064
				Sample Date	03/22/2017	06/21/2017	09/15/2016	12/07/2016	12/07/2016	03/23/2017	06/23/2017	09/15/2016	12/07/2016	03/23/2017	06/23/2017
				Sample Designation	CFMW-054-GW	CFMW-054-GW	CFMW-061-GW	CFMW-061-GW	CFMW-DUP5-GW	CFMW-061-GW	CFMW-061-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW
				Sample Type	N	N	N	N	FD	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 UJ	0.19 UJ	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 UJ
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 UJ
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	3.5 J	1.1 U	1.1 U	1.1 U	2.6 J	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U	0.18 UJ	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 UJ
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 UJ	0.22 U	0.22 U	0.22 U	0.22 UJ
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 U	0.14 UJ	0.14 U	0.14 U	0.14 U	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 UJ	0.58 U	0.58 UJ	0.58 UJ	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-054	CFMW-054	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFMW-064	CFMW-064
				Sample Date	03/22/2017	06/21/2017	09/15/2016	12/07/2016	12/07/2016	03/23/2017	06/23/2017	09/15/2016	12/07/2016	03/23/2017	06/23/2017
				Sample Designation	CFMW-054-GW	CFMW-054-GW	CFMW-061-GW	CFMW-061-GW	CFMW-DUP5-GW	CFMW-061-GW	CFMW-061-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW
				Sample Type	N	N	N	N	FD	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-064
				Sample Date	06/23/2017
				Sample Designation	CFMW-DUP14-GW
				Sample Type	FD
				Sample Fraction	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit	
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U
1,1,2,2-Tetrachloroethane	2	--	--	ug/l	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U
1,1-Dichloroethane	4	--	2.8	ug/l	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U
1,2,3-Trichlorobenzene	0.7	--	0.7	ug/l	0.35 U
1,2,4-Trichlorobenzene	70	--	0.4	ug/l	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00033	ug/l	0.23 U
1,2-Dichlorobenzene	600	600	30	ug/l	0.22 U
1,2-Dichloroethane	4	5	0.17	ug/l	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U
1,3-Dichlorobenzene	600	--	--	ug/l	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U
Acetone	--	--	1400	ug/l	1.1 U
Benzene	5	5	0.46	ug/l	0.09 U
Bromoform	80	80	3.3	ug/l	0.18 U
Bromomethane	10	--	0.75	ug/l	0.18 U
Carbon disulfide	--	--	81	ug/l	0.22 U
Carbon tetrachloride	3	5	0.46	ug/l	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U
Chloroform	70	80	0.22	ug/l	0.22 U
Chloromethane	30	--	19	ug/l	0.22 UJ
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U
cis-1,3-Dichloropropene	4	--	--	ug/l	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U
Dichlorobromomethane	10	80	0.13	ug/l	0.15 U
Dichlorodifluoromethane	1000	--	20	ug/l	0.14 UJ
Ethylbenzene	700	700	1.5	ug/l	0.3 U
Ethylene Dibromide	0.004	--	--	ug/l	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U
Methylcyclohexane	--	--	--	ug/l	0.22 U
Methylene Chloride	5	5	11	ug/l	0.21 U
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U
Styrene	100	100	120	ug/l	0.17 U

Appendix G1. Volatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-064
				Sample Date	06/23/2017
				Sample Designation	CFMW-DUP14-GW
				Sample Type	FD
				Sample Fraction	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit	
Tetrachloroethene	5	--	--	ug/l	0.12 U
Toluene	1000	1000	110	ug/l	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U
Vinyl chloride	0.2	2	0.019	ug/l	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-002	CFMW-002	CFMW-002	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-007	CFMW-007	CFMW-007	CFMW-007	CFMW-008a
				Sample Date	09/12/2016	03/24/2017	06/27/2017	09/14/2016	12/09/2016	03/22/2017	06/27/2017	09/21/2016	12/12/2016	03/28/2017	06/19/2017	09/15/2016
				Sample Designation	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-008a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.63 U	0.66 U	0.66 U	0.63 U	0.63 U	0.64 U	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.43 U	0.45 U	0.45 U	0.43 U	0.43 U	0.44 U	0.43 U	0.43 U	0.45 U	0.43 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.1 U	3.3 U	3.3 U	3.1 U	3.1 U	3.2 U	3.1 UJ	3.1 U	3.2 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.93 U	0.93 U	0.97 U	0.97 U	0.93 U	0.93 U	0.95 U	0.93 U	0.93 U	0.97 U	0.93 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U	0.69 U	0.7 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.49 U	0.51 U	0.51 U	0.49 U	0.49 U	0.5 U	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.53 U	0.55 U	0.55 U	0.53 U	0.53 U	0.54 U	0.53 U	0.53 U	0.55 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.63 U	0.63 U	0.66 U	0.66 U	0.63 U	0.63 U	0.64 U	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.91 U	0.91 U	0.95 U	0.95 U	0.91 U	0.91 U	0.93 U	0.91 U	0.91 UJ	0.95 U	0.91 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 U	2.4 U	2.5 U	2.5 UJ	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.5 UJ	2.4 UJ	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1.1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U	0.88 U	0.9 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.61 U	0.64 U	0.64 U	0.61 U	0.61 U	0.62 U	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.74 U	0.74 U	0.77 U	0.77 U	0.74 U	0.74 U	0.76 U	0.74 U	0.74 U	0.77 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U	0.88 U	0.9 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.65 U	0.65 U	0.68 U	0.68 UJ	0.65 U	0.65 U	0.66 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 UJ
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.59 U	0.62 U	0.62 U	0.59 U	0.59 U	0.6 U	0.59 U	0.59 U	0.61 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.88 U	0.88 U	0.92 U	0.92 UJ	0.88 U	0.88 U	0.9 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 UJ
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1.1 U	1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.82 U	0.82 U	0.86 U	0.86 U	0.82 U	0.82 U	0.84 U	0.82 U	0.82 U	0.85 U	0.82 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2 U	2.1 U	2.1 U	2 U	2 U	2.1 U	2 U	2 U	2.1 U	2 UJ	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	1.1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.76 U	0.76 U	0.79 U	0.79 U	0.76 U	0.76 U	0.78 U	0.76 U	0.76 U	0.79 U	0.76 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.73 U	0.73 U	0.76 U	0.76 U	0.73 U	0.73 U	0.74 U	0.73 U	0.73 U	0.76 U	0.73 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.96 U	0.96 U	1 U	1 U	0.96 U	0.96 U	0.98 U	0.96 U	0.96 U	1 U	0.96 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.48 U	0.5 U	0.5 U	0.48 U	0.48 U	0.49 U	0.48 U	0.48 U	0.5 UJ	0.48 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.7 U	4.9 U	4.9 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 UJ	4.8 U	4.7 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U	0.88 U	0.9 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U
Acenaphthylene	--	--	--	ug/l	0.65 U	0.65 U	0.68 U	0.68 U	0.65 U	0.65 U	0.66 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U
Acetophenone	--	--	190	ug/l	1 U	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1.1 U	1 U	1 U
Anthracene	2100	--	180	ug/l	0.57 U	0.57 U	0.6 U	0.6 U	0.57 U	0.57 U	0.58 U	0.57 U	0.57 U	0.59 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.77 U	0.77 U	0.81 U	0.81 U	0.77 U	0.77 U	0.79 U	0.77 U	0.77 U	0.8 U	0.77 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.86 U	0.86 U	0.9 U	0.9 U	0.86 U	0.86 U	0.88 U	0.86 U	0.86 U	0.9 U	0.86 U	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.55 U	0.58 U	0.58 U	0.55 U	0.55 U	0.56 U	0.55 U	0.55 U	0.57 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.16 U	0.17 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.44 U	0.46 U	0.46 U	0.44 U	0.44 U	0.45 U	0.44 U	0.44 U	0.46 U	0.44 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.75 U	0.75 U	0.78 U	0.78 U	0.75 U	0.75 U	0.77 U	0.75 U	0.75 U	0.78 U	0.75 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.18 U	0.19 U	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U	0.69 U	0.7 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.12 U	0.13 U	0.13 U	0.12 UJ	0.12 U	0.12 U	0.12 U	0.12 U	0.13 U	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.72 U	0.72 U	0.75 U	0.75 U	0.72 U	0.72 U	0.73 U	0.72 U	0.72 U	0.75 U	0.72 U	1.1 J
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.6 U	0.63 U	0.63 U	0.6 U	0.6 U	0.61 U	0.6 U	0.6 UJ	0.63 UJ	0.6 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 UJ	1.1 UJ	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-002	CFMW-002	CFMW-002	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-007	CFMW-007	CFMW-007	CFMW-007	CFMW-008a
				Sample Date	09/12/2016	03/24/2017	06/27/2017	09/14/2016	12/09/2016	03/22/2017	06/27/2017	09/21/2016	12/12/2016	03/28/2017	06/19/2017	09/15/2016
				Sample Designation	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-008a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Carbazole	--	--	--	ug/l	0.85 U	0.85 U	0.89 U	0.89 U	0.85 U	0.85 U	0.87 U	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.67 U	0.67 U	0.7 U	0.7 U	0.67 U	0.67 U	0.68 U	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.09 U	0.09 U	0.094 U	0.094 U	0.09 U	0.09 U	0.092 U	0.09 U	0.09 U	0.094 U	0.09 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.85 U	0.85 U	0.89 U	0.89 U	0.85 U	0.85 U	0.87 U	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 UJ	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.98 U	0.98 U	1 U	1 U	0.98 U	0.98 U	1 U	0.98 U	0.98 U	1 UJ	0.98 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.82 U	0.82 UJ	0.86 U	0.86 U	0.82 U	0.82 U	0.84 U	0.82 U	0.82 U	0.85 U	0.82 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U	0.69 U	0.7 U	0.69 U	0.69 UJ	0.72 U	0.69 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.72 U	0.72 U	0.75 U	0.75 U	0.72 U	0.72 U	0.73 U	0.72 U	0.72 U	0.75 U	0.72 U	0.72 U
Fluorene	1100	--	29	ug/l	0.8 U	0.8 U	0.84 U	0.84 U	0.8 U	0.8 U	0.82 U	0.8 U	0.8 U	0.83 U	0.8 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.47 U	0.49 U	0.49 U	0.47 U	0.47 U	0.48 U	0.47 U	0.47 U	0.49 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.76 U	0.76 U	0.79 U	0.79 U	0.76 U	0.76 U	0.78 U	0.76 U	0.76 U	0.79 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.61 UJ	0.64 U	0.64 U	0.61 U	0.61 U	0.62 U	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.09 U	0.09 U	0.094 U	0.094 U	0.09 U	0.09 U	0.092 U	0.09 U	0.09 U	0.094 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.21 U	0.22 U	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.67 U	0.67 U	0.7 U	0.7 U	0.67 U	0.67 U	0.68 U	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.8 U	0.8 U	0.84 U	0.84 U	0.8 U	0.8 U	0.82 U	0.8 U	0.8 U	0.83 U	0.8 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.49 U	0.51 U	0.51 U	0.49 U	0.49 U	0.5 U	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.83 U	0.83 U	0.87 U	0.87 UJ	0.83 U	0.83 U	0.85 U	0.83 U	0.83 U	0.86 U	0.83 U	0.83 UJ
N-Nitrosodiphenylamine	33	--	12	ug/l	0.74 U	0.74 U	0.77 U	0.77 U	0.74 U	0.74 U	0.76 U	0.74 U	0.74 U	0.77 U	0.74 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 U	2.2 U	2.3 U	2.3 R	2.2 UJ	2.2 U	2.2 U	2.2 U	2.2 UJ	2.3 U	2.2 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.65 U	0.65 U	0.68 U	0.68 U	0.65 U	0.65 U	0.66 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U
Phenol	300	--	580	ug/l	0.41 U	0.41 U	0.43 U	0.43 U	0.41 U	0.41 U	0.42 U	0.41 U	0.41 U	0.43 U	0.41 U	0.41 U
Pyrene	830	--	12	ug/l	0.83 U	0.83 U	0.87 U	0.87 U	0.83 U	0.83 U	0.85 U	0.83 U	0.83 U	0.86 UJ	0.83 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011
				Sample Date	12/16/2016	03/28/2017	06/28/2017	09/12/2016	12/15/2016	03/24/2017	06/27/2017	09/13/2016	12/08/2016	03/27/2017	06/28/2017
				Sample Designation	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.66 U	0.63 U	0.63 U	0.63 UJ	0.63 U	0.66 U	0.66 U	0.63 U	0.66 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.45 U	0.43 U	0.43 U	0.43 UJ	0.43 U	0.45 U	0.45 U	0.43 U	0.45 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.2 U	3.1 U	3.1 U	3.1 U	3.1 U	3.2 U	3.2 U	3.1 U	3.2 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.93 U	0.97 U	0.93 U	0.93 U	0.93 U	0.93 U	0.97 U	0.97 U	0.93 U	0.97 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U	0.72 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.51 U	0.49 U	0.51 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.55 U	0.53 U	0.53 U	0.53 U	0.53 U	0.55 U	0.55 U	0.53 U	0.55 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.63 U	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.66 U	0.63 U	0.66 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.91 U	0.95 U	0.91 U	0.91 U	0.91 U	0.91 U	0.95 U	0.95 U	0.91 U	0.95 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 U	2.5 UJ	2.4 U	2.4 U	2.4 U	2.4 U	2.5 U	2.5 UJ	2.4 U	2.5 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1.1 U	1 U	1.1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U	0.92 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.64 U	0.64 U	0.61 U	0.64 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.74 U	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.77 U	0.74 U	0.77 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U	0.92 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.68 U	0.65 U	0.68 U	0.65 U
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.61 U	0.59 U	0.59 U	0.59 U	0.59 U	0.61 U	0.61 U	0.59 U	0.61 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U	0.92 U	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1.1 U	1 U	1.1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.82 U	0.85 U	0.82 U	0.82 U	0.82 U	0.82 U	0.85 U	0.85 U	0.82 U	0.85 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2.1 U	2 U	2 U	2 U	2 U	2.1 U	2.1 U	2 U	2.1 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1.1 U	1 U	1.1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.76 U	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.79 U	0.76 U	0.79 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.73 U	0.76 U	0.73 U	0.73 U	0.73 U	0.73 U	0.76 U	0.76 U	0.73 U	0.76 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.96 U	1 U	0.96 U	0.96 U	0.96 U	0.96 U	1 U	1 U	0.96 U	1 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.5 UJ	0.48 U	0.48 U	0.48 U	0.48 U	0.5 U	0.5 U	0.48 U	0.5 UJ	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U	4.8 U	4.7 U	4.8 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.88 U	0.92 U	0.88 U	0.88 U	0.88 UJ	0.88 U	0.92 U	0.92 U	0.88 U	0.92 U	0.88 U
Acenaphthylene	--	--	--	ug/l	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.68 U	0.65 U	0.68 U	0.65 U
Acetophenone	--	--	190	ug/l	1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1.1 U	1 U	1.1 U	1 U
Anthracene	2100	--	180	ug/l	0.57 U	0.59 U	0.57 U	0.57 U	0.57 U	0.57 U	0.59 U	0.59 U	0.57 U	0.59 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.77 U	0.8 U	0.77 U	0.77 U	0.77 U	0.77 U	0.8 U	0.8 U	0.77 U	0.8 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.86 U	0.9 U	0.86 U	0.86 U	0.86 U	0.86 U	0.9 U	0.9 U	0.86 U	0.9 U	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.57 U	0.55 U	0.55 U	0.55 U	0.55 U	0.57 U	0.57 U	0.55 U	0.57 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.17 U	0.16 U	0.17 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.46 U	0.44 U	0.44 U	0.44 U	0.44 U	0.46 U	0.46 U	0.44 U	0.46 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.75 U	0.78 U	0.75 U	0.75 U	0.75 U	0.75 U	0.78 U	0.78 U	0.75 U	0.78 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.19 U	0.18 U	0.19 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U	0.72 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.13 U	0.12 U	0.12 U	0.12 UJ	0.12 U	0.13 U	0.13 U	0.12 UJ	0.13 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	2.4	1.6 J	1.2 J	0.72 U	0.72 U	0.72 U	0.75 U	0.75 U	0.72 U	0.75 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.63 UJ	0.6 U	0.6 U	0.6 U	0.6 U	0.63 U	0.63 U	0.6 U	0.63 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011
				Sample Date	12/16/2016	03/28/2017	06/28/2017	09/12/2016	12/15/2016	03/24/2017	06/27/2017	09/13/2016	12/08/2016	03/27/2017	06/28/2017
				Sample Designation	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Carbazole	--	--	--	ug/l	0.85 U	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.89 U	0.85 U	0.89 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.67 U	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.7 U	0.67 U	0.7 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.09 U	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.094 U	0.09 U	0.094 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.85 U	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.89 U	0.85 U	0.89 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.98 U	1 UJ	0.98 U	0.98 U	0.98 U	0.98 U	1 U	1 U	0.98 U	1 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.82 U	0.85 U	0.82 U	0.82 U	0.82 U	0.82 UJ	0.85 U	0.85 U	0.82 U	0.85 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U	0.72 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.72 U	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.75 U	0.72 U	0.75 U	0.72 U
Fluorene	1100	--	29	ug/l	0.8 U	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.83 U	0.83 U	0.8 U	0.83 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.49 U	0.47 U	0.47 U	0.47 U	0.47 U	0.49 U	0.49 U	0.47 U	0.49 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.76 U	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.79 U	0.76 U	0.79 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U	0.61 UJ	0.64 U	0.64 U	0.61 U	0.64 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.09 U	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.094 U	0.09 U	0.094 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.22 U	0.21 U	0.22 U	0.21 U
Isophorone	400	--	78	ug/l	0.67 U	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.7 U	0.67 U	0.7 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.8 U	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.83 U	0.83 U	0.8 U	0.83 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.51 U	0.49 U	0.51 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.83 U	0.86 U	0.83 U	0.83 U	0.83 U	0.83 U	0.86 U	0.86 U	0.83 U	0.86 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.74 U	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.77 U	0.74 U	0.77 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 U	2.3 U	2.2 U	2.2 U	2.2 UJ	2.2 U	2.3 U	2.3 R	2.2 U	2.3 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.68 U	0.65 U	0.68 U	0.65 U
Phenol	300	--	580	ug/l	0.41 U	0.43 U	0.41 U	0.41 U	0.41 U	0.41 U	0.43 U	0.43 U	0.41 U	0.43 U	0.41 U
Pyrene	830	--	12	ug/l	0.83 U	0.86 UJ	0.83 U	0.83 U	0.83 U	0.83 U	0.86 U	0.86 U	0.83 U	0.86 UJ	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-011	CFMW-012	CFMW-012	CFMW-012	CFMW-012	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-015	CFMW-015
				Sample Date	06/28/2017	09/12/2016	12/14/2016	03/22/2017	06/23/2017	09/12/2016	12/15/2016	03/29/2017	06/27/2017	09/12/2016	12/15/2016
				Sample Designation	CFMW-DUP15-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-015-GW	CFMW-015-GW
				Sample Type	FD	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.68 U	0.63 UJ	0.63 U	0.63 U	0.63 U	0.63 UJ
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.47 U	0.43 UJ	0.43 U	0.43 U	0.43 U	0.43 UJ
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.1 U	3.1 UJ	3.1 U	3.1 U	3.4 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	1 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.75 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.53 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.58 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.68 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.99 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 UJ
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.6 U	2.4 U	2.4 UJ	2.4 U	2.4 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.96 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.66 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.8 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.96 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.71 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 UJ
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.64 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.96 U	0.88 U	0.88 U	0.88 U	0.88 UJ	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 R
3-Nitroaniline	--	--	--	ug/l	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.89 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 R
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2 U	2 U	2 U	2 U	2.2 U	2 U	2 U	2 U	2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.83 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 UJ
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	1 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.52 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 R
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	5.1 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.88 U	0.88 U	0.88 UJ	0.88 U	0.88 U	0.96 U	0.88 UJ	0.88 U	0.88 U	0.88 U	0.88 UJ
Acenaphthylene	--	--	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.71 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
Acetophenone	--	--	190	ug/l	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
Anthracene	2100	--	180	ug/l	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.62 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.84 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.86 U	0.86 U	0.86 U	0.86 U	0.86 UJ	0.93 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.6 U	0.55 U	0.55 UJ	0.55 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.48 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.82 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.2 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.75 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.12 U	0.12 UJ	0.12 U	0.12 U	0.13 U	0.12 UJ	0.12 U	0.12 U	0.12 U	0.12 UJ
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.78 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.65 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-011	CFMW-012	CFMW-012	CFMW-012	CFMW-012	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-015	CFMW-015
				Sample Date	06/28/2017	09/12/2016	12/14/2016	03/22/2017	06/23/2017	09/12/2016	12/15/2016	03/29/2017	06/27/2017	09/12/2016	12/15/2016
				Sample Designation	CFMW-DUP15-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-015-GW	CFMW-015-GW
				Sample Type	FD	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Carbazole	--	--	--	ug/l	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.92 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.73 U	0.67 U	0.67 UJ	0.67 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.098 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.92 U	0.85 U	0.85 UJ	0.85 U	0.85 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	1.1 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.89 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.75 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.78 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Fluorene	1100	--	29	ug/l	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.87 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.51 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.83 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.61 U	0.61 U	0.61 U	0.61 UJ	0.66 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.098 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.23 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.73 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.87 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.53 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.9 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.74 U	0.74 U	0.74 UJ	0.74 U	0.74 U	0.8 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 U	2.2 U	2.2 UJ	2.2 U	2.2 U	2.4 U	2.2 UJ	2.2 U	2.2 U	2.2 U	2.2 UJ
Phenanthrene	--	--	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.71 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
Phenol	300	--	580	ug/l	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.45 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Pyrene	830	--	12	ug/l	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.9 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-015	CFMW-015	CFMW-016	CFMW-016	CFMW-016	CFMW-017	CFMW-017	CFMW-018	CFMW-018	CFMW-019	CFMW-019
				Sample Date	03/29/2017	06/27/2017	03/28/2017	03/28/2017	06/29/2017	03/28/2017	06/26/2017	03/28/2017	06/20/2017	09/12/2016	12/15/2016
				Sample Designation	CFMW-015-GW	CFMW-015-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-017-GW	CFMW-017-GW	CFMW-018-GW	CFMW-018-GW	CFMW-019-GW	CFMW-019-GW
				Sample Type	N	N	N	FD	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.66 U	0.66 U	0.66 U	0.63 U	0.66 U	0.63 U	0.66 U	0.63 U	0.63 U	0.65 UJ
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.45 U	0.45 U	0.45 U	0.43 U	0.45 U	0.43 U	0.45 U	0.43 U	0.43 U	0.44 UJ
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.2 U	3.2 U	3.2 U	3.1 U	3.2 U	3.1 U	3.2 U	3.1 U	3.1 U	3.2 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.93 U	0.97 U	0.97 U	0.97 U	0.93 U	0.97 U	0.93 U	0.97 U	0.93 U	0.93 U	0.96 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.69 U	0.72 U	0.72 U	0.72 U	0.69 U	0.72 U	0.69 U	0.72 U	0.69 U	0.69 U	0.71 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.51 U	0.51 U	0.51 U	0.49 U	0.51 U	0.49 U	0.51 U	0.49 U	0.49 U	0.51 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.55 U	0.55 U	0.55 U	0.53 U	0.55 U	0.53 U	0.55 U	0.53 U	0.53 U	0.55 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.63 U	0.66 U	0.66 U	0.66 U	0.63 U	0.66 U	0.63 U	0.66 U	0.63 U	0.63 U	0.65 U
2,4-Dimethylphenol	380	--	36	ug/l	0.91 U	0.95 U	0.95 U	0.95 U	0.91 U	0.95 U	0.91 U	0.95 U	0.91 U	0.91 U	0.94 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 U	2.5 U	2.5 UJ	2.5 UJ	2.4 U	2.5 UJ	2.4 U	2.5 UJ	2.4 UJ	2.4 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1.1 U	1.1 U	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1.1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.88 U	0.92 U	0.92 U	0.92 U	0.88 U	0.92 U	0.88 U	0.92 U	0.88 U	0.88 U	0.91 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.64 U	0.64 U	0.64 U	0.61 U	0.64 U	0.61 U	0.64 U	0.61 U	0.61 U	0.63 U
2-Chlorophenol	81	--	9.1	ug/l	0.74 U	0.77 U	0.77 U	0.77 U	0.74 U	0.77 U	0.74 U	0.77 U	0.74 U	0.74 U	0.76 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.88 U	0.92 U	0.92 U	0.92 U	0.88 U	0.92 U	0.88 U	0.92 U	0.88 U	0.88 U	0.91 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.65 U	0.68 U	0.68 U	0.68 U	0.65 U	0.68 U	0.65 U	0.68 U	0.65 U	0.65 U	0.67 U
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.61 U	0.61 U	0.61 U	0.59 U	0.61 U	0.59 U	0.61 U	0.59 U	0.59 U	0.61 U
3 & 4 Methylphenol	--	--	--	ug/l	0.88 U	0.92 U	0.92 U	0.92 U	0.88 U	0.92 U	0.88 U	0.92 U	0.88 U	0.88 U	0.91 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1.1 U	1.1 U	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1.1 U
3-Nitroaniline	--	--	--	ug/l	0.82 U	0.85 U	0.85 U	0.85 U	0.82 U	0.85 U	0.82 U	0.85 U	0.82 U	0.82 U	0.85 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2.1 U	2.1 U	2.1 U	2 U	2.1 U	2 U	2.1 U	2 U	2 U	2.1 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1.1 U	1.1 U	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1.1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.76 U	0.79 U	0.79 U	0.79 U	0.76 U	0.79 U	0.76 U	0.79 U	0.76 U	0.76 U	0.79 U
4-Chloroaniline	--	--	0.37	ug/l	0.73 U	0.76 U	0.76 U	0.76 U	0.73 U	0.76 U	0.73 U	0.76 U	0.73 U	0.73 U	0.75 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.96 U	1 U	1 U	1 U	0.96 U	1 U	0.96 U	1 U	0.96 U	0.96 U	0.99 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.5 U	0.5 UJ	0.5 UJ	0.48 U	0.5 UJ	0.48 U	0.5 UJ	0.48 UJ	0.48 U	0.5 U
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.8 U	4.8 U	4.8 U	4.7 U	4.8 U	4.7 U	4.8 U	4.7 U	4.7 U	4.8 U
Acenaphthene	670	--	53	ug/l	0.88 U	0.92 U	0.92 U	0.92 U	0.88 U	0.92 U	0.88 U	0.92 U	0.88 U	0.88 U	0.91 UJ
Acenaphthylene	--	--	--	ug/l	0.65 U	0.68 U	0.68 U	0.68 U	0.65 U	0.68 U	0.65 U	0.68 U	0.65 U	0.65 U	0.67 U
Acetophenone	--	--	190	ug/l	1 U	1.1 U	1.1 U	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1.1 U
Anthracene	2100	--	180	ug/l	0.57 U	0.59 U	0.59 U	0.59 U	0.57 U	0.59 U	0.57 U	0.59 U	0.57 U	0.57 U	0.59 U
Atrazine	3	3	0.3	ug/l	0.77 U	0.8 U	0.8 U	0.8 U	0.77 U	0.8 U	0.77 U	0.8 U	0.77 U	0.77 U	0.8 U
Benzaldehyde	--	--	190	ug/l	0.86 U	0.9 U	0.9 U	0.9 U	0.86 U	0.9 U	0.86 UJ	0.9 U	0.86 U	0.86 U	0.89 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.57 U	0.57 U	0.57 U	0.55 U	0.57 U	0.55 U	0.57 U	0.55 U	0.55 U	0.57 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.17 U	0.17 U	0.17 U	0.16 U	0.17 U	0.16 U	0.17 U	0.16 U	0.16 U	0.17 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.46 U	0.46 U	0.46 U	0.44 U	0.46 U	0.44 U	0.46 U	0.44 U	0.44 U	0.45 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.75 U	0.78 U	0.78 U	0.78 U	0.75 U	0.78 U	0.75 U	0.78 U	0.75 U	0.75 U	0.77 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.19 U	0.19 U	0.19 U	0.18 U	0.19 U	0.18 U	0.19 U	0.18 U	0.18 U	0.19 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.69 U	0.72 U	0.72 U	0.72 U	0.69 U	0.72 U	0.69 U	0.72 U	0.69 U	0.69 U	0.71 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.13 U	0.13 U	0.13 U	0.12 U	0.13 U	0.12 U	0.13 U	0.12 U	0.12 U	0.12 UJ
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.72 U	0.75 U	0.75 U	0.75 U	0.72 U	0.75 U	0.72 U	0.75 U	0.72 U	0.72 U	0.74 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.63 U	0.63 UJ	0.63 UJ	0.6 U	0.63 UJ	0.6 U	0.63 UJ	0.6 U	0.6 U	0.62 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-015	CFMW-015	CFMW-016	CFMW-016	CFMW-016	CFMW-017	CFMW-017	CFMW-018	CFMW-018	CFMW-019	CFMW-019
				Sample Date	03/29/2017	06/27/2017	03/28/2017	03/28/2017	06/29/2017	03/28/2017	06/26/2017	03/28/2017	06/20/2017	09/12/2016	12/15/2016
				Sample Designation	CFMW-015-GW	CFMW-015-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-017-GW	CFMW-017-GW	CFMW-018-GW	CFMW-018-GW	CFMW-019-GW	CFMW-019-GW
				Sample Type	N	N	N	FD	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Carbazole	--	--	--	ug/l	0.85 U	0.89 U	0.89 U	0.89 U	0.85 U	0.89 U	0.85 U	0.89 U	0.85 U	0.85 U	0.88 U
Chrysene	50	--	3.4	ug/l	0.67 U	0.7 U	0.7 U	0.7 U	0.67 U	0.7 U	0.67 U	0.7 U	0.67 U	0.67 U	0.69 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.09 U	0.094 U	0.094 U	0.094 U	0.09 U	0.094 U	0.09 U	0.094 U	0.09 U	0.09 U	0.093 U
Dibenzofuran	--	--	0.79	ug/l	0.85 U	0.89 U	0.89 U	0.89 U	0.85 U	0.89 U	0.85 U	0.89 U	0.85 U	0.85 U	0.88 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 UJ	1 UJ	1 U	1 UJ	1 U	1 UJ	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.98 U	1 U	1 UJ	1 UJ	0.98 U	1 UJ	0.98 U	1 UJ	0.98 U	0.98 U	1 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.82 U	0.85 U	0.85 U	0.85 U	0.82 U	0.85 U	0.82 U	0.85 U	0.82 U	0.82 U	0.85 U
Di-n-octyl phthalate	--	--	20	ug/l	0.69 UJ	0.72 U	0.72 U	0.72 U	0.69 U	0.72 U	0.69 U	0.72 U	0.69 U	0.69 U	0.71 U
Fluoranthene	130	--	80	ug/l	0.72 U	0.75 U	0.75 U	0.75 U	0.72 U	0.75 U	0.72 U	0.75 U	0.72 U	0.72 U	0.74 U
Fluorene	1100	--	29	ug/l	0.8 U	0.83 U	0.83 U	0.83 U	0.8 U	0.83 U	0.8 U	0.83 U	0.8 U	0.8 U	0.83 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.49 U	0.49 U	0.49 U	0.47 U	0.49 U	0.47 U	0.49 U	0.47 U	0.47 U	0.49 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.76 U	0.79 U	0.79 U	0.79 U	0.76 U	0.79 U	0.76 U	0.79 U	0.76 U	0.76 U	0.79 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.64 U	0.64 U	0.64 U	0.61 UJ	0.64 U	0.61 UJ	0.64 U	0.61 U	0.61 U	0.63 U
Hexachloroethane	30	--	0.33	ug/l	0.09 U	0.094 U	0.094 U	0.094 U	0.09 U	0.094 U	0.09 U	0.094 U	0.09 U	0.09 U	0.093 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.22 U	0.22 U	0.22 U	0.21 U	0.22 U	0.21 U	0.22 U	0.21 U	0.21 U	0.22 U
Isophorone	400	--	78	ug/l	0.67 U	0.7 U	0.7 U	0.7 U	0.67 U	0.7 U	0.67 U	0.7 U	0.67 U	0.67 U	0.69 U
Naphthalene	100	--	0.17	ug/l	0.8 U	0.83 U	0.83 U	0.83 U	0.8 U	0.83 U	0.8 U	0.83 U	0.8 U	0.8 U	0.83 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.51 U	0.51 U	0.51 U	0.49 U	0.51 U	0.49 U	0.51 U	0.49 U	0.49 U	0.51 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.83 U	0.86 U	0.86 U	0.86 U	0.83 U	0.86 U	0.83 U	0.86 U	0.83 U	0.83 U	0.86 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.74 U	0.77 U	0.77 U	0.77 U	0.74 U	0.77 U	0.74 U	0.77 U	0.74 U	0.74 U	0.76 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 U	2.3 U	2.3 U	2.3 U	2.2 U	2.3 U	2.2 U	2.3 U	2.2 U	2.2 U	2.3 UJ
Phenanthrene	--	--	--	ug/l	0.65 U	0.68 U	0.68 U	0.68 U	0.65 U	0.68 U	0.65 U	0.68 U	0.65 U	0.65 U	0.67 U
Phenol	300	--	580	ug/l	0.41 U	0.43 U	0.43 U	0.43 U	0.41 U	0.43 U	0.41 U	0.43 U	0.41 U	0.41 U	0.42 U
Pyrene	830	--	12	ug/l	0.83 UJ	0.86 U	0.86 UJ	0.86 UJ	0.83 U	0.86 UJ	0.83 U	0.86 UJ	0.83 U	0.83 U	0.86 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

			Sample Location		CFMW-019	CFMW-019	CFMW-020	CFMW-020	CFMW-020	CFMW-020	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-022	CFMW-022
			Sample Date		03/29/2017	06/29/2017	09/20/2016	12/13/2016	03/21/2017	06/26/2017	09/12/2016	12/14/2016	03/29/2017	06/26/2017	09/13/2016	12/09/2016
			Sample Designation		CFMW-019-GW	CFMW-019-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-022-GW	CFMW-022-GW
			Sample Type		N	N	N	N	N	N	N	N	N	N	N	N
			Sample Fraction		T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
1,1'-Biphenyl	--	--	0.083	ug/l	0.64 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.64 U	0.63 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.44 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 UJ	3.2 U	3.1 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.94 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.95 U	0.93 UJ	0.93 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.7 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.7 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.5 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.54 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.64 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.64 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.92 U	0.91 U	0.91 U	0.91 UJ	0.91 U	0.91 U	0.91 U	0.91 U	0.92 U	0.91 U	0.91 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 UJ	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.89 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.89 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.62 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.75 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.75 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.89 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.89 U	0.88 U	0.88 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.66 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.66 U	0.65 UJ	0.65 U	0.65 U
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.6 U	0.59 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.89 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 UJ	0.88 U	0.89 U	0.88 U	0.88 U	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.83 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.83 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.77 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.77 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.74 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.74 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.97 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.98 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.49 U	0.48 UJ	0.48 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.7 U	4.7 U	4.7 UJ	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 UJ	4.7 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.89 U	0.88 U	0.88 U	0.88 UJ	0.88 U	0.88 U	0.88 U	0.88 UJ	0.89 U	0.88 UJ	0.88 U	0.88 U
Acenaphthylene	--	--	--	ug/l	0.66 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.66 U	0.65 U	0.65 U	0.65 U
Acetophenone	--	--	190	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U
Anthracene	2100	--	180	ug/l	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.58 U	0.57 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.78 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.78 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.87 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 UJ	0.86 U	0.86 U	0.87 U	0.86 U	0.86 U	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.56 U	0.55 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.45 U	0.44 U	0.44 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.76 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.76 U	0.75 U	0.75 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.7 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.7 U	0.69 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.12 U	0.12 U	0.12 UJ	0.12 U	0.12 U	0.12 U	0.12 UJ	0.12 U	0.12 U	0.12 U	0.12 UJ
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.73 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.73 U	0.72 U	0.72 U	1.2 J
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U	0.6 U	0.6 U	0.6 U	0.61 U	0.6 U	0.6 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-019	CFMW-019	CFMW-020	CFMW-020	CFMW-020	CFMW-020	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-022	CFMW-022
				Sample Date	03/29/2017	06/29/2017	09/20/2016	12/13/2016	03/21/2017	06/26/2017	09/12/2016	12/14/2016	03/29/2017	06/26/2017	09/13/2016	12/09/2016
				Sample Designation	CFMW-019-GW	CFMW-019-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-022-GW	CFMW-022-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Carbazole	--	--	--	ug/l	0.86 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.86 U	0.85 U	0.85 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.68 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.68 U	0.67 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.091 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.091 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.86 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.86 U	0.85 U	0.85 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.99 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	1 U	0.98 U	0.98 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.83 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.83 U	0.82 U	0.82 U	1.2 J
Di-n-octyl phthalate	--	--	20	ug/l	0.7 UJ	0.69 U	0.69 U	0.69 UJ	0.69 U	0.69 U	0.69 U	0.69 U	0.7 UJ	0.69 U	0.69 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.73 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.73 U	0.72 U	0.72 U	0.72 U
Fluorene	1100	--	29	ug/l	0.81 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.81 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.48 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.77 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.77 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.61 UJ	0.61 U	0.61 U	0.61 U	0.61 UJ	0.61 U	0.61 U	0.62 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.091 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.091 U	0.09 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.68 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.68 U	0.67 U	0.67 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.81 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.81 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.5 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.84 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.84 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.75 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 UJ	0.75 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 U	2.2 U	2.2 U	2.2 UJ	2.2 U	2.2 U	2.2 U	2.2 UJ	2.2 U	2.2 U	2.2 R	2.2 UJ
Phenanthrene	--	--	--	ug/l	0.66 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.66 U	0.65 U	0.65 U	0.65 U
Phenol	300	--	580	ug/l	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.42 U	0.41 U	0.41 U	0.41 U
Pyrene	830	--	12	ug/l	0.84 UJ	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.84 UJ	0.83 U	0.83 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-022	CFMW-022	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-025b	CFMW-025b	CFMW-025B	CFMW-025b	CFMW-026
				Sample Date	03/28/2017	06/26/2017	09/21/2016	12/19/2016	03/21/2017	06/27/2017	09/13/2016	12/07/2016	03/20/2017	06/22/2017	09/13/2016
				Sample Designation	CFMW-022-GW	CFMW-022-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-25B-GW	CFMW-025b-GW	CFMW-026-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1'-Biphenyl	--	--	0.083	ug/l	0.67 U	0.63 U	0.63 U	0.66 UJ	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.46 U	0.43 U	0.43 U	0.45 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.3 U	3.1 U	3.1 UJ	3.3 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.99 U	0.93 U	0.93 U	0.98 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.73 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.52 U	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.56 U	0.53 U	0.53 U	0.56 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.67 U	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.96 U	0.91 U	0.91 U	0.96 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.5 UJ	2.4 U	2.4 U	2.5 U	2.4 U	2.4 U	2.4 UJ	2.4 U	2.4 U	2.4 U	2.4 UJ
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.93 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.65 U	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.78 U	0.74 U	0.74 U	0.78 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.93 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.69 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
2-Nitrophenol	--	--	--	ug/l	0.63 U	0.59 U	0.59 U	0.62 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.93 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.87 U	0.82 U	0.82 U	0.86 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2.1 U	2 U	2.2 J	2.1 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.81 U	0.76 U	0.76 U	0.8 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.77 U	0.73 U	0.73 U	0.77 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	1 U	0.96 U	0.96 U	1 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.51 UJ	0.48 U	0.48 U	0.5 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.9 U	4.7 U	4.7 U	4.9 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.93 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
Acenaphthylene	--	--	--	ug/l	0.69 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
Acetophenone	--	--	190	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Anthracene	2100	--	180	ug/l	0.6 U	0.57 U	0.57 U	0.6 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.82 U	0.77 U	0.77 U	0.81 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.91 U	0.86 UJ	0.86 U	0.9 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 UJ	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.58 U	0.55 U	0.55 U	0.58 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.17 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.47 U	0.44 U	0.44 U	0.46 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.79 U	0.75 U	0.75 U	0.79 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.19 U	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.73 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.13 U	0.12 U	0.12 U	0.13 UJ	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.76 U	0.72 U	0.72 U	0.76 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.64 UJ	0.6 U	0.6 U	0.63 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-022	CFMW-022	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-025b	CFMW-025b	CFMW-025B	CFMW-025b	CFMW-026
				Sample Date	03/28/2017	06/26/2017	09/21/2016	12/19/2016	03/21/2017	06/27/2017	09/13/2016	12/07/2016	03/20/2017	06/22/2017	09/13/2016
				Sample Designation	CFMW-022-GW	CFMW-022-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-25B-GW	CFMW-025b-GW	CFMW-026-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Carbazole	--	--	--	ug/l	0.9 U	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.71 U	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.095 U	0.09 U	0.09 U	0.095 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.9 U	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1.1 UJ	1 U	1 U	1.1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	1 UJ	0.98 U	0.98 U	1 UJ	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.87 U	0.82 U	0.82 U	0.86 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.73 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.76 U	0.72 U	0.72 U	0.76 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Fluorene	1100	--	29	ug/l	0.85 U	0.8 U	0.8 U	0.84 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.5 U	0.47 U	0.47 U	0.49 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.81 U	0.76 U	0.76 U	0.8 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.65 U	0.61 UJ	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 UJ	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.095 U	0.09 U	0.09 U	0.095 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.22 U	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.71 U	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.85 U	0.8 U	0.8 U	0.84 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.52 U	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.88 U	0.83 U	0.83 U	0.87 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.78 U	0.74 U	0.74 U	0.78 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.3 U	2.2 U	2.2 U	2.3 U	2.2 U	2.2 U	2.2 R	2.2 U	2.2 U	2.2 U	2.2 R
Phenanthrene	--	--	--	ug/l	0.69 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
Phenol	300	--	580	ug/l	0.43 U	0.41 U	0.41 U	0.43 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Pyrene	830	--	12	ug/l	0.88 UJ	0.83 U	0.83 U	0.87 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-026	CFMW-026	CFMW-026	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-029
				Sample Date	12/05/2016	03/20/2017	06/22/2017	09/13/2016	12/14/2016	03/27/2017	06/26/2017	09/13/2016	12/05/2016	03/20/2017	06/26/2017	09/13/2016
				Sample Designation	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-029-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.63 U	0.63 U	0.64 U	0.63 U	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.43 U	0.43 U	0.44 U	0.43 U	0.45 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.45 U
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.1 U	3.1 U	3.2 U	3.1 UJ	3.2 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.2 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.93 U	0.93 U	0.93 UJ	0.95 U	0.93 U	0.97 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.97 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.69 U	0.69 U	0.69 U	0.7 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.49 U	0.49 U	0.5 U	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.53 U	0.53 U	0.54 U	0.53 U	0.55 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.55 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.63 U	0.63 U	0.63 U	0.64 U	0.63 U	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U
2,4-Dimethylphenol	380	--	36	ug/l	0.91 U	0.91 U	0.91 U	0.93 U	0.91 U	0.95 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.95 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 U	2.4 U	2.4 U	2.4 UJ	2.4 U	2.5 U	2.4 U	2.4 UJ	2.4 U	2.4 U	2.4 U	2.5 UJ
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1.1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.88 U	0.88 U	0.88 U	0.9 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.61 U	0.61 U	0.62 U	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.64 U
2-Chlorophenol	81	--	9.1	ug/l	0.74 U	0.74 U	0.74 U	0.76 U	0.74 U	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.88 U	0.88 U	0.88 U	0.9 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.65 U	0.65 U	0.65 UJ	0.66 U	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.59 U	0.59 U	0.6 U	0.59 U	0.61 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.61 U
3 & 4 Methylphenol	--	--	--	ug/l	0.88 U	0.88 U	0.88 U	0.9 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1.1 U
3-Nitroaniline	--	--	--	ug/l	0.82 U	0.82 U	0.82 U	0.84 U	0.82 U	0.85 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.85 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2 U	2 U	2.1 U	2 U	2.1 U	2 U	2 U	2 U	2 U	2 U	2.1 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1.1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.76 U	0.76 U	0.76 U	0.78 U	0.76 U	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U
4-Chloroaniline	--	--	0.37	ug/l	0.73 U	0.73 U	0.73 U	0.74 U	0.73 U	0.76 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.76 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.96 U	0.96 U	0.96 U	0.98 U	0.96 U	1 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	1 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.48 U	0.48 UJ	0.49 U	0.48 U	0.5 UJ	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.5 U
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.7 U	4.7 UJ	4.7 U	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.8 U
Acenaphthene	670	--	53	ug/l	0.88 U	0.88 U	0.88 UJ	0.9 U	0.88 UJ	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U
Acenaphthylene	--	--	--	ug/l	0.65 U	0.65 U	0.65 U	0.66 U	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U
Acetophenone	--	--	190	ug/l	1 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1.1 U
Anthracene	2100	--	180	ug/l	0.57 U	0.57 U	0.57 U	0.58 U	0.57 U	0.59 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.59 U
Atrazine	3	3	0.3	ug/l	0.77 U	0.77 U	0.77 U	0.79 U	0.77 U	0.8 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.8 U
Benzaldehyde	--	--	190	ug/l	0.86 U	0.86 U	0.86 U	0.88 U	0.86 U	0.9 U	0.86 UJ	0.86 U	0.86 U	0.86 U	0.86 UJ	0.9 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.55 U	0.55 U	0.56 U	0.55 U	0.57 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.57 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.44 U	0.44 U	0.45 U	0.44 U	0.46 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.46 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.75 U	0.75 U	0.75 U	0.77 U	0.75 U	0.78 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.78 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.69 U	0.69 U	0.69 U	0.7 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.12 U	0.12 U	0.12 U	0.12 UJ	0.13 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.13 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.72 U	0.72 U	0.72 U	0.73 U	0.72 U	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.6 U	0.6 U	0.61 U	0.6 U	0.63 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.63 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-026	CFMW-026	CFMW-026	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-029
				Sample Date	12/05/2016	03/20/2017	06/22/2017	09/13/2016	12/14/2016	03/27/2017	06/26/2017	09/13/2016	12/05/2016	03/20/2017	06/26/2017	09/13/2016
				Sample Designation	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-029-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Carbazole	--	--	--	ug/l	0.85 U	0.85 U	0.85 U	0.87 U	0.85 U	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U
Chrysene	50	--	3.4	ug/l	0.67 U	0.67 U	0.67 U	0.68 U	0.67 U	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.09 U	0.09 U	0.09 U	0.092 U	0.09 U	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U
Dibenzofuran	--	--	0.79	ug/l	0.85 U	0.85 U	0.85 U	0.87 U	0.85 U	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.98 U	0.98 U	0.98 U	1 U	0.98 U	1 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	1 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.82 U	0.82 U	0.82 U	0.84 U	0.82 U	0.85 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.85 U
Di-n-octyl phthalate	--	--	20	ug/l	0.69 U	0.69 U	0.69 U	0.7 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U
Fluoranthene	130	--	80	ug/l	0.72 U	0.72 U	0.72 U	0.73 U	0.72 U	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U
Fluorene	1100	--	29	ug/l	0.8 U	0.8 U	0.8 U	0.82 U	0.8 U	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.83 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.47 U	0.47 U	0.48 U	0.47 U	0.49 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.49 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.76 U	0.76 U	0.76 U	0.78 U	0.76 U	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.61 U	0.61 U	0.62 U	0.61 U	0.64 U	0.61 UJ	0.61 U	0.61 U	0.61 U	0.61 UJ	0.64 U
Hexachloroethane	30	--	0.33	ug/l	0.09 U	0.09 U	0.09 U	0.092 U	0.09 U	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U
Isophorone	400	--	78	ug/l	0.67 U	0.67 U	0.67 U	0.68 U	0.67 U	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U
Naphthalene	100	--	0.17	ug/l	0.8 U	0.8 U	0.8 U	0.82 U	0.8 U	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.83 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.49 U	0.49 U	0.5 U	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.83 U	0.83 U	0.83 U	0.85 U	0.83 U	0.86 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.86 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.74 U	0.74 U	0.74 U	0.76 U	0.74 UJ	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 U	2.2 U	2.2 U	2.2 R	2.2 UJ	2.3 U	2.2 U	2.2 R	2.2 U	2.2 U	2.2 U	NA
Phenanthrene	--	--	--	ug/l	0.65 U	0.65 U	0.65 U	0.66 U	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U
Phenol	300	--	580	ug/l	0.41 U	0.41 U	0.41 U	0.42 U	0.41 U	0.43 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.43 U
Pyrene	830	--	12	ug/l	0.83 U	0.83 U	0.83 U	0.85 U	0.83 U	0.86 UJ	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.86 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-032	CFMW-032
				Sample Date	09/13/2016	12/14/2016	03/24/2017	06/26/2017	09/15/2016	12/09/2016	03/21/2017	06/21/2017	06/21/2017	09/15/2016	12/13/2016
				Sample Designation	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-DUP13-GW	CFMW-032-GW	CFMW-032-GW
				Sample Type	FD	N	N	N	N	N	N	N	FD	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1'-Biphenyl	--	--	0.083	ug/l	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.45 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.2 U	3.1 UJ	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.97 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.55 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.95 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 UJ
2,4-Dinitrophenol	69	--	3.9	ug/l	2.5 UJ	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
2-Nitrophenol	--	--	--	ug/l	0.61 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.92 U	0.88 U	0.88 U	0.88 U	0.88 UJ	0.88 U	0.88 U	0.88 U	0.88 U	0.88 UJ	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.85 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2.1 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.76 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	1 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.5 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.8 U	4.7 U	4.7 U	4.7 U	4.7 UJ	4.7 U	4.7 U	4.7 U	4.7 U	4.7 UJ	4.7 UJ
Acenaphthene	670	--	53	ug/l	0.92 U	0.88 UJ	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 UJ
Acenaphthylene	--	--	--	ug/l	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
Acetophenone	--	--	190	ug/l	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Anthracene	2100	--	180	ug/l	0.59 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.8 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.9 U	0.86 U	0.86 U	0.86 UJ	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.57 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.46 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.78 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.13 U	0.12 UJ	0.12 U	0.12 U	0.12 U	0.12 UJ	0.12 U	0.12 U	0.12 U	0.12 U	0.12 UJ
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.63 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 UJ
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-032	CFMW-032
				Sample Date	09/13/2016	12/14/2016	03/24/2017	06/26/2017	09/15/2016	12/09/2016	03/21/2017	06/21/2017	06/21/2017	09/15/2016	12/13/2016
				Sample Designation	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-DUP13-GW	CFMW-032-GW	CFMW-032-GW
				Sample Type	FD	N	N	N	N	N	N	N	FD	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Carbazole	--	--	--	ug/l	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ
Dimethyl phthalate	270000	--	--	ug/l	1 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.85 U	0.82 U	0.82 UJ	0.82 U	0.82 U	1.3 J	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 UJ
Fluoranthene	130	--	80	ug/l	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Fluorene	1100	--	29	ug/l	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.49 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.64 U	0.61 U	0.61 UJ	0.61 UJ	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.86 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.77 U	0.74 UJ	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.3 R	2.2 UJ	2.2 U	2.2 U	2.2 U	2.2 UJ	2.2 U	2.2 U	2.2 U	2.2 U	2.2 UJ
Phenanthrene	--	--	--	ug/l	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
Phenol	300	--	580	ug/l	0.43 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Pyrene	830	--	12	ug/l	0.86 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-032	CFMW-032	CFMW-032	CFMW-033	CFMW-033	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034
				Sample Date	03/27/2017	06/20/2017	06/20/2017	09/15/2016	12/06/2016	03/21/2017	06/19/2017	09/14/2016	12/13/2016	03/21/2017	06/19/2017
				Sample Designation	CFMW-032-GW	CFMW-032-GW	CFMW-DUP12-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW
				Sample Type	N	N	FD	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1'-Biphenyl	--	--	0.083	ug/l	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U	0.64 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.45 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.45 U	0.43 U	0.43 U	0.44 U
1,4-Dioxane	--	--	0.46	ug/l	3.2 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.3 U	3.1 U	3.1 U	3.2 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.97 U	0.93 U	0.93 U	0.93 U	0.93 UJ	0.93 U	0.93 U	0.97 U	0.93 U	0.93 U	0.95 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	0.7 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U	0.5 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.55 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.55 U	0.53 U	0.53 U	0.54 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U	0.64 U
2,4-Dimethylphenol	380	--	36	ug/l	0.95 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.95 U	0.91 UJ	0.91 U	0.93 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.5 U	2.4 UJ	2.4 UJ	2.4 U	2.4 U	2.4 U	2.4 UJ	2.5 UJ	2.4 U	2.4 U	2.4 UJ
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1.1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.9 U
2-Chloronaphthalene	1000	--	--	ug/l	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U	0.62 U
2-Chlorophenol	81	--	9.1	ug/l	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.74 U	0.74 U	0.76 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.9 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 UJ	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.68 U	0.65 U	0.65 U	0.65 UJ	0.65 U	0.65 U	0.65 U	0.68 UJ	0.65 U	0.65 U	0.66 U
2-Nitrophenol	--	--	--	ug/l	0.61 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.62 U	0.59 U	0.59 U	0.6 U
3 & 4 Methylphenol	--	--	--	ug/l	0.92 U	0.88 U	0.88 U	0.88 UJ	0.88 UJ	0.88 U	0.88 U	0.92 UJ	0.88 U	0.88 U	0.9 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1.1 U
3-Nitroaniline	--	--	--	ug/l	0.85 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.86 U	0.82 U	0.82 U	0.84 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2.1 U	2 U	2 U	2 U	2 U	2 U	2 UJ	2.1 U	2 U	2 U	2.1 UJ
4-Bromophenyl phenyl ether	--	--	--	ug/l	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.76 U	0.76 U	0.78 U
4-Chloroaniline	--	--	0.37	ug/l	0.76 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.76 U	0.73 U	0.73 U	0.74 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	1 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	1 U	0.96 U	0.96 U	0.98 U
4-Nitroaniline	--	--	3.8	ug/l	0.5 UJ	0.48 UJ	0.48 UJ	0.48 U	0.48 U	0.48 U	0.48 U	0.5 U	0.48 U	0.48 U	0.49 U
4-Nitrophenol	60	--	--	ug/l	4.8 U	4.7 U	4.7 U	4.7 U	4.7 UJ	4.7 U	4.7 U	4.9 U	4.7 UJ	4.7 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 UJ	0.88 U	0.9 U
Acenaphthylene	--	--	--	ug/l	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	0.66 U
Acetophenone	--	--	190	ug/l	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1.1 U
Anthracene	2100	--	180	ug/l	0.59 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.6 U	0.57 U	0.57 U	0.58 U
Atrazine	3	3	0.3	ug/l	0.8 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.81 U	0.77 U	0.77 U	0.79 U
Benzaldehyde	--	--	190	ug/l	0.9 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.9 U	0.86 U	0.86 U	0.88 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.57 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.58 U	0.55 U	0.55 U	0.56 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.46 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.46 U	0.44 U	0.44 U	0.45 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.78 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.78 U	0.75 U	0.75 U	0.77 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	0.7 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.13 U	0.12 U	0.12 U	0.12 U	0.12 UJ	0.12 U	0.12 U	0.13 U	0.12 UJ	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.72 U	0.72 U	0.73 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.63 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.63 U	0.6 UJ	0.6 U	0.61 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-032	CFMW-032	CFMW-032	CFMW-033	CFMW-033	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034
				Sample Date	03/27/2017	06/20/2017	06/20/2017	09/15/2016	12/06/2016	03/21/2017	06/19/2017	09/14/2016	12/13/2016	03/21/2017	06/19/2017
				Sample Designation	CFMW-032-GW	CFMW-032-GW	CFMW-DUP12-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW
				Sample Type	N	N	FD	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Carbazole	--	--	--	ug/l	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U	0.87 U
Chrysene	50	--	3.4	ug/l	0.7 U	0.67 U	0.67 U	0.67 U	0.67 UJ	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U	0.68 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.09 U	0.09 U	0.092 U
Dibenzofuran	--	--	0.79	ug/l	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U	0.87 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	1 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	1 U	0.98 U	0.98 U	1 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.85 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.86 U	0.82 U	0.82 U	0.84 U
Di-n-octyl phthalate	--	--	20	ug/l	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 UJ	0.69 U	0.7 U
Fluoranthene	130	--	80	ug/l	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.72 U	0.72 U	0.73 U
Fluorene	1100	--	29	ug/l	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.84 U	0.8 U	0.8 U	0.82 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.49 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.49 U	0.47 U	0.47 U	0.48 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 UJ	0.79 U	0.76 U	0.76 U	0.78 UJ
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 UJ	0.64 U	0.61 U	0.61 U	0.62 UJ
Hexachloroethane	30	--	0.33	ug/l	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.09 U	0.09 U	0.092 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U	0.68 U
Naphthalene	100	--	0.17	ug/l	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.84 U	0.8 U	0.8 U	0.82 U
Nitrobenzene	17	--	0.14	ug/l	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 UJ	0.51 U	0.49 U	0.49 U	0.5 UJ
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.86 U	0.83 U	0.83 U	0.83 UJ	0.83 U	0.83 U	0.83 U	0.87 UJ	0.83 U	0.83 U	0.85 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.74 U	0.74 U	0.76 U
Pentachlorophenol	1	1	0.041	ug/l	2.3 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.3 R	2.2 UJ	2.2 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	0.66 U
Phenol	300	--	580	ug/l	0.43 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U	0.41 U	0.42 U
Pyrene	830	--	12	ug/l	0.86 UJ	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.87 U	0.83 U	0.83 U	0.85 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-038
				Sample Date	09/14/2016	12/13/2016	03/21/2017	06/20/2017	09/16/2016	12/08/2016	03/23/2017	06/20/2017	09/14/2016	12/09/2016	03/24/2017	06/27/2017
				Sample Designation	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.63 U	0.66 U	0.63 U	0.63 U	0.64 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.45 U	0.43 U	0.45 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.3 U	3.1 U	3.2 U	3.1 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.97 U	0.93 U	0.97 U	0.93 U	0.93 U	0.94 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U	0.72 U	0.69 U	0.69 U	0.7 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.55 U	0.53 U	0.55 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.63 U	0.66 U	0.63 U	0.63 U	0.64 U
2,4-Dimethylphenol	380	--	36	ug/l	0.91 U	0.91 UJ	0.91 U	0.91 U	0.91 U	0.91 U	0.95 U	0.91 U	0.95 U	0.91 U	0.91 U	0.92 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 UJ	2.4 U	2.4 U	2.4 UJ	2.4 U	2.4 U	2.5 U	2.4 UJ	2.5 UJ	2.4 U	2.4 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U	0.92 U	0.88 U	0.88 U	0.89 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.64 U	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.74 U	0.77 U	0.74 U	0.74 U	0.75 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U	0.92 U	0.88 U	0.88 U	0.89 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.65 UJ	0.65 U	0.65 U	0.65 U	0.65 UJ	0.65 U	0.68 U	0.65 U	0.68 UJ	0.65 U	0.65 U	0.66 U
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.62 U	0.59 U	0.61 U	0.59 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.88 UJ	0.88 U	0.88 U	0.88 U	0.88 UJ	0.88 U	0.92 U	0.88 U	0.92 UJ	0.88 U	0.88 U	0.89 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.86 U	0.82 U	0.85 U	0.82 U	0.82 U	0.83 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2 U	2 U	2 U	2 U	2 U	2.1 U	2 U	2.1 U	2 U	2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.76 U	0.79 U	0.76 U	0.76 U	0.77 U
4-Chloroaniline	--	--	0.37	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.76 U	0.73 U	0.76 U	0.73 U	0.73 U	0.74 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	1 U	0.96 U	1 U	0.96 U	0.96 U	0.97 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.48 U	0.48 U	0.48 UJ	0.48 U	0.48 U	0.5 U	0.48 UJ	0.5 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.7 UJ	4.7 U	4.7 U	4.7 U	4.7 U	4.9 U	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.88 U	0.88 UJ	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U	0.92 U	0.88 UJ	0.88 U	0.89 U
Acenaphthylene	--	--	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.68 U	0.65 U	0.65 U	0.66 U
Acetophenone	--	--	190	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U
Anthracene	2100	--	180	ug/l	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.6 U	0.57 U	0.59 U	0.57 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.81 U	0.77 U	0.8 U	0.77 U	0.77 U	0.78 U
Benzaldehyde	--	--	190	ug/l	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.9 U	0.86 U	0.9 U	0.86 UJ	0.86 U	0.87 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.58 U	0.55 U	0.57 U	0.55 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.46 U	0.44 U	0.46 U	0.44 U	0.44 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.78 U	0.75 U	0.78 U	0.75 U	0.75 U	0.76 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.18 U	0.19 U	0.18 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U	0.72 U	0.69 U	0.69 U	0.7 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.12 UJ	0.12 U	0.12 U	0.12 U	0.12 UJ	0.13 U	0.12 U	0.13 U	0.12 UJ	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.72 U	1.1 J	0.72 U	0.72 U	0.73 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.6 UJ	0.6 U	0.6 U	0.6 U	0.6 U	0.63 U	0.6 U	0.63 U	0.6 U	0.6 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-038
				Sample Date	09/14/2016	12/13/2016	03/21/2017	06/20/2017	09/16/2016	12/08/2016	03/23/2017	06/20/2017	09/14/2016	12/09/2016	03/24/2017	06/27/2017
				Sample Designation	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Carbazole	--	--	--	ug/l	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.85 U	0.89 U	0.85 U	0.85 U	0.86 U
Chrysene	50	--	3.4	ug/l	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.67 U	0.7 U	0.67 U	0.67 U	0.68 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.09 U	0.094 U	0.09 U	0.09 U	0.091 U
Dibenzofuran	--	--	0.79	ug/l	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.85 U	0.89 U	0.85 U	0.85 U	0.86 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	1 U	0.98 U	1 U	0.98 U	0.98 U	0.99 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.86 U	0.82 U	0.85 U	0.82 U	0.82 UJ	0.83 U
Di-n-octyl phthalate	--	--	20	ug/l	0.69 U	0.69 UJ	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U	0.72 U	0.69 U	0.69 U	0.7 U
Fluoranthene	130	--	80	ug/l	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.72 U	0.75 U	0.72 U	0.72 U	0.73 U
Fluorene	1100	--	29	ug/l	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.84 U	0.8 U	0.83 U	0.8 U	0.8 U	0.81 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.49 U	0.47 U	0.49 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.76 U	0.79 U	0.76 U	0.76 U	0.77 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.64 U	0.61 U	0.64 U	0.61 U	0.61 UJ	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.09 U	0.094 U	0.09 U	0.09 U	0.091 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.21 U	0.22 U	0.21 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.67 U	0.7 U	0.67 U	0.67 U	0.68 U
Naphthalene	100	--	0.17	ug/l	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.84 U	0.8 U	0.83 U	0.8 U	0.8 U	0.81 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.83 UJ	0.83 U	0.83 U	0.83 U	0.83 UJ	0.83 U	0.87 U	0.83 U	0.86 UJ	0.83 U	0.83 U	0.84 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.74 U	0.77 U	0.74 U	0.74 U	0.75 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 R	2.2 UJ	2.2 U	2.2 U	2.2 U	2.2 U	2.3 U	2.2 U	2.3 R	2.2 U	2.2 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.68 U	0.65 U	0.65 U	0.66 U
Phenol	300	--	580	ug/l	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U	0.43 U	0.41 U	0.41 U	0.41 U
Pyrene	830	--	12	ug/l	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.87 U	0.83 U	0.86 U	0.83 U	0.83 U	0.84 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

			Sample Location		CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-044	CFMW-044
			Sample Date		09/14/2016	12/13/2016	03/30/2017	06/20/2017	09/14/2016	06/20/2017	09/13/2016	12/14/2016	03/20/2017	06/21/2017	09/15/2016	12/09/2016
			Sample Designation		CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-042-GW	CFMW-042-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-044-GW	CFMW-044-GW
			Sample Type		N	N	N	N	N	N	N	N	N	N	N	N
			Sample Fraction		T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
1,1'-Biphenyl	--	--	0.083	ug/l	0.64 U	0.63 U	0.64 U	0.63 U	0.66 U	0.63 U	0.67 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.44 U	0.43 U	0.44 U	0.43 U	0.45 U	0.43 U	0.46 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.2 U	3.1 U	3.2 U	3.1 U	3.2 U	3.1 U	3.3 U	3.1 UJ	3.1 U	3.1 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.95 U	0.93 U	0.95 U	0.93 U	0.97 U	0.93 U	0.99 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.7 U	0.69 U	0.7 U	0.69 U	0.72 U	0.69 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.5 U	0.49 U	0.5 U	0.49 U	0.51 U	0.49 U	0.52 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.54 U	0.53 U	0.54 U	0.53 U	0.55 U	0.53 U	0.56 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.64 U	0.63 U	0.64 U	0.63 U	0.66 U	0.63 U	0.67 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.93 U	0.91 UJ	0.93 U	0.91 U	0.95 U	0.91 U	0.97 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 UJ	2.4 U	2.4 U	2.4 UJ	2.5 UJ	2.4 UJ	2.5 UJ	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.9 U	0.88 U	0.9 U	0.88 U	0.92 U	0.88 U	0.94 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.62 U	0.61 U	0.62 U	0.61 U	0.64 U	0.61 U	0.65 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.76 U	0.74 U	0.76 U	0.74 U	0.77 U	0.74 U	0.79 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.9 U	0.88 U	0.9 U	0.88 U	0.92 U	0.88 U	0.94 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.66 UJ	0.65 U	0.66 U	0.65 U	0.68 UJ	0.65 U	0.69 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
2-Nitrophenol	--	--	--	ug/l	0.6 U	0.59 U	0.6 U	0.59 U	0.61 U	0.59 U	0.63 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.9 UJ	0.88 U	0.9 U	0.88 U	0.92 UJ	0.88 U	0.94 U	0.88 U	0.88 U	0.88 U	0.88 UJ	34
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.84 U	0.82 U	0.84 U	0.82 U	0.85 U	0.82 U	0.87 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2.1 U	2 U	2.1 U	2 U	2.1 U	2 U	2.1 U	2 U	2 U	2 U	2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.78 U	0.76 U	0.78 U	0.76 U	0.79 U	0.76 U	0.81 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.74 U	0.73 U	0.74 U	0.73 U	0.76 U	0.73 U	0.78 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.98 U	0.96 U	0.98 U	0.96 U	1 U	0.96 U	1 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.49 U	0.48 U	0.49 U	0.48 UJ	0.5 U	0.48 UJ	0.51 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.7 UJ	4.7 U	4.7 U	4.8 U	4.7 U	4.9 U	4.7 U	4.7 U	4.7 U	4.7 UJ	4.7 U
Acenaphthene	670	--	53	ug/l	0.9 U	0.88 UJ	0.9 U	0.88 U	0.92 U	0.88 U	0.94 U	0.88 UJ	0.88 U	0.88 U	0.88 U	0.88 UJ
Acenaphthylene	--	--	--	ug/l	0.66 U	0.65 U	0.66 U	0.65 U	0.68 U	0.65 U	0.69 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
Acetophenone	--	--	190	ug/l	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
Anthracene	2100	--	180	ug/l	0.58 U	0.57 U	0.58 U	0.57 U	0.59 U	0.57 U	0.61 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.79 U	0.77 U	0.79 U	0.77 U	0.8 U	0.77 U	0.82 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.88 U	0.86 U	0.88 U	0.86 U	0.9 U	0.86 U	0.91 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 UJ
Benzo[a]anthracene	0.5	--	--	ug/l	0.56 U	0.55 U	0.56 U	0.55 U	0.57 U	0.55 U	0.59 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.45 U	0.44 U	0.45 U	0.44 U	0.46 U	0.44 U	0.47 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.77 U	0.75 U	0.77 U	0.75 U	0.78 U	0.75 U	0.8 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.18 U	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.7 U	0.69 U	0.7 U	0.69 U	0.72 U	0.69 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.12 UJ	0.12 U	0.12 U	0.13 U	0.12 U	0.13 U	0.12 UJ	0.12 U	0.12 U	0.12 U	0.12 UJ
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.73 U	0.72 U	0.73 U	0.72 U	0.75 U	0.72 U	0.77 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.61 U	0.6 UJ	0.61 U	0.6 U	0.63 U	0.6 U	0.64 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

			Sample Location		CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-044	CFMW-044
			Sample Date		09/14/2016	12/13/2016	03/30/2017	06/20/2017	09/14/2016	06/20/2017	09/13/2016	12/14/2016	03/20/2017	06/21/2017	09/15/2016	12/09/2016
			Sample Designation		CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-042-GW	CFMW-042-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-044-GW	CFMW-044-GW
			Sample Type		N	N	N	N	N	N	N	N	N	N	N	N
			Sample Fraction		T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Carbazole	--	--	--	ug/l	0.87 U	0.85 U	0.87 U	0.85 U	0.89 U	0.85 U	0.9 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.68 U	0.67 U	0.68 U	0.67 U	0.7 U	0.67 U	0.71 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.092 U	0.09 U	0.092 U	0.09 U	0.094 U	0.09 U	0.096 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.87 U	0.85 U	0.87 U	0.85 U	0.89 U	0.85 U	0.9 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 UJ	1 UJ	1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	1 U	0.98 U	1 U	0.98 U	1 U	0.98 U	1 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.84 U	0.82 U	0.84 U	0.82 U	0.85 U	0.82 U	0.87 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.7 U	0.69 UJ	0.7 U	0.69 U	0.72 U	0.69 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.73 U	0.72 U	0.73 U	0.72 U	0.75 U	0.72 U	0.77 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Fluorene	1100	--	29	ug/l	0.82 U	0.8 U	0.82 U	0.8 U	0.83 U	0.8 U	0.85 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.48 U	0.47 U	0.48 U	0.47 U	0.49 U	0.47 U	0.5 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.78 U	0.76 U	0.78 U	0.76 U	0.79 U	0.76 U	0.81 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.62 U	0.61 U	0.62 U	0.61 U	0.64 U	0.61 U	0.65 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.092 U	0.09 U	0.092 U	0.09 U	0.094 U	0.09 U	0.096 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.21 U	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.68 U	0.67 U	0.68 U	0.67 U	0.7 U	0.67 U	0.71 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.82 U	0.8 U	0.82 U	0.8 U	0.83 U	0.8 U	0.85 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.5 U	0.49 U	0.5 U	0.49 U	0.51 U	0.49 U	0.52 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.85 UJ	0.83 U	0.85 U	0.83 U	0.86 UJ	0.83 U	0.88 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.76 U	0.74 U	0.76 U	0.74 U	0.77 U	0.74 U	0.79 U	0.74 UJ	0.74 U	0.74 U	0.74 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 R	2.2 UJ	2.2 U	2.2 U	2.3 R	2.2 U	2.3 R	2.2 UJ	2.2 U	2.2 U	2.2 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.66 U	0.65 U	0.66 U	0.65 U	0.68 U	0.65 U	0.69 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
Phenol	300	--	580	ug/l	0.42 U	0.41 U	0.42 U	0.41 U	0.43 U	0.41 U	0.44 U	0.41 U	0.41 U	0.41 U	0.41 U	1.6 J
Pyrene	830	--	12	ug/l	0.85 U	0.83 U	0.85 U	0.83 U	0.86 U	0.83 U	0.88 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-044	CFMW-044	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-047
				Sample Date	03/28/2017	06/21/2017	09/19/2016	12/19/2016	03/24/2017	06/23/2017	09/15/2016	12/14/2016	03/23/2017	06/28/2017	09/14/2016
				Sample Designation	CFMW-044-GW	CFMW-044-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-047-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
1,1'-Biphenyl	--	--	0.083	ug/l	0.67 U	0.63 U	0.63 U	0.66 UJ	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.63 U	0.64 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.46 U	0.43 U	0.43 U	0.45 U	0.43 U	0.43 U	0.43 U	0.43 U	0.45 U	0.43 U	0.44 U
1,4-Dioxane	--	--	0.46	ug/l	3.3 U	3.1 U	3.1 U	3.3 U	3.1 U	3.1 U	3.1 U	3.1 UJ	3.3 U	3.1 U	3.2 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.99 U	0.93 U	0.93 U	0.98 U	0.93 U	0.93 UJ	0.93 U	0.93 U	0.97 U	0.93 U	0.95 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U	0.7 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.52 U	0.49 U	0.49 U	0.52 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.49 U	0.5 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.56 U	0.53 U	0.53 U	0.56 U	0.53 U	0.53 U	0.53 U	0.53 U	0.55 U	0.53 U	0.54 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.67 U	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.63 U	0.64 U
2,4-Dimethylphenol	380	--	36	ug/l	0.97 U	0.91 U	0.91 U	0.96 U	0.91 U	0.91 U	0.91 U	0.91 U	0.95 U	0.91 U	0.93 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.5 UJ	2.4 U	2.4 U	2.5 U	2.4 U	2.4 U	2.4 U	2.4 U	2.5 U	2.4 U	2.4 UJ
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1.1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.94 U	0.88 U	0.88 U	0.93 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U	0.9 U
2-Chloronaphthalene	1000	--	--	ug/l	0.65 U	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.64 U	0.61 U	0.62 U
2-Chlorophenol	81	--	9.1	ug/l	0.79 U	0.74 U	0.74 U	0.78 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.74 U	0.76 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.94 U	0.88 U	0.88 U	0.93 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U	0.9 U
2-Methylphenol	--	--	--	ug/l	1.4 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.69 U	0.65 U	0.65 U	0.69 U	0.65 U	0.65 UJ	0.65 UJ	0.65 U	0.68 U	0.65 U	0.66 UJ
2-Nitrophenol	--	--	--	ug/l	0.63 U	0.59 U	0.59 U	0.62 U	0.59 U	0.59 U	0.59 U	0.59 U	0.62 U	0.59 U	0.6 U
3 & 4 Methylphenol	--	--	--	ug/l	0.94 U	42	0.88 U	1.4 J	0.88 U	0.88 U	0.88 UJ	0.88 U	0.92 U	0.88 U	0.9 UJ
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1.1 U
3-Nitroaniline	--	--	--	ug/l	0.87 U	0.82 U	0.82 U	0.86 U	0.82 U	0.82 U	0.82 U	0.82 U	0.86 U	0.82 U	0.84 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2.1 U	2 U	2 U	2.1 U	2 U	2 U	2 U	2 U	2.1 U	2 U	2.1 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.81 U	0.76 U	0.76 U	0.8 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.76 U	0.78 U
4-Chloroaniline	--	--	0.37	ug/l	0.78 U	0.73 U	0.73 U	0.77 U	0.73 U	0.73 U	0.73 U	0.73 U	0.76 U	0.73 U	0.74 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	1 U	0.96 U	0.96 U	1 U	0.96 U	0.96 U	0.96 U	0.96 U	1 U	0.96 U	0.98 U
4-Nitroaniline	--	--	3.8	ug/l	0.51 UJ	0.48 U	0.48 U	0.51 U	0.48 U	0.48 UJ	0.48 U	0.48 U	0.5 U	0.48 U	0.49 U
4-Nitrophenol	60	--	--	ug/l	4.9 U	4.7 U	4.7 U	4.9 U	4.7 U	4.7 UJ	4.7 U	4.7 U	4.9 U	4.7 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.94 U	0.88 U	0.88 U	0.93 U	0.88 U	0.88 UJ	0.88 U	0.88 UJ	0.92 U	0.88 U	0.9 U
Acenaphthylene	--	--	--	ug/l	0.69 U	0.65 U	0.65 U	0.69 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.66 U
Acetophenone	--	--	190	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1.1 U
Anthracene	2100	--	180	ug/l	0.61 U	0.57 U	0.57 U	0.6 U	0.57 U	0.57 U	0.57 U	0.57 U	0.6 U	0.57 U	0.58 U
Atrazine	3	3	0.3	ug/l	0.82 U	0.77 U	0.77 U	0.81 U	0.77 U	0.77 U	0.77 U	0.77 U	0.81 U	0.77 U	0.79 U
Benzaldehyde	--	--	190	ug/l	0.91 U	0.86 U	0.86 U	0.91 U	0.86 U	0.86 U	0.86 U	0.86 U	0.9 U	0.86 U	0.88 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.59 U	0.55 U	0.55 U	0.58 U	0.55 U	0.55 U	0.55 U	0.55 U	0.58 U	0.55 U	0.56 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.17 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.47 U	0.44 U	0.44 U	0.46 U	0.44 U	0.44 U	0.44 U	0.44 U	0.46 U	0.44 U	0.45 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.8 U	0.75 U	0.75 U	0.79 U	0.75 U	0.75 U	0.75 U	0.75 U	0.78 U	0.75 U	0.77 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.19 U	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U	0.7 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.13 U	0.12 U	0.12 U	0.13 UJ	0.12 U	0.12 U	0.12 U	0.12 UJ	0.13 U	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.77 U	0.72 U	0.72 U	0.76 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.72 U	0.73 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.64 UJ	0.6 U	0.6 U	0.63 U	0.6 U	0.6 U	0.6 U	0.6 U	0.63 U	0.6 U	0.61 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-044	CFMW-044	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-047
				Sample Date	03/28/2017	06/21/2017	09/19/2016	12/19/2016	03/24/2017	06/23/2017	09/15/2016	12/14/2016	03/23/2017	06/28/2017	09/14/2016
				Sample Designation	CFMW-044-GW	CFMW-044-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-047-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Carbazole	--	--	--	ug/l	0.9 U	0.85 U	0.85 U	0.9 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.85 U	0.87 U
Chrysene	50	--	3.4	ug/l	0.71 U	0.67 U	0.67 U	0.71 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.67 U	0.68 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.096 U	0.09 U	0.09 U	0.095 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.09 U	0.092 U
Dibenzofuran	--	--	0.79	ug/l	0.9 U	0.85 U	0.85 U	0.9 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.85 U	0.87 U
Diethyl phthalate	17000	--	--	ug/l	1.1 UJ	1 U	1 U	1.1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	1 UJ	0.98 U	0.98 U	1 UJ	0.98 U	0.98 U	0.98 U	0.98 U	1 U	0.98 U	1 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.87 U	0.82 U	0.82 U	0.86 U	0.82 UJ	0.82 U	0.82 U	0.82 U	0.86 U	0.82 U	0.84 U
Di-n-octyl phthalate	--	--	20	ug/l	0.73 U	0.69 U	0.69 U	0.73 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U	0.7 U
Fluoranthene	130	--	80	ug/l	0.77 U	0.72 U	0.72 U	0.76 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.72 U	0.73 U
Fluorene	1100	--	29	ug/l	0.85 U	0.8 U	0.8 U	0.84 U	0.8 U	0.8 U	0.8 U	0.8 U	0.84 U	0.8 U	0.82 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.5 U	0.47 U	0.47 U	0.5 U	0.47 U	0.47 U	0.47 U	0.47 U	0.49 U	0.47 U	0.48 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.81 U	0.76 U	0.76 U	0.8 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.76 U	0.78 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.65 U	0.61 U	0.61 U	0.64 U	0.61 UJ	0.61 U	0.61 U	0.61 U	0.64 U	0.61 U	0.62 U
Hexachloroethane	30	--	0.33	ug/l	0.096 U	0.09 U	0.09 U	0.095 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.09 U	0.092 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.22 U	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.71 U	0.67 U	0.67 U	0.71 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.67 U	0.68 U
Naphthalene	100	--	0.17	ug/l	0.85 U	0.8 U	0.8 U	0.84 U	0.8 U	0.8 U	0.8 U	0.8 U	0.84 U	0.8 U	0.82 U
Nitrobenzene	17	--	0.14	ug/l	0.52 U	0.49 U	0.49 U	0.52 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.49 U	0.5 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.88 U	0.83 U	0.83 U	0.88 U	0.83 U	0.83 U	0.83 UJ	0.83 U	0.87 U	0.83 U	0.85 UJ
N-Nitrosodiphenylamine	33	--	12	ug/l	0.79 U	0.74 U	0.74 U	0.78 U	0.74 U	0.74 U	0.74 U	0.74 UJ	0.77 U	0.74 U	0.76 U
Pentachlorophenol	1	1	0.041	ug/l	2.3 U	2.2 U	2.2 U	2.3 U	2.2 U	2.2 U	2.2 U	2.2 UJ	2.3 U	2.2 U	2.2 R
Phenanthrene	--	--	--	ug/l	0.69 U	0.65 U	0.65 U	0.69 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U	0.66 U
Phenol	300	--	580	ug/l	0.44 U	3.9 J	0.41 U	0.43 U	0.41 U	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U	0.42 U
Pyrene	830	--	12	ug/l	0.88 UJ	0.83 U	0.83 U	0.88 U	0.83 U	0.83 U	0.83 U	0.83 U	0.87 U	0.83 U	0.85 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-050	CFMW-050	CFMW-050	CFMW-050
				Sample Date	12/15/2016	03/23/2017	06/21/2017	09/21/2016	12/15/2016	12/15/2016	03/23/2017	06/21/2017	09/19/2016	12/15/2016	03/23/2017	06/21/2017
				Sample Designation	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-049-GW	CFMW-049-GW	CFMW-DUP6-GW	CFMW-049-GW	CFMW-049-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW
				Sample Type	N	N	N	N	N	FD	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
1,1'-Biphenyl	--	--	0.083	ug/l	0.65 UJ	0.66 U	0.63 U	0.63 U	0.64 UJ	0.65 UJ	0.66 U	0.63 U	0.63 U	0.66 UJ	0.66 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.45 UJ	0.45 U	0.43 U	0.43 U	0.44 UJ	0.44 UJ	0.45 U	0.43 U	0.43 U	0.45 UJ	0.45 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.2 U	3.2 U	3.1 U	3.1 UJ	3.2 U	3.2 U	3.2 U	3.1 U	3.1 U	3.3 U	3.2 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.96 U	0.97 U	0.93 U	0.93 U	0.95 U	0.96 U	0.97 U	0.93 U	0.93 U	0.97 U	0.97 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.72 U	0.72 U	0.69 U	0.69 U	0.7 U	0.71 U	0.72 U	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.51 U	0.51 U	0.49 U	0.49 U	0.5 U	0.5 U	0.51 U	0.49 U	0.49 U	0.51 U	0.51 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.55 U	0.55 U	0.53 U	0.53 U	0.54 U	0.55 U	0.55 U	0.53 U	0.53 U	0.55 U	0.55 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.65 U	0.66 U	0.63 U	0.63 U	0.64 U	0.65 U	0.66 U	0.63 U	0.63 U	0.66 U	0.66 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.94 U	0.95 U	0.91 U	0.91 U	0.93 U	0.94 U	0.95 U	0.91 U	0.91 U	0.95 U	0.95 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.5 U	2.5 U	2.4 U	2.4 U	2.4 U	2.4 U	2.5 U	2.4 U	2.4 U	2.5 U	2.5 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.91 U	0.92 U	0.88 U	0.88 U	0.9 U	0.91 U	0.92 U	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.63 U	0.64 U	0.61 U	0.61 U	0.62 U	0.63 U	0.64 U	0.61 U	0.61 U	0.64 U	0.64 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.77 U	0.77 U	0.74 U	0.74 U	0.76 U	0.76 U	0.77 U	0.74 U	0.74 U	0.77 U	0.77 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.91 U	0.92 U	0.88 U	0.88 U	0.9 U	0.91 U	0.92 U	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.67 U	0.68 U	0.65 U	0.65 U	0.66 U	0.67 U	0.68 U	0.65 U	0.65 U	0.68 U	0.68 U	0.65 U
2-Nitrophenol	--	--	--	ug/l	0.61 U	0.61 U	0.59 U	0.59 U	0.6 U	0.61 U	0.61 U	0.59 U	0.59 U	0.62 U	0.61 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.91 U	0.92 U	0.88 U	0.88 U	0.9 U	0.91 U	0.92 U	0.88 U	0.88 U	0.92 U	0.92 U	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.85 U	0.85 U	0.82 U	0.82 U	0.84 U	0.84 U	0.85 U	0.82 U	0.82 U	0.86 U	0.85 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2.1 U	2.1 U	2 U	2 U	2.1 U	2.1 U	2.1 U	2 U	2 U	2.1 U	2.1 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1.1 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.79 U	0.79 U	0.76 U	0.76 U	0.78 U	0.78 U	0.79 U	0.76 U	0.76 U	0.79 U	0.79 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.76 U	0.76 U	0.73 U	0.73 U	0.74 U	0.75 U	0.76 U	0.73 U	0.73 U	0.76 U	0.76 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	0.96 U	0.96 U	0.98 U	0.99 U	1 U	0.96 U	0.96 U	1 U	1 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.5 U	0.5 U	0.48 U	0.48 U	0.49 U	0.49 U	0.5 U	0.48 U	0.48 U	0.5 U	0.5 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.8 U	4.8 U	4.7 U	4.7 U	4.7 U	4.8 U	4.8 U	4.7 U	4.7 U	4.9 U	4.8 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.91 UJ	0.92 U	0.88 U	0.88 U	0.9 UJ	0.91 UJ	0.92 U	0.88 U	0.88 U	0.92 UJ	0.92 U	0.88 U
Acenaphthylene	--	--	--	ug/l	0.67 U	0.68 U	0.65 U	0.65 U	0.66 U	0.67 U	0.68 U	0.65 U	0.65 U	0.68 U	0.68 U	0.65 U
Acetophenone	--	--	190	ug/l	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1 U
Anthracene	2100	--	180	ug/l	0.59 U	0.59 U	0.57 U	0.57 U	0.58 U	0.59 U	0.59 U	0.57 U	0.57 U	0.6 U	0.59 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.8 U	0.8 U	0.77 U	0.77 U	0.79 U	0.79 U	0.8 U	0.77 U	0.77 U	0.81 U	0.8 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.89 U	0.9 U	0.86 U	0.86 U	0.88 U	0.88 U	0.9 U	0.86 U	0.86 U	0.9 U	0.9 U	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.57 U	0.57 U	0.55 U	0.55 U	0.56 U	0.57 U	0.57 U	0.55 U	0.55 U	0.58 U	0.57 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.17 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U	0.17 U	0.17 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.46 U	0.46 U	0.44 U	0.44 U	0.45 U	0.45 U	0.46 U	0.44 U	0.44 U	0.46 U	0.46 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.78 U	0.78 U	0.75 U	0.75 U	0.77 U	0.77 U	0.78 U	0.75 U	0.75 U	0.78 U	0.78 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.19 U	0.19 U	0.18 U	0.18 U	0.18 U	0.19 U	0.19 U	0.18 U	0.18 U	0.19 U	0.19 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.72 U	0.72 U	0.69 U	0.69 U	0.7 U	0.71 U	0.72 U	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 UJ	0.13 U	0.12 U	0.12 U	0.12 UJ	0.12 UJ	0.13 U	0.12 U	0.12 U	0.13 UJ	0.13 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.75 U	0.75 U	0.72 U	0.72 U	0.73 U	0.74 U	0.75 U	0.72 U	0.72 U	0.75 U	0.75 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.62 U	0.63 U	0.6 U	0.6 U	0.61 U	0.62 U	0.63 U	0.6 U	0.6 U	0.63 U	0.63 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-050	CFMW-050	CFMW-050	CFMW-050
				Sample Date	12/15/2016	03/23/2017	06/21/2017	09/21/2016	12/15/2016	12/15/2016	03/23/2017	06/21/2017	09/19/2016	12/15/2016	03/23/2017	06/21/2017
				Sample Designation	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-049-GW	CFMW-049-GW	CFMW-DUP6-GW	CFMW-049-GW	CFMW-049-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW
				Sample Type	N	N	N	N	N	FD	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Carbazole	--	--	--	ug/l	0.88 U	0.89 U	0.85 U	0.85 U	0.87 U	0.87 U	0.89 U	0.85 U	0.85 U	0.89 U	0.89 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.7 U	0.7 U	0.67 U	0.67 U	0.68 U	0.69 U	0.7 U	0.67 U	0.67 U	0.7 U	0.7 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.093 U	0.094 U	0.09 U	0.09 U	0.092 U	0.093 U	0.094 U	0.09 U	0.09 U	0.094 U	0.094 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.88 U	0.89 U	0.85 U	0.85 U	0.87 U	0.87 U	0.89 U	0.85 U	0.85 U	0.89 U	0.89 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	1 U	1 U	0.98 U	0.98 U	1 U	1 U	1 U	0.98 U	0.98 U	1 U	1 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.85 U	0.85 U	0.82 U	0.82 U	0.84 U	0.84 U	0.85 U	0.82 U	0.82 U	0.86 U	0.85 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.72 U	0.72 U	0.69 U	0.69 U	0.7 U	0.71 U	0.72 U	0.69 U	0.69 U	0.72 U	0.72 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.75 U	0.75 U	0.72 U	0.72 U	0.73 U	0.74 U	0.75 U	0.72 U	0.72 U	0.75 U	0.75 U	0.72 U
Fluorene	1100	--	29	ug/l	0.83 U	0.83 U	0.8 U	0.8 U	0.82 U	0.82 U	0.83 U	0.8 U	0.8 U	0.84 U	0.83 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.49 U	0.49 U	0.47 U	0.47 U	0.48 U	0.48 U	0.49 U	0.47 U	0.47 U	0.49 U	0.49 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.79 U	0.79 U	0.76 U	0.76 U	0.78 U	0.78 U	0.79 U	0.76 U	0.76 U	0.79 U	0.79 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.63 U	0.64 U	0.61 U	0.61 U	0.62 U	0.63 U	0.64 U	0.61 U	0.61 U	0.64 U	0.64 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.093 U	0.094 U	0.09 U	0.09 U	0.092 U	0.093 U	0.094 U	0.09 U	0.09 U	0.094 U	0.094 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.22 U	0.22 U	0.21 U	0.21 U	0.21 U	0.22 U	0.22 U	0.21 U	0.21 U	0.22 U	0.22 U	0.21 U
Isophorone	400	--	78	ug/l	0.7 U	0.7 U	0.67 U	0.67 U	0.68 U	0.69 U	0.7 U	0.67 U	0.67 U	0.7 U	0.7 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.83 U	0.83 U	0.8 U	0.8 U	0.82 U	0.82 U	0.83 U	0.8 U	0.8 U	0.84 U	0.83 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.51 U	0.51 U	0.49 U	0.49 U	0.5 U	0.5 U	0.51 U	0.49 U	0.49 U	0.51 U	0.51 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.86 U	0.86 U	0.83 U	0.83 U	0.85 U	0.85 U	0.86 U	0.83 U	0.83 U	0.87 U	0.86 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.77 U	0.77 U	0.74 U	0.74 U	0.76 U	0.76 U	0.77 U	0.74 U	0.74 U	0.77 U	0.77 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.3 UJ	2.3 U	2.2 U	2.2 U	2.2 UJ	2.2 UJ	2.3 U	2.2 U	2.2 U	2.3 UJ	2.3 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.67 U	0.68 U	0.65 U	0.65 U	0.66 U	0.67 U	0.68 U	0.65 U	0.65 U	0.68 U	0.68 U	0.65 U
Phenol	300	--	580	ug/l	0.43 U	0.43 U	0.41 U	0.41 U	0.42 U	0.42 U	0.43 U	0.41 U	0.41 U	0.43 U	0.43 U	0.41 U
Pyrene	830	--	12	ug/l	0.86 U	0.86 U	0.83 U	0.83 U	0.85 U	0.85 U	0.86 U	0.83 U	0.83 U	0.87 U	0.86 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061
				Sample Date	09/14/2016	12/12/2016	06/28/2017	09/14/2016	12/12/2016	03/22/2017	06/21/2017	09/15/2016	12/07/2016	12/07/2016	03/23/2017	06/23/2017
				Sample Designation	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-061-GW	CFMW-061-GW	CFMW-DUP5-GW	CFMW-061-GW	CFMW-061-GW
				Sample Type	N	N	N	N	N	N	N	N	N	FD	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
1,1'-Biphenyl	--	--	0.083	ug/l	0.66 U	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.45 U	0.43 U	0.43 U	0.45 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.45 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.3 U	3.1 U	3.1 U	3.2 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.3 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.97 U	0.93 U	0.93 U	0.97 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.97 U	0.93 UJ
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.72 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.51 U	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.55 U	0.53 U	0.53 U	0.55 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.55 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.66 U	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.66 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.95 U	0.91 U	0.91 U	0.95 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.95 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.5 UJ	2.4 U	2.4 U	2.5 UJ	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.5 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.92 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.64 U	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.64 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.77 U	0.74 U	0.74 U	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.92 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.68 UJ	0.65 U	0.65 U	0.68 UJ	0.65 U	0.65 U	0.65 U	0.65 UJ	0.65 U	0.65 U	0.68 U	0.65 UJ
2-Nitrophenol	--	--	--	ug/l	0.62 U	0.59 U	0.59 U	0.61 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.62 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.92 UJ	0.88 U	0.88 U	0.92 UJ	0.88 U	0.88 U	0.88 U	0.88 UJ	0.88 U	0.88 U	0.92 U	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.86 U	0.82 U	0.82 U	0.85 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.86 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2.1 U	2 U	2 U	2.1 U	2 U	2 U	2 U	2 U	2 U	2 U	2.1 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.79 U	0.76 U	0.76 U	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.76 U	0.73 U	0.73 U	0.76 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.76 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	1 U	0.96 U	0.96 U	1 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 U	1 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.5 U	0.48 U	0.48 U	0.5 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.5 U	0.48 UJ
4-Nitrophenol	60	--	--	ug/l	4.9 U	4.7 U	4.7 U	4.8 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.9 U	4.7 UJ
Acenaphthene	670	--	53	ug/l	0.92 U	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.92 U	0.88 UJ
Acenaphthylene	--	--	--	ug/l	0.68 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U
Acetophenone	--	--	190	ug/l	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1 U	1 U
Anthracene	2100	--	180	ug/l	0.6 U	0.57 U	0.57 U	0.59 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.6 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.81 U	0.77 U	0.77 U	0.8 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.81 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.9 U	0.86 U	0.86 U	0.9 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.9 U	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.58 U	0.55 U	0.55 U	0.57 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.58 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.17 U	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.17 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.46 U	0.44 U	0.44 U	0.46 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.46 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.78 U	0.75 U	0.75 U	0.78 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.78 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.19 U	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.19 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.72 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.13 U	0.12 U	0.12 U	0.13 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.13 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.75 U	0.72 U	0.72 U	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.63 U	0.6 U	0.6 U	0.63 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.63 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-053	CFMW-053	CFMW-053	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061
				Sample Date	09/14/2016	12/12/2016	06/28/2017	09/14/2016	12/12/2016	03/22/2017	06/21/2017	09/15/2016	12/07/2016	12/07/2016	03/23/2017	06/23/2017
				Sample Designation	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-061-GW	CFMW-061-GW	CFMW-DUP5-GW	CFMW-061-GW	CFMW-061-GW
				Sample Type	N	N	N	N	N	N	N	N	N	FD	N	N
				Sample Fraction	T	T	T	T	T	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Carbazole	--	--	--	ug/l	0.89 U	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.7 U	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.094 U	0.09 U	0.09 U	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.89 U	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.89 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	1 U	0.98 U	0.98 U	1 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	1 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.86 U	0.82 U	0.82 U	0.85 U	0.82 U	0.82 U	0.82 U	0.82 U	1.1 J	0.82 U	0.86 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.72 U	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.69 U	0.72 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.75 U	0.72 U	0.72 U	0.75 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.75 U	0.72 U
Fluorene	1100	--	29	ug/l	0.84 U	0.8 U	0.8 U	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.84 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.49 U	0.47 U	0.47 U	0.49 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.47 U	0.49 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.79 U	0.76 U	0.76 U	0.79 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.76 U	0.79 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.64 U	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.61 U	0.64 U	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.094 U	0.09 U	0.09 U	0.094 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.094 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.22 U	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.21 U
Isophorone	400	--	78	ug/l	0.7 U	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.7 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.84 U	0.8 U	0.8 U	0.83 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.84 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.51 U	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.51 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.87 UJ	0.83 U	0.83 U	0.86 UJ	0.83 U	0.83 U	0.83 U	0.83 UJ	0.83 U	0.83 U	0.87 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.77 U	0.74 U	0.74 U	0.77 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.74 U	0.77 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.3 R	2.2 U	2.2 U	2.3 R	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.3 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.68 U	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.68 U	0.65 U
Phenol	300	--	580	ug/l	0.43 U	0.41 U	0.41 U	0.43 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.43 U	0.41 U
Pyrene	830	--	12	ug/l	0.87 U	0.83 U	0.83 U	0.86 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.87 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-064	CFMW-064	CFMW-064	CFMW-064	CFMW-064
				Sample Date	09/15/2016	12/07/2016	03/23/2017	06/23/2017	06/23/2017
				Sample Designation	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-DUP14-GW
				Sample Type	N	N	N	N	FD
				Sample Fraction	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit					
1,1'-Biphenyl	--	--	0.083	ug/l	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.43 U	0.43 U	0.45 U	0.43 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.1 U	3.1 U	3.3 U	3.1 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.93 U	0.93 U	0.98 U	0.93 U	0.93 UJ
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U
2,4,6-Trichlorophenol	30	--	1.2	ug/l	0.53 U	0.53 U	0.56 U	0.53 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.63 U	0.63 U	0.66 U	0.63 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.91 U	0.91 U	0.96 U	0.91 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.4 U	2.4 U	2.5 U	2.4 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1 U	1 U	1.1 U	1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.61 U	0.61 U	0.64 U	0.61 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.74 U	0.74 U	0.78 U	0.74 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.88 U	0.88 U	0.92 U	0.88 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.65 UJ	0.65 U	0.68 U	0.65 U	0.65 UJ
2-Nitrophenol	--	--	--	ug/l	0.59 U	0.59 U	0.62 U	0.59 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.88 UJ	0.88 U	0.92 U	0.88 U	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1 U	1 U	1.1 U	1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.82 U	0.82 U	0.86 U	0.82 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2 U	2 U	2.1 U	2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1 U	1 U	1.1 U	1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.76 U	0.76 U	0.8 U	0.76 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.73 U	0.73 U	0.77 U	0.73 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	0.96 U	0.96 U	1 U	0.96 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.48 U	0.48 U	0.5 U	0.48 U	0.48 UJ
4-Nitrophenol	60	--	--	ug/l	4.7 U	4.7 U	4.9 U	4.7 U	4.7 UJ
Acenaphthene	670	--	53	ug/l	0.88 U	0.88 U	0.92 U	0.88 U	0.88 UJ
Acenaphthylene	--	--	--	ug/l	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U
Acetophenone	--	--	190	ug/l	1 U	1 U	1.1 U	1 U	1 U
Anthracene	2100	--	180	ug/l	0.57 U	0.57 U	0.6 U	0.57 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.77 U	0.77 U	0.81 U	0.77 U	0.77 U
Benzaldehyde	--	--	190	ug/l	0.86 U	0.86 U	0.9 U	0.86 UJ	0.86 U
Benzo[a]anthracene	0.5	--	--	ug/l	0.55 U	0.55 U	0.58 U	0.55 U	0.55 U
Benzo[a]pyrene	0.05	0.2	0.0034	ug/l	0.16 U	0.16 U	0.17 U	0.16 U	0.16 U
Benzo[b]fluoranthene	0.5	--	0.034	ug/l	0.44 U	0.44 U	0.46 U	0.44 U	0.44 U
Benzo[g,h,i]perylene	--	--	--	ug/l	0.75 U	0.75 U	0.79 U	0.75 U	0.75 U
Benzo[k]fluoranthene	5	--	0.34	ug/l	0.18 U	0.18 U	0.19 U	0.18 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.12 U	0.12 U	0.13 U	0.12 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.72 U	0.72 U	0.76 U	0.72 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.6 U	0.6 U	0.63 U	0.6 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U

Appendix G2. Semivolatile Organic Compounds in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-064	CFMW-064	CFMW-064	CFMW-064	CFMW-064
				Sample Date	09/15/2016	12/07/2016	03/23/2017	06/23/2017	06/23/2017
				Sample Designation	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-DUP14-GW
				Sample Type	N	N	N	N	FD
				Sample Fraction	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit					
Carbazole	--	--	--	ug/l	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U
Chrysene	50	--	3.4	ug/l	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U
Dibenz(a,h)anthracene	0.05	--	0.0034	ug/l	0.09 U	0.09 U	0.095 U	0.09 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.85 U	0.85 U	0.89 U	0.85 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1.1 U	1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	0.98 U	0.98 U	1 U	0.98 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.82 U	0.82 U	0.86 U	0.82 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.69 U	0.69 U	0.72 U	0.69 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.72 U	0.72 U	0.76 U	0.72 U	0.72 U
Fluorene	1100	--	29	ug/l	0.8 U	0.8 U	0.84 U	0.8 U	0.8 U
Hexachlorobenzene	0.2	1	0.0098	ug/l	0.47 U	0.47 U	0.49 U	0.47 U	0.47 U
Hexachlorobutadiene	5	--	0.14	ug/l	0.76 U	0.76 U	0.8 U	0.76 U	0.76 U
Hexachlorocyclopentadiene	50	50	0.041	ug/l	0.61 U	0.61 U	0.64 U	0.61 UJ	0.61 U
Hexachloroethane	30	--	0.33	ug/l	0.09 U	0.09 U	0.095 U	0.09 U	0.09 U
Indeno[1,2,3-cd]pyrene	0.5	--	0.034	ug/l	0.21 U	0.21 U	0.22 U	0.21 U	0.21 U
Isophorone	400	--	78	ug/l	0.67 U	0.67 U	0.7 U	0.67 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.8 U	0.8 U	0.84 U	0.8 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.49 U	0.49 U	0.51 U	0.49 U	0.49 U
N-Nitrosodi-n-propylamine	0.5	--	0.011	ug/l	0.83 UJ	0.83 U	0.87 U	0.83 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.74 U	0.74 U	0.78 U	0.74 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.2 U	2.2 U	2.3 U	2.2 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.65 U	0.65 U	0.68 U	0.65 U	0.65 U
Phenol	300	--	580	ug/l	0.41 U	0.41 U	0.43 U	0.41 U	0.41 U
Pyrene	830	--	12	ug/l	0.83 U	0.83 U	0.87 U	0.83 U	0.83 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-001	CFMW-001	CFMW-001	CFMW-001	CFMW-001	CFMW-001	CFMW-001	CFMW-001	CFMW-002	CFMW-002	CFMW-002	CFMW-002
				Sample Date	09/20/2016	09/20/2016	12/12/2016	12/12/2016	03/20/2017	03/20/2017	06/19/2017	06/19/2017	09/12/2016	09/12/2016	03/24/2017	03/24/2017
				Sample Designation	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	NA	18.2 U	1020	39.8 J	NA	254	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	1.2 J	NA	0.86 J	1.9 J	0.84 J	NA	0.96 J	NA	1.1 J
Barium	**1000**	2000	380	ug/l	NA	228	NA	76.6	NA	71.1	94.1	75	NA	243	NA	318
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	60300	NA	54900	NA	53500	59400	57600	NA	31800	NA	37200
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.9 J	NA	1.4 J
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	6.1	NA	8.6
Copper	1300	1300	80	ug/l	NA	3.2 J	NA	1.8 J	NA	1.4 U	1.8 J	1.4 U	NA	4.2	NA	3.5 J
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA	**306**	NA
Cyanide, Total	**200**	200	0.15	ug/l	2.4 J	NA	2 U	NA	2 U	NA	2 U	2 U	**2060 J**	NA	**1370**	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	NA	42.4 U	1100	277	NA	871	NA	910
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.85 J	0.38 J	NA	0.53 J	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	14100	NA	13100	NA	13200	16600	12500	NA	10900	NA	13800
Manganese	--	--	43	ug/l	NA	2.5 U	NA	15.7	NA	24.8	22.5	15.8	NA	26.8	NA	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	740	NA	737	NA	676	826	632	NA	1020	NA	1060
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.84 J	NA	0.82 J
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	8360	NA	4380	NA	4200	4810	4180	NA	173000	NA	191000
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	7.7 J	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-002	CFMW-002	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-003	CFMW-003a	CFMW-003a
				Sample Date	06/27/2017	06/27/2017	09/14/2016	09/14/2016	12/09/2016	12/09/2016	03/22/2017	03/22/2017	06/27/2017	06/27/2017	09/20/2016	09/20/2016
				Sample Designation	CFMW-002-GW	CFMW-002-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003a-GW	CFMW-003a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	86.4	18.2 U	NA	18.2 U	NA	18.2 U	NA	23.9 J	279	18.2 U	NA	33.8 J
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 J
Arsenic	**10**	10	0.052	ug/l	0.84 J	0.81 J	NA	0.64 U	NA	0.64 U	NA	0.67 J	1.6 J	0.65 J	NA	5.2
Barium	**1000**	2000	380	ug/l	199	184	NA	28.6	NA	24.3	NA	20.8	26	20.1	NA	53.3
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	27800	26400	NA	178000	NA	184000	NA	165000	201000	194000	NA	31000
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	2.4 J	2 J	NA	1.3 J	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	1.8 J	1.4 U	NA	4.8	NA	1.8 J	NA	1.5 J	1.9 J	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	119	47.9	NA	NA	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	**985**	**883**	15.4	NA	19.1	NA	14	NA	13.2	12	2.1 J	NA
Iron	--	--	1400	ug/l	617	409	NA	42.4 U	NA	42.4 U	NA	42.4 U	469	42.4 U	NA	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	10700	9180	NA	45800	NA	49800	NA	48300	56500	44800	NA	5380
Manganese	--	--	43	ug/l	3.6 J	2.5 U	NA	306	NA	209	NA	142	155	129	NA	56.2
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	3 J	NA	3.1 J	NA	2.8 J	3.3 J	2.6 J	NA	1.4 U
Potassium	--	--	--	ug/l	793	705	NA	2100	NA	2040	NA	1920	2210	1970	NA	3270
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	7.5 J	NA	8.9 J	NA	8.9 J	8.6 J	9.1 J	NA	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	97300	77700	NA	322000	NA	360000	NA	320000	372000	295000	NA	17500
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	3.7 J
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-003a	CFMW-003a	CFMW-003a	CFMW-003a	CFMW-003a	CFMW-003a	CFMW-007	CFMW-007	CFMW-007	CFMW-007	CFMW-007	CFMW-007
				Sample Date	12/12/2016	12/12/2016	03/20/2017	03/20/2017	06/19/2017	06/19/2017	09/21/2016	09/21/2016	12/12/2016	12/12/2016	03/28/2017	03/28/2017
				Sample Designation	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	1570	24.4 J	NA	18.2 U	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	3.5	NA	2.8	3.6	2.8	NA	0.64 U	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	39.9	NA	41.2	63.8	45.5	NA	163	NA	184	NA	169 J
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	28500	NA	31700	36900	36900	NA	50200	NA	56600	NA	54900 J
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	2.3 J	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	3.4 J	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA	NA	NA	1.5 U	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	NA	2 U	2 U	2.1 J	NA	2 U	NA	4.7 J	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	2110	51.6 J	NA	42.4 U	NA	104 J	NA	99.1 J
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	1.2	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	4870	NA	5980	8510	7140	NA	12800	NA	14100	NA	14200 J
Manganese	--	--	43	ug/l	NA	52.6	NA	183	366	308	NA	11.4	NA	80.9	NA	74.7
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	1.8 J	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	4960	NA	3100	2320	2120	NA	579	NA	668	NA	643
Selenium	50	50	10	ug/l	NA	0.73 U	NA	1.2 J	0.73 U	1.1 J	NA	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	19500	NA	14500	14200	12900	NA	3050	NA	5970	NA	3890
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	14.2 J	7 U	NA	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-007	CFMW-007	CFMW-008	CFMW-008	CFMW-008	CFMW-008	CFMW-008	CFMW-008	CFMW-008	CFMW-008	CFMW-008a	CFMW-008a
				Sample Date	06/19/2017	06/19/2017	09/21/2016	09/21/2016	12/16/2016	12/16/2016	03/28/2017	03/28/2017	06/20/2017	06/20/2017	09/15/2016	09/15/2016
				Sample Designation	CFMW-007-GW	CFMW-007-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008a-GW	CFMW-008a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	21.3 J	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	819	18.2 U	NA	107
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	1.2 J	0.62 U	NA	0.68 J
Arsenic	**10**	10	0.052	ug/l	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	1.9 J	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	218	170	NA	140	NA	516	NA	434 J	505	434	NA	701
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	52500	51800	NA	6370	NA	38100	NA	28800 J	31600	24400	NA	388000
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.4 J	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.8 J	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	NA	1.4 J	NA	1.4 U	NA	1.4 U	5.8	1.4 U	NA	3.7 J
Cyanide, Free	**200**	200	0.15	ug/l	1.5 U	1.5 U	NA	NA	NA	NA	NA	NA	1.5 U	1.5 U	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	2 U	2 U	NA	2 U	NA	2.2 J	NA	2 U	2 U	2.2 J	NA
Iron	--	--	1400	ug/l	12600	87.9 J	NA	42.4 U	NA	99600	NA	35600 J	72900	26500	NA	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	14	0.38 U	NA	0.82 J
Magnesium	--	--	--	ug/l	15700	12500	NA	4320	NA	16300	NA	16200 J	17600	15000	NA	63.6 U
Manganese	--	--	43	ug/l	249	156	NA	11.1	NA	741	NA	261	515	166	NA	2.5 U
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	1.4 U	NA	1.8 J	NA	1.4 U	7.7	1.9 J	NA	1.4 U
Potassium	--	--	--	ug/l	661	632	NA	1190	NA	2220	NA	2210	2560	2170	NA	18000
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	4560	3910	NA	138000	NA	86000	NA	89800	113000	95800	NA	49600
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	11.5 J	NA	20.4	NA	228	**3990**	1220	NA	12.3 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010
				Sample Date	12/16/2016	12/16/2016	03/28/2017	03/28/2017	06/28/2017	06/28/2017	09/12/2016	09/12/2016	12/15/2016	12/15/2016	03/24/2017	03/24/2017
				Sample Designation	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	97.6	NA	135	181	132	NA	1850	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	1.3 J	0.91 J	NA	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	5.2	NA	6.8	NA	3.9
Barium	**1000**	2000	380	ug/l	NA	970	NA	949 J	953	888	NA	239	NA	107	NA	139
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	431000	NA	420000 J	407000	416000	NA	35500	NA	14800	NA	23100
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	3.6 J	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	23.7	NA	6.9	NA	4.1
Copper	1300	1300	80	ug/l	NA	3 J	NA	3.5 J	6.8	5.3	NA	16.8	NA	10	NA	7.2
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	1.5 U	NA	1.5 UJ	1.5 UJ	NA	NA	NA	NA	33.1	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2.8 J	NA	2 U	2 U	**7320 J**	NA	**2120**	NA	**1020**	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 UJ	203	42.4 U	NA	4710	NA	844	NA	769
Lead	15	15	15	ug/l	NA	0.65 J	NA	0.62 J	1.8	1.8	NA	2.8	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	63.6 U	NA	63.6 UJ	65.6 J	63.6 U	NA	16500	NA	9810	NA	9070
Manganese	--	--	43	ug/l	NA	2.5 U	NA	2.5 U	2.5 U	2.5 U	NA	110	NA	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	5	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	23200	NA	19900	19100	19000	NA	1460	NA	890	NA	810
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	3.3 J	NA	1.4 J	NA	1.1 J
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	66400	NA	53200	63500	49600	NA	445000	NA	231000	NA	198000
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	23.6	NA	9.9 J	24.5	15.8 J	NA	7.5 J	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011	CFMW-011	CFMW-011	CFMW-011	CFMW-011	CFMW-011	CFMW-011
				Sample Date	06/27/2017	06/27/2017	09/13/2016	09/13/2016	12/08/2016	12/08/2016	03/27/2017	03/27/2017	06/28/2017	06/28/2017	06/28/2017	06/28/2017
				Sample Designation	CFMW-010-GW	CFMW-010-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-DUP15-GW	CFMW-011-GW	CFMW-DUP15-GW
				Sample Type	N	N	N	N	N	N	N	N	N	FD	N	FD
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	T	DI	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	218	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	18.2 U	18.2 U	18.2 U	18.2 U
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	2.9	2.5	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	141	126	NA	186	NA	209	NA	238	199	197	181	186
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	28800	26200	NA	47600	NA	52400	NA	62300	46500	46300	44000	43600
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	3 J	2.2 J	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	4.7	3.5 J	NA	3.2 J	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	117	56.8	NA	NA	NA	NA	7.4	NA	6.6 J	9.8 J	3.3 J-	3.1 J-
Cyanide, Total	**200**	200	0.15	ug/l	**1190**	**1120**	80.7	NA	132	NA	**235**	NA	125	123	125	126
Iron	--	--	1400	ug/l	902	506	NA	42.4 U	NA	42.4 U	NA	119 J	62 J	62.9 J	45.9 J	47.3 J
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	12300	10400	NA	14100	NA	16000	NA	18000	14100	14100	11900	11900
Manganese	--	--	43	ug/l	10.3	2.5 U	NA	2.5 U	NA	2.5 U	NA	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	929	815	NA	657	NA	709	NA	798	733	737	663	663
Selenium	50	50	10	ug/l	0.74 J	0.73 J	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	122000	95400	NA	9950	NA	11200	NA	13300	18100	18200	15300	15000
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-012	CFMW-012	CFMW-012	CFMW-012
				Sample Date	09/20/2016	09/20/2016	12/14/2016	12/14/2016	03/21/2017	03/21/2017	06/29/2017	06/29/2017	09/12/2016	09/12/2016	12/14/2016	12/14/2016
				Sample Designation	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	27.2 J	NA	60.9	NA	18.2 U	2030 J+	18.2 U	NA	25.7 J	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	3.3	NA	1.7 J	NA	1.4 J	2.1	1.3 J	NA	**15.5**	NA	**10.7**
Barium	**1000**	2000	380	ug/l	NA	42.7	NA	48.8	NA	52.8	83	57.9	NA	79.6	NA	133
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	24600	NA	21700	NA	37000	43700	39100	NA	8660	NA	11700
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	2.6 J	1.3 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	7.9	NA	2.4 J
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	4	1.4 U	NA	12.6	NA	4.6
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	NA	2 U	NA	2 U	2 U	**2280 J**	NA	**972**	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	NA	86.9 J	2280	42.4 U	NA	717	NA	427
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	1.4	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	9010	NA	8910	NA	14300	17000	14400	NA	4130	NA	6070
Manganese	--	--	43	ug/l	NA	13.7	NA	30.7	NA	154	167	93.6	NA	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.9 J	1.4 U	NA	1.5 J	NA	1.4 U
Potassium	--	--	--	ug/l	NA	2070	NA	3120	NA	1430	1850	1380	NA	817	NA	937
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	4.4 J	NA	1.4 J
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	19900	NA	24100	NA	10900	9740	8640	NA	226000	NA	234000
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	2.8 J	NA	1.9 U	NA	1.9 U	2 J	1.9 U	NA	19.8	NA	15.4
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	8.3 J	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-012	CFMW-012	CFMW-012	CFMW-012	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-012a
				Sample Date	03/22/2017	03/22/2017	06/23/2017	06/23/2017	09/15/2016	09/15/2016	09/15/2016	09/15/2016	12/13/2016	12/13/2016	03/20/2017	03/20/2017
				Sample Designation	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012a-GW	CFMW-DUP2-GW	CFMW-012a-GW	CFMW-DUP2-GW	CFMW-012a-GW	CFMW-012a-GW	CFMW-012a-GW	CFMW-012a-GW
				Sample Type	N	N	N	N	N	FD	N	FD	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	T	DI	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	32.4 J	18.2 U	18.2 U	NA	NA	18.2 U	18.2 U	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.86 J	0.62 U	NA	NA	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	2.9	**80.2**	**92.6**	NA	NA	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	306	145	129	NA	NA	78.2	77.7	NA	84.1	NA	79.6
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	NA	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	NA	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	31000	7480	7270	NA	NA	51300	50800	NA	52900	NA	51000
Chromium	100	100	0.035	ug/l	NA	2.5 J	3.5 J	2.9 J	NA	NA	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	4.9	28.4	23.2	NA	NA	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	6.6	22.9	17.6	NA	NA	1.4 UJ	3.3 J	NA	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	48	NA	35.2	40.6	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	**2340**	NA	**5780**	**5860**	2 U	2 U	NA	NA	2 U	NA	2 U	NA
Iron	--	--	1400	ug/l	NA	964	2750	2420	NA	NA	42.4 U	42.4 U	NA	42.4 U	NA	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	0.38 U	0.38 U	NA	NA	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	17100	7710	6990	NA	NA	13000	13000	NA	12900	NA	13100
Manganese	--	--	43	ug/l	NA	2.5 U	2.5 J	2.5 U	NA	NA	21.6	21.3	NA	5.9 J	NA	32.8
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	NA	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	6	4.8	NA	NA	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	1600	3410	3190	NA	NA	721	726	NA	767	NA	796
Selenium	50	50	10	ug/l	NA	1.6 J	7.5 J	8.5 J	NA	NA	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	NA	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	232000	834000	707000	NA	NA	6380	6190	NA	6490	NA	6130
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	NA	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	13.5	457	397	NA	NA	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	7 U	7 U	NA	NA	7 U	7 U	NA	7.6 J	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-012a	CFMW-012a	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-014	CFMW-015	CFMW-015
				Sample Date	06/20/2017	06/20/2017	09/12/2016	09/12/2016	12/15/2016	12/15/2016	03/29/2017	03/29/2017	06/27/2017	06/27/2017	09/12/2016	09/12/2016
				Sample Designation	CFMW-012a-GW	CFMW-012a-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-015-GW	CFMW-015-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	292 J+	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	47	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.69 J
Arsenic	**10**	10	0.052	ug/l	0.64 U	0.64 U	NA	0.64 U	NA	0.82 J	NA	0.72 J	2.2	2.1	NA	**47.7**
Barium	**1000**	2000	380	ug/l	85.7	79.3	NA	336	NA	354	NA	417	169	158	NA	62
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	51600	51300	NA	44900	NA	42000	NA	60200	26500	25900	NA	2710
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 J	NA	1.6 J	1.3 U	1.3 U	NA	2 J
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	NA	5.3	NA	8.2	NA	6.5	1.6 J	1.3 J	NA	27.8
Copper	1300	1300	80	ug/l	1.4 J	1.4 U	NA	5.7	NA	10.5	NA	3.5 J	1.5 J	1.7 J	NA	46.8
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	87.4	NA	111	27.4	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	2 U	**2750 J**	NA	**3360**	NA	**3320**	NA	**720**	**720**	**6240 J**	NA
Iron	--	--	1400	ug/l	358	42.4 U	NA	927	NA	1200	NA	1420	441	320	NA	2550
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	14500	13000	NA	16800	NA	16100	NA	22100	10200	9070	NA	4010
Manganese	--	--	43	ug/l	28.9	18.7	NA	2.5 U	NA	2.5 U	NA	2.5 U	2.5 U	2.5 U	NA	4.1 J
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	4.2	1.4 U	1.4 U	NA	7.7
Potassium	--	--	--	ug/l	802	725	NA	1120	NA	1160	NA	1140	805	769	NA	2400
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	1.7 J	NA	1.4 J	NA	1.6 J	0.73 U	0.73 U	NA	13.5
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	6620 J+	5960	NA	168000	NA	239000	NA	191000	79100	64700	NA	620000
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	11.7	10.2	NA	50.4
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-016	CFMW-016	CFMW-016	CFMW-016	CFMW-016	CFMW-016
				Sample Date	12/15/2016	12/15/2016	03/29/2017	03/29/2017	06/27/2017	06/27/2017	03/28/2017	03/28/2017	03/28/2017	03/28/2017	06/29/2017	06/29/2017
				Sample Designation	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-016-GW
				Sample Type	N	N	N	N	N	N	N	FD	N	FD	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	T	DI	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	48.7	18.2 U	NA	NA	18.2 U	18.2 U	67	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	0.82 J	0.62 U	NA	NA	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	**50.8**	NA	**38.1**	**77.7**	**92.1**	NA	NA	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	34	NA	72.6	76.5	67	NA	NA	220 J	220 J	213	199
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	NA	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	NA	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	1410	NA	4210	3730	3550	NA	NA	46700 J	46800 J	48400	45800
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	2.2 J	2.9 J	2 J	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	17.2	NA	20.8	39.5	37.5	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	29.2	NA	42.4	59.5	50.9	NA	NA	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	23.9	NA	97.3	36.9	NA	NA	NA	NA	1.5 UJ	1.5 UJ
Cyanide, Total	**200**	200	0.15	ug/l	**3100**	NA	**6600**	NA	**8120**	**7780**	2.3 J	3.3 J	NA	NA	2 U	2 U
Iron	--	--	1400	ug/l	NA	1330	NA	2640	3180	3320	NA	NA	42.4 UJ	42.4 UJ	78.9 J	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	NA	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	1640	NA	5540	6400	6110	NA	NA	11500 J	11600 J	12300	11300
Manganese	--	--	43	ug/l	NA	3.3 J	NA	3.9 J	9.6	4.3 J	NA	NA	2.5 U	2.5 U	4.9 J	4 J
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	NA	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	4.8	NA	4.9	10.2	9	NA	NA	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	1520	NA	2560	2760	2860	NA	NA	646	648	584	534
Selenium	50	50	10	ug/l	NA	9.6 J	NA	8.9 J	13	17.1	NA	NA	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	365000	NA	601000	703000	662000	NA	NA	14300	13300	3580	3250
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	NA	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	108	NA	75.7	378	378	NA	NA	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	7 U	7 U	NA	NA	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-016a	CFMW-016a	CFMW-016a	CFMW-016a	CFMW-016a	CFMW-016a	CFMW-016a	CFMW-016a	CFMW-017	CFMW-017	CFMW-017	CFMW-017
				Sample Date	09/21/2016	09/21/2016	12/14/2016	12/14/2016	03/27/2017	03/27/2017	06/26/2017	06/26/2017	03/28/2017	03/28/2017	06/26/2017	06/26/2017
				Sample Designation	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-017-GW	CFMW-017-GW	CFMW-017-GW	CFMW-017-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	64.8	NA	18.2 U	NA	18.2 U	41.7	18.2 U	NA	18.2 U	18.2 U	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	4.4	2.6	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	1.3 J	NA	1.3 J	NA	0.64 U	0.64 U	0.64 U	NA	5.6	1.1 J	0.67 J
Barium	**1000**	2000	380	ug/l	NA	99.5	NA	143	NA	263	141	97.1	NA	46.8 J	87.9	88.9
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	38100	NA	31400	NA	56800	62800	37900	NA	26400 J	46900	47800
Chromium	100	100	0.035	ug/l	NA	1.8 J	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.6 J	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	3.6 J	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	3.5 J	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA	1.5 U	1.5 U
Cyanide, Total	**200**	200	0.15	ug/l	2.8 J	NA	2 J	NA	2.1 J	NA	2.1 J	2 U	**1880**	NA	103	93.6
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	NA	42.4 U	42.4 U	42.4 U	NA	784 J	670	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	1.3	NA	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	4060	NA	9330	NA	15000	8920	7100	NA	8990 J	10600	10900
Manganese	--	--	43	ug/l	NA	2.5 U	NA	6.1 J	NA	2.5 U	2.5 U	2.5 U	NA	2.5 U	23.2	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	2780	NA	1360	NA	892	1080	1130	NA	865	476	475
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	18600	NA	13100	NA	9300	29200	7690	NA	135000	8960	8460
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 J	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	29.5	9.2	5.6
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-018	CFMW-018	CFMW-018	CFMW-018	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019
				Sample Date	03/28/2017	03/28/2017	06/20/2017	06/20/2017	09/12/2016	09/12/2016	12/15/2016	12/15/2016	03/29/2017	03/29/2017	06/29/2017	06/29/2017
				Sample Designation	CFMW-018-GW	CFMW-018-GW	CFMW-018-GW	CFMW-018-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	348	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	18.2 U	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	123 J	168	155	NA	104	NA	113	NA	140	131	122
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	49400 J	61500	60900	NA	55100	NA	54600	NA	71900	59200	58200
Chromium	100	100	0.035	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	3.3 J	NA	5.1	NA	6.9	5.6	5.1
Copper	1300	1300	80	ug/l	NA	1.4 U	2.1 J	1.4 U	NA	1.4 U	NA	1.6 J	NA	1.8 J	1.6 J	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	3.3 J	3.7 J	NA	NA	NA	NA	44.1	NA	67.8 J-	44.5 J-
Cyanide, Total	**200**	200	0.15	ug/l	12.2	NA	78	74.9 J-	**961 J**	NA	**791**	NA	**1770**	NA	**1230**	**1250**
Iron	--	--	1400	ug/l	NA	42.4 UJ	462	42.4 U	NA	1160	NA	260	NA	656	2370	596
Lead	15	15	15	ug/l	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	12900 J	17500	14600	NA	17200	NA	17800	NA	25000	19900	19000
Manganese	--	--	43	ug/l	NA	5.1 J	13	9.5	NA	35.8	NA	61.2	NA	3.9 J	35.1	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	6.8	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	509	692	583	NA	1520	NA	1840	NA	1820	1720	1720
Selenium	50	50	10	ug/l	NA	0.73 U	0.73 U	0.73 U	NA	0.84 J	NA	0.77 J	NA	1.4 J	0.99 J	1.2 J
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	7640	5130	4420	NA	104000	NA	120000	NA	149000	145000	138000
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	7 U	7 U	NA	27.8	NA	9.3 J	NA	7 J	24.9	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-020	CFMW-020
				Sample Date	09/20/2016	09/20/2016	12/14/2016	12/14/2016	03/27/2017	03/27/2017	03/27/2017	03/27/2017	06/26/2017	06/26/2017	09/20/2016	09/20/2016
				Sample Designation	CFMW-019a-GW	CFMW-019a-GW	CFMW-019a-GW	CFMW-019a-GW	CFMW-019a-GW	CFMW-DUP9-GW	CFMW-019a-GW	CFMW-DUP9-GW	CFMW-019a-GW	CFMW-019a-GW	CFMW-020-GW	CFMW-020-GW
				Sample Type	N	N	N	N	N	FD	N	FD	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	T	DI	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	82.3	NA	29.5 J	NA	NA	20.6 J	18.2 U	664	22.5 J	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	NA	0.62 U	0.62 U	1 J	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	8.3	NA	2.2	NA	NA	1.2 J	1.2 J	1.8 J	1.3 J	NA	2.1
Barium	**1000**	2000	380	ug/l	NA	56.9	NA	56.6	NA	NA	42.5	42.6	54.5	46.8	NA	74.2
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	NA	0.24 U	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	NA	0.71 U	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	15100	NA	40100	NA	NA	30100	30300	34000	31800	NA	54400
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	2.6 J	NA	NA	1.4 U	1.4 U	1.5 J	1.4 U	NA	2.4 J
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	NA	2 U	2 U	NA	NA	2 U	2.8 J	2.9 J	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	NA	NA	61.8 J	65.1 J	960	80.5 J	NA	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	NA	0.38 U	0.38 U	0.78 J	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	3700	NA	14900	NA	NA	11400	11600	12400	12100	NA	13900
Manganese	--	--	43	ug/l	NA	9.4	NA	88.6	NA	NA	221	225	286	254	NA	37.5
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	NA	0.17 U	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	NA	1.7 J	1.4 U	1.4 U	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	8880	NA	1520	NA	NA	2770	2820	3170	2960	NA	774
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	NA	0.73 U	0.73 U	0.73 U	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	50900	NA	10000	NA	NA	22200	22600	19100	18200	NA	4810
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	NA	0.26 U	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	NA	1.9 U	1.9 U	1.9 U	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	NA	7 U	7 U	7.9 J	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-020	CFMW-020	CFMW-020	CFMW-020	CFMW-020	CFMW-020	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021
				Sample Date	12/13/2016	12/13/2016	03/21/2017	03/21/2017	06/26/2017	06/26/2017	09/12/2016	09/12/2016	12/14/2016	12/14/2016	03/29/2017	03/29/2017
				Sample Designation	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	18.2 U	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.81 J	NA	0.78 J
Barium	**1000**	2000	380	ug/l	NA	266	NA	256	193	199	NA	193	NA	189	NA	220
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	65300	NA	62600	50500	51400	NA	62300	NA	45700	NA	55700
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.5 J	NA	7.2	NA	4.7
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	4.2	NA	2.9 J	NA	3 J
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA	NA	NA	23	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	NA	2 J	2 U	**400 J**	NA	**1560**	NA	**1020**	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	1150	42.4 U	NA	85.9 J	NA	660	NA	371
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	14700	NA	15300	11400	11700	NA	18800	NA	14000	NA	18900
Manganese	--	--	43	ug/l	NA	2.5 U	NA	2.5 U	12.9	2.5 U	NA	2.5 U	NA	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	676	NA	622	594	599	NA	1000	NA	1070	NA	1360
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	1.6 J	NA	1.1 J
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	6680	NA	12000	3510	3680	NA	54300	NA	142000	NA	178000
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	18.4	7 U	NA	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-021	CFMW-021	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-022	CFMW-023	CFMW-023
				Sample Date	06/26/2017	06/26/2017	09/13/2016	09/13/2016	12/09/2016	12/09/2016	03/28/2017	03/28/2017	06/26/2017	06/26/2017	09/21/2016	09/21/2016
				Sample Designation	CFMW-021-GW	CFMW-021-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-023-GW	CFMW-023-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	18.2 U	18.2 U	NA	9.1 U	NA	18.2 U	NA	18.2 U	18.2 U	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.31 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	0.64 U	0.64 U	NA	0.32 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 J
Barium	**1000**	2000	380	ug/l	110	109	NA	102	NA	233	NA	232 J	171	170	NA	235
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.12 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.36 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	38300	38900	NA	27700	NA	59800	NA	55100 J	48900	47500	NA	60700
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	0.66 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	1.7 J	1.5 J	NA	0.65 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	NA	1.6 J	NA	1.4 J	NA	3.6 J	1.4 U	1.4 U	NA	4.3
Cyanide, Free	**200**	200	0.15	ug/l	18.9	7.5	NA	NA	NA	NA	3.4 J	NA	1.5 U	1.5 U	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	**321**	**302**	155	NA	**279**	NA	141	NA	13.3	11.8	2.7 J	NA
Iron	--	--	1400	ug/l	210	135	NA	36.1 J	NA	119 J	NA	51.8 J	42.4 U	42.4 U	NA	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.19 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	12000	12500	NA	6720	NA	14400	NA	15100 J	11700	11500	NA	17700
Manganese	--	--	43	ug/l	2.5 U	2.5 U	NA	1.2 U	NA	2.5 U	NA	2.5 U	2.5 U	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	0.68 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	883	881	NA	318	NA	685	NA	761	554	546	NA	600
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	0.37 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	0.64 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	47200	46100	NA	5090	NA	15600	NA	23600	5180	5310	NA	4100
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.13 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	0.95 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	3.5 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-025a	CFMW-025a	CFMW-025a	CFMW-025a	CFMW-025a	CFMW-025a
				Sample Date	12/19/2016	12/19/2016	03/21/2017	03/21/2017	06/27/2017	06/27/2017	09/13/2016	09/13/2016	12/05/2016	12/05/2016	03/24/2017	03/24/2017
				Sample Designation	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-025a-GW	CFMW-025a-GW	CFMW-025a-GW	CFMW-025a-GW	CFMW-025a-GW	CFMW-025a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	18.2 U	18.2 U	NA	18.2 U	NA	22.9 J	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.71 J	NA	0.64 U	0.72 J	0.64 U	NA	0.93 J	NA	2.7	NA	1.6 J
Barium	**1000**	2000	380	ug/l	NA	212	NA	182	186	170	NA	128	NA	336	NA	121
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	61100	NA	58700	56000	53500	NA	38300	NA	137000	NA	38000
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	2.7 J	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	2.4 J	NA	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	7.6 J	NA	5.9 J	5.7 J	2 U	NA	2 U	NA	2 U	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	311	42.4 U	NA	174	NA	4350	NA	293
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	17700	NA	16900	15900	14200	NA	24100	NA	33000	NA	22900
Manganese	--	--	43	ug/l	NA	2.5 U	NA	2.5 U	4.8 J	2.5 U	NA	297	NA	1540	NA	225
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	532	NA	495	514	475	NA	2090	NA	2500	NA	1950
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	2870	NA	69 U	3560 J+	2980	NA	8850	NA	9180	NA	7410
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	10.2 J	7 U	NA	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-025a	CFMW-025a	CFMW-025b	CFMW-025b	CFMW-025b	CFMW-025b	CFMW-025B	CFMW-025B	CFMW-025b	CFMW-025b	CFMW-026	CFMW-026
				Sample Date	06/22/2017	06/22/2017	09/13/2016	09/13/2016	12/07/2016	12/07/2016	03/20/2017	03/20/2017	06/22/2017	06/22/2017	09/13/2016	09/13/2016
				Sample Designation	CFMW-025a-GW	CFMW-025a-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-25B-GW	CFMW-25B-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-026-GW	CFMW-026-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	6370	23 J	NA	18.2 U	NA	18.2 U	NA	18.2 U	63.1	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	5.3	1.6 J	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	232	122	NA	320	NA	314	NA	308	313	295	NA	260
Beryllium	4	4	2.5	ug/l	0.38 J	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	48200	37900	NA	50700	NA	46200	NA	55700	44400	44700	NA	59900
Chromium	100	100	0.035	ug/l	8.7	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	4.4	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	13.2	1.4 U	NA	1.4 U	NA	3.1 J	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	2 U	2 U	NA	2 U	NA	2 U	NA	2 U	2 U	3.9 J	NA
Iron	--	--	1400	ug/l	7860	314	NA	101 J	NA	42.4 U	NA	81.3 J	4140	1250	NA	42.4 U
Lead	15	15	15	ug/l	7.7	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	26200	22900	NA	20000	NA	20200	NA	20500	20100	18900	NA	14600
Manganese	--	--	43	ug/l	347	225	NA	111	NA	69.2	NA	79.7	114	99.8	NA	65
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	7.6	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	3110	2030	NA	932	NA	1040	NA	1050	981	988	NA	858
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	7370	8020	NA	6430	NA	6590	NA	6730	6460	6460	NA	11600
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	5.2	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	45.5	7 U	NA	7 U	NA	7 U	NA	7 U	23.5	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-026	CFMW-026	CFMW-026	CFMW-026	CFMW-026	CFMW-026	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-027
				Sample Date	12/05/2016	12/05/2016	03/20/2017	03/20/2017	06/22/2017	06/22/2017	09/13/2016	09/13/2016	12/14/2016	12/14/2016	03/27/2017	03/27/2017
				Sample Designation	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	28.8 J	18.2 U	NA	9.1 U	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.31 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.32 U	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	289	NA	266	272	266	NA	89.1	NA	187	NA	200
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.12 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.36 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	66400	NA	59900	60700	59000	NA	24500	NA	51500	NA	55800
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	0.66 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	0.85 J	NA	2 J	NA	2.5 J
Copper	1300	1300	80	ug/l	NA	2.7 J	NA	1.4 U	1.4 U	1.4 U	NA	1.9 J	NA	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA	NA	NA	33.7	NA
Cyanide, Total	**200**	200	0.15	ug/l	3.4 J	NA	7.5 J	NA	2 U	2 U	**603**	NA	**793**	NA	**755**	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	42.4 U	42.4 U	NA	147	NA	341	NA	371
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.19 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	15700	NA	14400	15000	13900	NA	7890	NA	16100	NA	17400
Manganese	--	--	43	ug/l	NA	97.6	NA	2.5 U	2.5 U	2.5 U	NA	1.2 J	NA	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	0.68 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	905	NA	860	630	631	NA	520	NA	1090	NA	1110 J+
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.84 J	0.73 U	0.73 U	NA	0.37 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	0.64 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	10700	NA	10500	7610	7410	NA	31000	NA	56500	NA	60800
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.13 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	1.9 J	1.9 U	NA	0.95 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	7 U	7 U	NA	3.5 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028a	CFMW-028a
				Sample Date	06/26/2017	06/26/2017	09/13/2016	09/13/2016	12/05/2016	12/05/2016	03/20/2017	03/20/2017	06/26/2017	06/26/2017	09/20/2016	09/20/2016
				Sample Designation	CFMW-027-GW	CFMW-027-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028a-GW	CFMW-028a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	56.3	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	38.6 J	18.2 U	NA	34.6 J
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	1 J
Arsenic	**10**	10	0.052	ug/l	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	1.7 J
Barium	**1000**	2000	380	ug/l	146	148	NA	141	NA	152	NA	154	181	177	NA	48
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	38300	37900	NA	44100	NA	48700	NA	49600	51400	51500	NA	12200
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	1.4 J	1.3 J	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	1.5 J	1.4 U	NA	4.2	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	2.2 J
Cyanide, Free	**200**	200	0.15	ug/l	62	46.3	NA	NA	NA	NA	10.4	NA	10.7	10.5	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	**560**	**520**	104	NA	195	NA	**283**	NA	**315**	**304**	2 J	NA
Iron	--	--	1400	ug/l	329	237	NA	46.6 J	NA	80.1 J	NA	124	188	134	NA	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	11600	11500	NA	15900	NA	15800	NA	15500	16100	15400	NA	8100
Manganese	--	--	43	ug/l	2.5 U	2.5 U	NA	366	NA	10.7	NA	2.5 U	2.5 U	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	1.7 J	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	998	965	NA	4230	NA	2730	NA	1630	1230	1170	NA	3260
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	76700	72300	NA	26000	NA	24900	NA	23200	29300	26700	NA	13600
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	7.2
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-028a	CFMW-028a	CFMW-028a	CFMW-028a	CFMW-028a	CFMW-028a	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029
				Sample Date	12/09/2016	12/09/2016	03/21/2017	03/21/2017	06/27/2017	06/27/2017	09/13/2016	09/13/2016	09/13/2016	09/13/2016	12/14/2016	12/14/2016
				Sample Designation	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW
				Sample Type	N	N	N	N	N	N	N	FD	N	FD	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	T	DI	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	310	NA	266	1350	60.5	NA	NA	18.2 U	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	NA	0.62 U	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	8.2	NA	8.9	**10.2**	9.4	NA	NA	0.64 U	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	35.5	NA	36.3	53.5	40.2	NA	NA	233	225	NA	220
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	NA	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	NA	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	43200	NA	35000	35900	33700	NA	NA	52700	51100	NA	52800
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	1.9 J	1.3 U	NA	NA	1.3 U	1.3 U	NA	1.3 J
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	NA	1.3 U	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	5.3	1.4 U	NA	NA	4.5 J	1.4 UJ	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2.9 J	NA	2 U	NA	2 U	2 U	**366**	**357**	NA	NA	186	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	230	1540	42.4 U	NA	NA	172	164	NA	115 J
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.39 J	1.3	0.38 U	NA	NA	0.38 U	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	282	NA	3940	6560	6150	NA	NA	18700	17800	NA	17700
Manganese	--	--	43	ug/l	NA	2.5 U	NA	23.7	49.9	3 J	NA	NA	2.5 U	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	NA	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	1.6 J	1.4 U	NA	NA	1.4 U	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	2080	NA	1520	1710	1490	NA	NA	898	864	NA	923
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	NA	0.73 U	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	NA	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	9320	NA	6190	7040	6370	NA	NA	35400	34200	NA	21500
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	NA	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	22.1	NA	7.7	5	2.7 J	NA	NA	1.9 U	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	7 U	7 U	NA	NA	7 U	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031
				Sample Date	03/24/2017	03/24/2017	06/26/2017	06/26/2017	09/15/2016	09/15/2016	12/09/2016	12/09/2016	03/21/2017	03/21/2017	06/21/2017	06/21/2017
				Sample Designation	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-DUP13-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	FD
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	25.5 J	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	18.2 U	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	0.66 J	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	251	147	141	NA	164	NA	217	NA	213	150	147
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	58400	34500	34300	NA	47700	NA	60300	NA	59000	40500	39600
Chromium	100	100	0.035	ug/l	NA	7.3	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.6 J	NA	1.4 J	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.7 J	1.4 U	1.4 U	NA	1.4 U	NA	1.7 J	NA	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	8	NA	19.7	5.4	NA	NA	NA	NA	45.7	NA	2.8 J	3.5 J
Cyanide, Total	**200**	200	0.15	ug/l	**258**	NA	128	116	**233**	NA	**690**	NA	**520**	NA	104	103
Iron	--	--	1400	ug/l	NA	125	104 J	48.8 J	NA	99.8 J	NA	300	NA	224	46.4 J	46.4 J
Lead	15	15	15	ug/l	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	18900	11500	11200	NA	13200	NA	17300	NA	17200	12100	11900
Manganese	--	--	43	ug/l	NA	2.5 U	2.5 U	2.5 U	NA	2.5 U	NA	2.5 U	NA	2.5 U	2.5 U	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	1050	692	691	NA	736	NA	842	NA	861	712	697
Selenium	50	50	10	ug/l	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	36400	38900	35300	NA	29800	NA	32200	NA	40600	35000	34400
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-031	CFMW-031	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032	CFMW-032
				Sample Date	06/21/2017	06/21/2017	09/15/2016	09/15/2016	12/13/2016	12/13/2016	03/27/2017	03/27/2017	06/20/2017	06/20/2017	06/20/2017	06/20/2017
				Sample Designation	CFMW-031-GW	CFMW-DUP13-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-DUP12-GW	CFMW-032-GW	CFMW-DUP12-GW
				Sample Type	N	FD	N	N	N	N	N	N	N	FD	N	FD
				Sample Fraction	DI	DI	T	DI	T	DI	T	DI	T	T	DI	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	18.2 U	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	131	169	18.2 U	18.2 U
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	151	150	NA	147	NA	297	NA	285	156	158	146	145
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	40000	39600	NA	38800	NA	88000	NA	85700	42900	42800	42800	42300
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.6 J	2.1 J	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.4 J	1.5 J	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	NA	2.1 J	NA	2.9 J	NA	2.6 J	2.1 J	2.2 J	1.4 J	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	2.4 J	3.1 J	NA	NA	NA	NA	4.2 J	NA	46.1 J	129 J	45.9 J	135 J
Cyanide, Total	**200**	200	0.15	ug/l	101	100	**412 J-**	NA	152	NA	**238**	NA	**478**	**470**	**494 J-**	**483 J-**
Iron	--	--	1400	ug/l	42.4 U	42.4 U	NA	198	NA	52.2 J	NA	121	407	446	209	206
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	11100	10900	NA	11700	NA	22100	NA	23100	11900	12000	10500	10400
Manganese	--	--	43	ug/l	2.5 U	2.5 U	NA	536	NA	211	NA	3 J	83.2	84.3	74	72.2
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	1.4 J	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	691	678	NA	2630	NA	3020	NA	3120	2300	2350	2380	2270
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	30100	29700	NA	155000	NA	153000	NA	132000	198000	200000	159000	160000
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-033	CFMW-033	CFMW-033	CFMW-033
				Sample Date	09/16/2016	09/16/2016	12/16/2016	12/16/2016	03/29/2017	03/29/2017	06/27/2017	06/27/2017	09/15/2016	09/15/2016	12/06/2016	12/06/2016
				Sample Designation	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	69.3	NA	20.5 J	NA	102	195	97.5	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.86 J	NA	0.62 U	0.64 J	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	890	NA	269	NA	481	464	412	NA	176	NA	172
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	628000	NA	253000	NA	436000	390000	404000	NA	53600	NA	53600
Chromium	100	100	0.035	ug/l	NA	3.1 J	NA	8.1	NA	7.3	7.4	6.6	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	1.7 J	NA	1.7 J	NA	3.5 J	7.9	3.1 J	NA	4.1	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	1.5 U	1.5 U	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	NA	3.9 J	NA	2 U	2 U	**478**	NA	**483**	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	NA	42.4 U	181	42.4 U	NA	210	NA	223
Lead	15	15	15	ug/l	NA	0.6 J	NA	0.38 U	NA	0.38 U	1 J	1.2	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	63.6 U	NA	69 J	NA	63.6 U	259	63.6 U	NA	16600	NA	15600 J
Manganese	--	--	43	ug/l	NA	2.5 U	NA	2.5 U	NA	2.5 U	3.8 J	2.5 U	NA	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	21600	NA	3860	NA	7870	16200	17800	NA	944	NA	1040
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	25400	NA	11900	NA	13900	17700	16400	NA	43500	NA	39500
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	11.3 J	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-033	CFMW-033	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034
				Sample Date	03/21/2017	03/21/2017	06/19/2017	06/19/2017	09/14/2016	09/14/2016	12/13/2016	12/13/2016	03/21/2017	03/21/2017	06/19/2017	06/19/2017
				Sample Designation	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	18.2 U	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	59.5	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	174	143	134	NA	199	NA	300	NA	321	176	157
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	55600	40600	41700	NA	59100	NA	82500	NA	84000	45100	44100
Chromium	100	100	0.035	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.4 J	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	4.5	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	12.8	NA	10.6	5.7	NA	NA	NA	NA	17.1	NA	24.9	6.7
Cyanide, Total	**200**	200	0.15	ug/l	**515**	NA	181	190	**327**	NA	**255**	NA	**275**	NA	**287**	**287**
Iron	--	--	1400	ug/l	NA	228	94.5 J	75.8 J	NA	148	NA	86.2 J	NA	123	228	112 J
Lead	15	15	15	ug/l	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	17000	12800	11800	NA	15500	NA	19200	NA	20700	13100	11600
Manganese	--	--	43	ug/l	NA	2.5 U	2.5 U	2.5 U	NA	9.4	NA	20.5	NA	48.9	2.6 J	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	891	806	799	NA	918	NA	970	NA	959	902	830
Selenium	50	50	10	ug/l	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	37900	44900	38400	NA	27400	NA	31500	NA	29200	53100	43600
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-037
				Sample Date	09/14/2016	09/14/2016	12/13/2016	12/13/2016	03/21/2017	03/21/2017	06/20/2017	06/20/2017	09/16/2016	09/16/2016	12/08/2016	12/08/2016
				Sample Designation	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	NA	18.2 U	6950	177	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	5.8	NA	**10.4**	NA	9.5	**13.2**	**11.3**	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	546	NA	582	NA	613	745	702	NA	272	NA	280
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.4 J	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	76700	NA	77200	NA	79600	121000	84800	NA	49100	NA	46700
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	8.2	1.3 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	6.2	1.4 J	NA	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	20.9	1.4 U	NA	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	1.5 U	NA	4.4 J-	4.6 J	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	57.1	NA	51.7	NA	45.1	NA	53	51.4 J-	66.7	NA	40.7	NA
Iron	--	--	1400	ug/l	NA	502	NA	1230	NA	1220	10600	1670	NA	42.4 U	NA	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	13.2	1 J	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	32700	NA	31100	NA	35600	41000	31600	NA	14200	NA	14400
Manganese	--	--	43	ug/l	NA	1450	NA	1320	NA	1100	1270	1030	NA	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	9.3	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	2430	NA	1930	NA	1890	2910	2030	NA	807	NA	789
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	34500	NA	32700	NA	32000	33600	33500	NA	8930	NA	9550
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 U	7.1	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	47.3	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-037	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038
				Sample Date	03/23/2017	03/23/2017	06/20/2017	06/20/2017	09/14/2016	09/14/2016	12/09/2016	12/09/2016	03/24/2017	03/24/2017	06/27/2017	06/27/2017
				Sample Designation	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	70.3	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	27.1 J	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	262	298	288	NA	253	NA	250	NA	239	266	231
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	46000	48000	48400	NA	60600	NA	60000	NA	59000	63100	57800
Chromium	100	100	0.035	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.5 J	NA	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	1.5 U	NA	2.1 J	1.5 U	NA	NA	NA	NA	3.3 J	NA	4.8 J	4.4 J
Cyanide, Total	**200**	200	0.15	ug/l	37.5	NA	75.8	6 J-	**260**	NA	**286**	NA	110	NA	**298**	197
Iron	--	--	1400	ug/l	NA	42.4 U	108 J	42.4 U	NA	115 J	NA	128	NA	120	192	125
Lead	15	15	15	ug/l	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	13800	15600	14000	NA	16300	NA	16900	NA	16500	18300	15300
Manganese	--	--	43	ug/l	NA	2.5 J	2.5 U	2.5 U	NA	2.5 U	NA	2.5 U	NA	2.5 U	6.8 J	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	783	869	870	NA	1030	NA	961	NA	947	1040	910
Selenium	50	50	10	ug/l	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	9640	16200	14400	NA	37300	NA	36500	NA	35700	40800	32100
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-042	CFMW-042
				Sample Date	09/14/2016	09/14/2016	12/13/2016	12/13/2016	03/30/2017	03/30/2017	06/20/2017	06/20/2017	09/14/2016	09/14/2016	06/20/2017	06/20/2017
				Sample Designation	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-042-GW	CFMW-042-GW	CFMW-042-GW	CFMW-042-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	NA	18.2 U	18.5 J	18.2 U	NA	18.2 U	38.8 J	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	148	NA	150	NA	131	184	175	NA	157	178	171
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	55700	NA	53600	NA	53700	58300	58200	NA	56000	50400	52100
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 J	1.3 J	1.3 U
Copper	1300	1300	80	ug/l	NA	4	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	5.7	NA	40.4	45	NA	NA	27.6 J-	21.1
Cyanide, Total	**200**	200	0.15	ug/l	**304**	NA	**288**	NA	**288**	NA	**385**	**391 J-**	**402**	NA	**395**	**391 J-**
Iron	--	--	1400	ug/l	NA	140	NA	96.4 J	NA	130	225	147	NA	184	297	178
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	15600	NA	15200	NA	16300	18800	15800	NA	16200	16500	14600
Manganese	--	--	43	ug/l	NA	54.5	NA	7.1 J	NA	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	1180	NA	1020	NA	1040	1150	1100	NA	1010	1030	1010
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 UJ	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	34700	NA	32500	NA	31900	47200	39900	NA	43900	59600	51100
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044
				Sample Date	09/13/2016	09/13/2016	12/14/2016	12/14/2016	03/20/2017	03/20/2017	06/21/2017	06/21/2017	09/15/2016	09/15/2016	12/09/2016	12/09/2016
				Sample Designation	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	20.2 J	NA	18.2 U	22.9 J	18.2 U	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	136	NA	142	NA	150	171	169	NA	109	NA	119
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	51600	NA	51700	NA	55400	63000	60800	NA	50100	NA	45200
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 J	NA	1.3 U	NA	1.3 U	1.6 J	1.4 J	NA	1.4 J	NA	1.3 J
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.8 J	1.4 U	NA	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	14.7	NA	120	66.2	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	**510**	NA	**423**	NA	**477**	NA	**535**	**530**	**430**	NA	**220**	NA
Iron	--	--	1400	ug/l	NA	207	NA	185	NA	222	308	228	NA	370	NA	5120
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	15900	NA	15600	NA	16700	20300	17000	NA	16200	NA	17000
Manganese	--	--	43	ug/l	NA	38.8	NA	11.4	NA	3.1 J	2.5 U	2.5 U	NA	45.4	NA	209
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	2.6 J
Potassium	--	--	--	ug/l	NA	999	NA	960	NA	988	1030	986	NA	888	NA	1980
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	44200	NA	37900	NA	41700	44900	37100	NA	45000	NA	48100
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044a	CFMW-044a	CFMW-044a	CFMW-044a	CFMW-044a	CFMW-044a	CFMW-044a	CFMW-044a
				Sample Date	03/28/2017	03/28/2017	06/21/2017	06/21/2017	09/19/2016	09/19/2016	12/19/2016	12/19/2016	03/21/2017	03/21/2017	06/23/2017	06/23/2017
				Sample Designation	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	18.2 U	18.2 U	NA	108	NA	41.1	NA	171	417	21.9 J
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	2	NA	1.1 J	1.5 J	1.5 J
Barium	**1000**	2000	380	ug/l	NA	96.8 J	125	147	NA	75	NA	18.7	NA	24.2	35.5	31
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	51700 J	45100	67300	NA	155000	NA	24600	NA	23900	27000	25200
Chromium	100	100	0.035	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	4.2	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	2.1 J	1.3 U	NA	1.3 U	NA	1.5 J	NA	1.4 J	1.6 J	1.3 J
Copper	1300	1300	80	ug/l	NA	1.4 U	1.5 J	1.4 U	NA	1.9 J	NA	2.9 J	NA	8.7	9.5	6.2
Cyanide, Free	**200**	200	0.15	ug/l	4.9 J	NA	4.5 J	2.8 J	NA	NA	NA	NA	11.4	NA	7.8	10.3
Cyanide, Total	**200**	200	0.15	ug/l	**233**	NA	69.5	89.4	32.8	NA	125	NA	80.8	NA	119	120
Iron	--	--	1400	ug/l	NA	387 J	20400	42.4 U	NA	42.4 U	NA	42.4 U	NA	230	486	53.6 J
Lead	15	15	15	ug/l	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	16700 J	19700	13600	NA	121 J	NA	9190	NA	11600	12100	10600
Manganese	--	--	43	ug/l	NA	77.6	829	2.5 U	NA	2.5 U	NA	2.5 U	NA	10.5	36	22.6
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	2 J	8.8	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	958	3210	1050	NA	1660	NA	1120	NA	900	987	889
Selenium	50	50	10	ug/l	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	42400	50600	19100	NA	40700	NA	38700	NA	38700	44700	38800
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 U	1.9 U	NA	10.3	NA	8.6	NA	4.5	4.8	3.6 J
Zinc	**2000**	--	600	ug/l	NA	7 U	15.9 J	7 U	NA	7 U	NA	7 U	NA	7 U	12.9 J	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-045	CFMW-045	CFMW-045	CFMW-045
				Sample Date	09/19/2016	09/19/2016	12/19/2016	12/19/2016	03/24/2017	03/24/2017	06/23/2017	06/23/2017	09/15/2016	09/15/2016	12/14/2016	12/14/2016
				Sample Designation	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	NA	18.2 U	40.9	18.2 U	NA	18.2 U	NA	18.5 J
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	87.4	NA	251	NA	309	374	352	NA	150	NA	155
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	13700	NA	31300	NA	37700	41100	40200	NA	53700	NA	52900
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	3.8 J	NA	2.8 J
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	5.9 J	NA	8.2 J	NA	9.8 J	NA	10.5	10.1	**365**	NA	**392**	NA
Iron	--	--	1400	ug/l	NA	732	NA	2200	NA	1760	4880	1400	NA	152	NA	170
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	3.9	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	16500	NA	21500	NA	21500	22500	19700	NA	15600	NA	15500
Manganese	--	--	43	ug/l	NA	86.2	NA	155	NA	137	169	140	NA	8.8	NA	6.6 J
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	2520	NA	1440	NA	1010	1000	950	NA	936	NA	986
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	3900	NA	4060	NA	4020	4840	4340	NA	39000	NA	40700
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	26.6	384	7.2 J	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045a	CFMW-045a	CFMW-045a	CFMW-045a	CFMW-045a	CFMW-045a	CFMW-045a	CFMW-045a
				Sample Date	03/23/2017	03/23/2017	06/28/2017	06/28/2017	09/19/2016	09/19/2016	12/09/2016	12/09/2016	03/24/2017	03/24/2017	06/23/2017	06/23/2017
				Sample Designation	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	139	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	25.1 J	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	130	175	156	NA	88.5	NA	18.9	NA	115	127	124
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	48600	55500	53000	NA	45800	NA	4500	NA	53700	57000	56800
Chromium	100	100	0.035	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	5	NA	1.3 U	3.2 J	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	1.3 J	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	2.9 J	NA	33.7 J-	14.4 J-	NA	NA	NA	NA	1.5 U	NA	1.6 J	2.4 J
Cyanide, Total	**200**	200	0.15	ug/l	**381**	NA	**450**	**428**	56	NA	34.8	NA	52.9	NA	63.2	67.3
Iron	--	--	1400	ug/l	NA	147	432	169	NA	42.4 U	NA	42.4 U	NA	317	489	316
Lead	15	15	15	ug/l	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	14100	17100	14300	NA	13000	NA	4800	NA	15100	16100	15200
Manganese	--	--	43	ug/l	NA	10.1	3.5 J	2.5 U	NA	23.6	NA	2.5 U	NA	58.2	74.9	66.9
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	860	1090	962	NA	2300	NA	3590	NA	1560	1240	1180
Selenium	50	50	10	ug/l	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	36000	54200	44300	NA	31100	NA	27700	NA	31600	32600	28300
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 U	1.9 U	NA	2.3 J	NA	4	NA	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-049	CFMW-049	CFMW-049	CFMW-049
				Sample Date	09/14/2016	09/14/2016	12/15/2016	12/15/2016	03/23/2017	03/23/2017	06/21/2017	06/21/2017	09/21/2016	09/21/2016	12/15/2016	12/15/2016
				Sample Designation	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-049-GW	CFMW-049-GW	CFMW-049-GW	CFMW-DUP6-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	FD
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	NA	20.7 J	39.6 J	18.2 U	NA	18.2 U	NA	NA
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	NA
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	NA
Barium	**1000**	2000	380	ug/l	NA	232	NA	244	NA	217	209	201	NA	273	NA	NA
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	NA
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	NA
Calcium	--	--	--	ug/l	NA	57100	NA	58400	NA	53000	51300	49500	NA	47600	NA	NA
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	NA
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	NA
Copper	1300	1300	80	ug/l	NA	4.1	NA	1.4 J	NA	1.4 J	2.3 J	1.4 U	NA	4	NA	NA
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	1.5 U	NA	10	4.1 J	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	120	NA	145	NA	171	NA	119	120	93.2	NA	82.9	84.6
Iron	--	--	1400	ug/l	NA	55.1 J	NA	42.4 U	NA	95.6 J	105 J	45.6 J	NA	42.4 U	NA	NA
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	NA
Magnesium	--	--	--	ug/l	NA	15600	NA	16600	NA	15300	15700	13700	NA	15500	NA	NA
Manganese	--	--	43	ug/l	NA	2.5 U	NA	2.5 U	NA	2.5 U	2.5 U	2.5 U	NA	2.5 U	NA	NA
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	NA
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	NA
Potassium	--	--	--	ug/l	NA	1200	NA	972	NA	907	909	875	NA	857	NA	NA
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	NA
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	NA
Sodium	--	--	--	ug/l	NA	18500	NA	21100	NA	23600	19100	16400	NA	10100	NA	NA
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	NA
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	NA
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U	NA	NA

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-049a	CFMW-049a	CFMW-049a	CFMW-049a	CFMW-049a	CFMW-049a
				Sample Date	12/15/2016	12/15/2016	03/23/2017	03/23/2017	06/21/2017	06/21/2017	09/16/2016	09/16/2016	12/15/2016	12/15/2016	03/23/2017	03/23/2017
				Sample Designation	CFMW-049-GW	CFMW-DUP6-GW	CFMW-049-GW	CFMW-049-GW	CFMW-049-GW	CFMW-049-GW	CFMW-049a-GW	CFMW-049a-GW	CFMW-049a-GW	CFMW-049a-GW	CFMW-049a-GW	CFMW-049a-GW
				Sample Type	N	FD	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	DI	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	18.2 U	18.2 U	NA	18.2 U	23.2 J	18.2 U	NA	18.2 U	NA	21.9 J	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	0.64 U	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	278	278	NA	280	276	276	NA	520	NA	224	NA	**1010**
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	47200	47500	NA	48500	46400	46400	NA	198000	NA	41100	NA	233000
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	4	NA	1.4 J	NA	4.3
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	3.8 J	NA	1.7 J
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	1.5 U	NA	5.5	4.7 J	NA	NA	NA	NA	1.5 U	NA
Cyanide, Total	**200**	200	0.15	ug/l	NA	NA	87.5	NA	89.7	89.8	47.1	NA	71.5	NA	8 J	NA
Iron	--	--	1400	ug/l	42.4 U	42.4 U	NA	79.3 J	68.9 J	42.4 U	NA	42.4 U	NA	42.4 U	NA	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	15400	15300	NA	16000	16400	14400	NA	291	NA	13600	NA	605
Manganese	--	--	43	ug/l	2.5 U	2.5 U	NA	7.4 J	2.5 U	2.5 U	NA	2.5 U	NA	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	783	804	NA	803	806	786	NA	19700	NA	3480	NA	10800
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	10200	10200	NA	10300	12200	10500	NA	25200	NA	12000	NA	20400
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 J	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	7 U	7 U	7 U	NA	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-049a	CFMW-049a	CFMW-050	CFMW-050	CFMW-050	CFMW-050	CFMW-050	CFMW-050	CFMW-050	CFMW-050	CFMW-053	CFMW-053
				Sample Date	06/21/2017	06/21/2017	09/19/2016	09/19/2016	12/15/2016	12/15/2016	03/23/2017	03/23/2017	06/21/2017	06/21/2017	09/14/2016	09/14/2016
				Sample Designation	CFMW-049a-GW	CFMW-049a-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-053-GW	CFMW-053-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	42.7	18.2 U	NA	18.2 U	NA	18.2 U	NA	18.2 U	18.2 U	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	371	275	NA	255	NA	257	NA	256	276	271	NA	147
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	86300	51100	NA	46800	NA	46600	NA	49400	49400	48600	NA	58200
Chromium	100	100	0.035	ug/l	3 J	2.4 J	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 J
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	NA	3.8 J	NA	4.2	NA	1.4 U	1.4 U	1.4 U	NA	4.6
Cyanide, Free	**200**	200	0.15	ug/l	1.8 J	1.6 J	NA	NA	NA	NA	1.5 U	NA	4.5 J	3.9 J	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	58.6	38.2	51.7	NA	51.6	NA	72.4	NA	106	105	**363**	NA
Iron	--	--	1400	ug/l	50.4 J	42.4 U	NA	42.4 U	NA	42.4 U	NA	42.4 U	42.4 J	42.4 U	NA	179
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	13300	6200	NA	15300	NA	15400	NA	16300	17500	14800	NA	16600
Manganese	--	--	43	ug/l	2.5 U	2.5 U	NA	3.1 J	NA	3.7 J	NA	2.7 J	2.5 U	2.5 U	NA	2.5 U
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	3750	3400	NA	845	NA	844	NA	820	840	801	NA	1070
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	13700	12000	NA	11700	NA	10700	NA	9690	13000	11300	NA	44000
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-053a	CFMW-053a	CFMW-053a	CFMW-053a	CFMW-053a	CFMW-053a	CFMW-053a	CFMW-053a
				Sample Date	12/12/2016	12/12/2016	06/28/2017	06/28/2017	09/19/2016	09/19/2016	12/19/2016	12/19/2016	03/27/2017	03/27/2017	06/28/2017	06/28/2017
				Sample Designation	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	18.2 U	18.2 U	NA	90.6	NA	115	NA	110	151	115
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	1.3 J	**10**	**8.2**
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	143	145	132	NA	**4430**	NA	**2390**	NA	**2540**	**2310**	**2120**
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	55100	57600	57100	NA	922000	NA	593000	NA	588000	602000	627000
Chromium	100	100	0.035	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	11.4	NA	1.7 J	NA	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	2 J	1.4 U	NA	2.4 J	NA	4.5	NA	8.4	12	8
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	5.2 J-	3.3 J-	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	**386**	NA	**239**	**238**	2 U	NA	2 U	NA	2 U	NA	2 U	2 U
Iron	--	--	1400	ug/l	NA	135	116 J	86.8 J	NA	42.4 U	NA	42.4 U	NA	42.4 U	269	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	0.38 U	0.38 U	NA	0.62 J	NA	0.89 J	NA	1.5	2	1.5
Magnesium	--	--	--	ug/l	NA	15600	17800	15500	NA	63.6 U	NA	63.6 U	NA	63.6 U	63.6 U	63.6 U
Manganese	--	--	43	ug/l	NA	2.5 U	2.5 U	2.5 U	NA	2.5 U	NA	2.5 U	NA	2.5 U	2.5 U	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	3.4 J	2.2 J	1.8 J
Potassium	--	--	--	ug/l	NA	918	920	868	NA	65200	NA	13500	NA	12400	10800	10400
Selenium	50	50	10	ug/l	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	41900	28600	24500	NA	102000	NA	47500	NA	92700	31200	27200
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	15.5 J	7.8 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-056	CFMW-056	CFMW-056	CFMW-056
				Sample Date	09/14/2016	09/14/2016	12/12/2016	12/12/2016	03/22/2017	03/22/2017	06/21/2017	06/21/2017	09/20/2016	09/20/2016	09/20/2016	09/20/2016
				Sample Designation	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-056-GW	CFMW-DUP3-GW	CFMW-056-GW	CFMW-DUP3-GW
				Sample Type	N	N	N	N	N	N	N	N	N	FD	N	FD
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	T	DI	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	NA	18.2 U	277	18.2 U	NA	NA	18.2 U	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	NA	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	NA	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	153	NA	153	NA	146	148	145	NA	NA	144	142
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	NA	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	NA	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	59400	NA	56200	NA	56100	57800	57400	NA	NA	48700	49700
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	NA	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	NA	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	NA	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	13.5	NA	40.3	19.1	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	**327**	NA	**382**	NA	**391**	NA	**302**	**284**	2 U	2 U	NA	NA
Iron	--	--	1400	ug/l	NA	156	NA	126	NA	167	463	163	NA	NA	516	514
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	NA	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	16500	NA	15600	NA	16200	17400	16200	NA	NA	18700	19000
Manganese	--	--	43	ug/l	NA	2.5 U	NA	2.5 U	NA	2.5 U	9.2	2.5 U	NA	NA	36.7	37.4
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	NA	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	NA	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	1050	NA	931	NA	1000	1020	958	NA	NA	1570	1590
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	NA	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	NA	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	38800	NA	38900	NA	41100	36400	34800	NA	NA	4100	4280
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	NA	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	NA	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	NA	7 U	7.1 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-056	CFMW-056	CFMW-056	CFMW-056	CFMW-056	CFMW-056	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056a
				Sample Date	12/13/2016	12/13/2016	03/22/2017	03/22/2017	06/22/2017	06/22/2017	09/20/2016	09/20/2016	12/06/2016	12/06/2016	12/06/2016	12/06/2016
				Sample Designation	CFMW-056-GW	CFMW-056-GW	CFMW-056-GW	CFMW-056-GW	CFMW-056-GW	CFMW-056-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-DUP4-GW	CFMW-056a-GW	CFMW-DUP4-GW
				Sample Type	N	N	N	N	N	N	N	N	N	FD	N	FD
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	T	DI	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	18.2 U	18.2 U	NA	43	NA	NA	21.4 J	24.6 J
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.87 J	NA	NA	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	0.74 J	0.64 U	NA	2.2	NA	NA	2.2	2.3
Barium	**1000**	2000	380	ug/l	NA	5.8	NA	137	144	135	NA	73.3	NA	NA	111	116
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	NA	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	NA	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	4800	NA	47800	48800	47000	NA	18600	NA	NA	26400	27000
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	NA	1.4 U	2.6 J	1.4 U	NA	3 J	NA	NA	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	NA	2 U	2 U	2 U	NA	3.3 J	2 UJ	NA	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	1680	7280	857	NA	42.4 U	NA	NA	42.4 U	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	0.69 J	0.38 U	NA	0.42 J	NA	NA	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	7440	NA	18200	19500	17900	NA	7470	NA	NA	10400 J	10800 J
Manganese	--	--	43	ug/l	NA	15.6	NA	32.5	60.5	24.8	NA	73.3	NA	NA	241	248
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	NA	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	2.7 J	1.4 U	NA	1.4 U	NA	NA	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	1590	NA	1530	1570	1530	NA	10800	NA	NA	6160	6500
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	NA	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	4590	NA	3980	4250	4270	NA	26700	NA	NA	18300	18200
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	NA	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	5.4	NA	NA	3.4 J	3.6 J
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	176	907	7 U	NA	7 U	NA	NA	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056b	CFMW-056b	CFMW-056b	CFMW-056b	CFMW-056b	CFMW-056b	CFMW-056b	CFMW-056b
				Sample Date	03/30/2017	03/30/2017	06/22/2017	06/22/2017	09/13/2016	09/13/2016	12/12/2016	12/12/2016	03/21/2017	03/21/2017	03/21/2017	03/21/2017
				Sample Designation	CFMW-056a-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-056b-GW	CFMW-056b-GW	CFMW-056b-GW	CFMW-056b-GW	CFMW-0566-GW	CFMW-Dup7-GW	CFMW-0566-GW	CFMW-Dup7-GW
				Sample Type	N	N	N	N	N	N	N	N	N	FD	N	FD
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	T	DI	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	1430	18.2 U	NA	18.2 U	NA	18.2 U	NA	NA	18.2 U	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	NA	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.79 J	1.9 J	0.99 J	NA	0.64 U	NA	0.64 U	NA	NA	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	214	186	170	NA	132	NA	132	NA	NA	123	124
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	NA	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	NA	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	38400	29100	29000	NA	69000	NA	64900	NA	NA	61300	61900
Chromium	100	100	0.035	ug/l	NA	1.3 U	2.9 J	1.3 U	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	3.8 J	1.4 U	NA	3.7 J	NA	1.4 U	NA	NA	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	1.5 U	NA	1.5 U	1.5 U	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	2 U	2 U	NA	2 U	NA	2 U	2 U	NA	NA
Iron	--	--	1400	ug/l	NA	120	2110	42.4 U	NA	42.4 U	NA	42.4 U	NA	NA	42.4 U	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	1.1 J	0.38 U	NA	0.38 U	NA	0.38 U	NA	NA	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	15700	14100	12700	NA	17500	NA	15400	NA	NA	15600	15700
Manganese	--	--	43	ug/l	NA	424	391	327	NA	83.2	NA	11.2	NA	NA	2.5 U	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	NA	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	1.5 J	1.4 U	NA	1.4 U	NA	1.4 U	NA	NA	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	2670	7650	7310	NA	925	NA	771	NA	NA	692	700
Selenium	50	50	10	ug/l	NA	2 J	0.73 U	1.2 J	NA	0.73 U	NA	0.73 U	NA	NA	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 UJ	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	9290	17800	17100	NA	9450	NA	7000	NA	NA	3490	3510
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	NA	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 J	1.9 U	NA	1.9 U	NA	1.9 U	NA	NA	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	11.6 J	7 U	NA	7 U	NA	7 U	NA	NA	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-056b	CFMW-056b	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057
				Sample Date	06/22/2017	06/22/2017	09/19/2016	09/19/2016	12/05/2016	12/05/2016	03/29/2017	03/29/2017	03/29/2017	03/29/2017	06/28/2017	06/28/2017
				Sample Designation	CFMW-056b-GW	CFMW-056b-GW	CFMW-057-GW	CFMW-057-GW	CFMW-057-GW	CFMW-057-GW	CFMW-057-GW	CFMW-DUP11-GW	CFMW-057-GW	CFMW-DUP11-GW	CFMW-057-GW	CFMW-057-GW
				Sample Type	N	N	N	N	N	N	N	FD	N	FD	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	T	DI	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	18.2 U	18.2 U	NA	18.2 U	NA	18.2 U	NA	NA	18.2 U	18.2 U	123 J+	18.2 U
Antimony	**6**	6	0.78	ug/l	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	NA	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	0.64 U	0.64 U	NA	0.64 U	NA	0.64 U	NA	NA	0.64 U	0.64 U	1.7 J	0.64 U
Barium	**1000**	2000	380	ug/l	152	149	NA	46.3	NA	43.6	NA	NA	50.8	51	121	111
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	NA	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	NA	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	69900	70800	NA	20500	NA	19400	NA	NA	21900	21800	39500	39400
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	NA	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	2 U	2 U	NA	2 U	NA	2 U	2 U	NA	NA	2 U	2 U
Iron	--	--	1400	ug/l	42.4 U	42.4 U	NA	2290	NA	2440	NA	NA	3430	3420	17400	2580
Lead	15	15	15	ug/l	0.38 U	0.38 U	NA	0.38 U	NA	0.38 U	NA	NA	0.38 U	0.38 U	6.6	0.38 U
Magnesium	--	--	--	ug/l	18500	17600	NA	15600	NA	15700	NA	NA	20500	20200	23800	21500
Manganese	--	--	43	ug/l	2.5 U	2.5 U	NA	65.6	NA	59.1	NA	NA	74.4	74.2	96.5	46
Mercury	2	2	0.063	ug/l	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	NA	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	NA	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	806	824	NA	1730	NA	1690	NA	NA	1830	1820	2360	2240
Selenium	50	50	10	ug/l	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	NA	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	NA	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	9810	9500	NA	3700	NA	3800	NA	NA	3920	3850	5880 J+	5040
Thallium	2	2	0.02	ug/l	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	NA	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	NA	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	7 U	7 U	NA	7 U	NA	7 U	NA	NA	73.9	71.3	770	8.8 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-057a	CFMW-057a	CFMW-057a	CFMW-057a	CFMW-057a	CFMW-057a	CFMW-057a	CFMW-057a	CFMW-059	CFMW-059	CFMW-059	CFMW-059
				Sample Date	09/19/2016	09/19/2016	12/16/2016	12/16/2016	03/22/2017	03/22/2017	06/28/2017	06/28/2017	09/15/2016	09/15/2016	12/12/2016	12/12/2016
				Sample Designation	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	168	NA	417	NA	902	1240	897	NA	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	NA	0.62 U	1.6 J	0.62 U	NA	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	NA	0.64 U	0.64 J	0.64 U	NA	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	924	NA	364	NA	148	98	89.7	NA	140	NA	154
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	581000	NA	344000	NA	154000	112000	109000	NA	69300	NA	72100
Chromium	100	100	0.035	ug/l	NA	16	NA	22.3	NA	24.1	20.4	17.2	NA	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	7.1	NA	3.6 J	NA	5.2	6.5	3.9 J	NA	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	NA	2 U	NA	2 U	2 U	2 U	NA	2 U	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	NA	42.4 U	457	42.4 U	NA	42.4 U	NA	42.4 U
Lead	15	15	15	ug/l	NA	1.3	NA	0.38 U	NA	0.38 U	0.85 J	0.38 U	NA	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	63.6 U	NA	63.6 U	NA	63.6 U	226	63.6 U	NA	14100	NA	14100
Manganese	--	--	43	ug/l	NA	2.5 U	NA	2.5 U	NA	2.5 U	9.8	2.5 U	NA	88.4	NA	16.8
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	18100	NA	6500	NA	12300	11500	11000	NA	1150	NA	1000
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.98 J	0.73 U	NA	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	48100	NA	28200	NA	26600	21600	19300	NA	20600	NA	15200
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	NA	1.9 J	5.2	3.9 J	NA	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	NA	7 U	7 U	7 U	NA	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-059	CFMW-059	CFMW-059	CFMW-059	CFMW-059a	CFMW-059a	CFMW-059a	CFMW-059a	CFMW-059a	CFMW-059a	CFMW-059a	CFMW-059a
				Sample Date	03/23/2017	03/23/2017	06/21/2017	06/21/2017	09/19/2016	09/19/2016	12/16/2016	12/16/2016	03/29/2017	03/29/2017	06/28/2017	06/28/2017
				Sample Designation	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	DI	T	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	619	18.2 U	NA	137	NA	18.2 U	NA	20.2 J	861	34.6 J
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U	NA	4	NA	4.3	4.6	3.7
Barium	**1000**	2000	380	ug/l	NA	146	158	145	NA	268	NA	121	NA	110	147	125
Beryllium	4	4	2.5	ug/l	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	68300	68700	55000	NA	340000	NA	29000	NA	32400	39700	34500
Chromium	100	100	0.035	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 J	NA	1.3 U	NA	1.3 U	1.5 J	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 U	2.1 J	1.4 U	NA	3.7 J	NA	1.4 U	NA	1.4 U	1.9 J	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	2 U	NA	2 U	2 U	2 U	NA	2 U	NA	2 U	NA	2 U	2 U
Iron	--	--	1400	ug/l	NA	42.4 U	940	129	NA	42.4 U	NA	42.4 U	NA	42.4 U	1120	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	0.73 J	0.38 U	NA	0.38 U	NA	0.38 U	NA	0.38 U	0.65 J	0.38 U
Magnesium	--	--	--	ug/l	NA	13900	15200	14200	NA	63.6 U	NA	10500	NA	9860	10900	9290
Manganese	--	--	43	ug/l	NA	2.5 U	40.5	2.5 U	NA	2.5 U	NA	29.8	NA	29	71.5	33.3
Mercury	2	2	0.063	ug/l	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	NA	1010	1230	917	NA	7920	NA	1210	NA	1560	1940	1560
Selenium	50	50	10	ug/l	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	18600	21600	30600	NA	15400	NA	3430 J+	NA	3800	4050	3400
Thallium	2	2	0.02	ug/l	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U	NA	1.9 U	NA	1.9 U	2 J	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	7 U	7 U	NA	7 U	NA	7 U	NA	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064
				Sample Date	09/15/2016	09/15/2016	12/07/2016	12/07/2016	12/07/2016	12/07/2016	03/23/2017	03/23/2017	06/23/2017	06/23/2017	09/15/2016	09/15/2016
				Sample Designation	CFMW-061-GW	CFMW-061-GW	CFMW-061-GW	CFMW-DUP5-GW	CFMW-061-GW	CFMW-DUP5-GW	CFMW-061-GW	CFMW-061-GW	CFMW-061-GW	CFMW-061-GW	CFMW-064-GW	CFMW-064-GW
				Sample Type	N	N	N	FD	N	FD	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	DI	DI	T	DI	T	DI	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	NA	18.2 U	18.2 U	NA	18.2 U	18.2 U	18.2 U	NA	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	NA	0.62 U	0.62 U	NA	0.62 U	0.62 U	0.62 U	NA	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	NA	0.64 U	0.64 U	NA	0.64 U	0.64 U	0.64 U	NA	0.64 U
Barium	**1000**	2000	380	ug/l	NA	220	NA	NA	300	297	NA	203	232	226	NA	312
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	NA	0.24 U	0.24 U	NA	0.24 U	0.24 U	0.24 U	NA	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	NA	0.71 U	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA	0.71 U
Calcium	--	--	--	ug/l	NA	50100	NA	NA	60700	60600	NA	46300	51100	51100	NA	47100
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	NA	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	NA	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Copper	1300	1300	80	ug/l	NA	3.1 J	NA	NA	1.4 U	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	1.5 U	NA	1.5 U	1.5 U	NA	NA
Cyanide, Total	**200**	200	0.15	ug/l	7.7 J	NA	4 J	3.8 J	NA	NA	2 U	NA	2 U	2 U	42.7	NA
Iron	--	--	1400	ug/l	NA	42.4 U	NA	NA	42.4 U	42.4 U	NA	42.4 U	42.4 U	42.4 U	NA	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	NA	NA	0.38 U	0.38 U	NA	0.38 U	0.38 U	0.38 U	NA	0.38 U
Magnesium	--	--	--	ug/l	NA	16200	NA	NA	20600	20100	NA	15300	17700	15400	NA	17900
Manganese	--	--	43	ug/l	NA	68	NA	NA	15.6	15.3	NA	2.5 U	2.5 U	2.5 U	NA	19.3
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	NA	0.17 U	0.17 U	NA	0.17 U	0.17 U	0.17 U	NA	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	NA	1.4 U	1.4 U	NA	1.4 U	1.4 U	1.4 U	NA	1.4 U
Potassium	--	--	--	ug/l	NA	837	NA	NA	871	861	NA	667	692	690	NA	948
Selenium	50	50	10	ug/l	NA	0.73 U	NA	NA	0.73 U	0.73 U	NA	0.73 U	0.73 U	0.73 U	NA	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	NA	1.3 U	1.3 U	NA	1.3 U	1.3 U	1.3 U	NA	1.3 U
Sodium	--	--	--	ug/l	NA	8660	NA	NA	11400	11100	NA	5890	6010	5420	NA	9020
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	NA	0.26 U	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	NA	1.9 U	1.9 U	NA	1.9 U	1.9 U	1.9 U	NA	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	NA	7 UJ	18.2 J	NA	7 U	7 U	7 U	NA	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G3. Metals in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-064	CFMW-064	CFMW-064	CFMW-064	CFMW-064	CFMW-064	CFMW-064	CFMW-064
				Sample Date	12/07/2016	12/07/2016	03/23/2017	03/23/2017	06/23/2017	06/23/2017	06/23/2017	06/23/2017
				Sample Designation	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW	CFMW-DUP14-GW	CFMW-064-GW	CFMW-DUP14-GW
				Sample Type	N	N	N	N	N	FD	N	FD
				Sample Fraction	T	DI	T	DI	T	T	DI	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit								
Aluminum	--	--	2000	ug/l	NA	18.2 U	NA	18.2 U	18.2 UJ	101 J	18.2 U	18.2 U
Antimony	**6**	6	0.78	ug/l	NA	0.62 U	NA	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**10**	10	0.052	ug/l	NA	0.64 U	NA	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**1000**	2000	380	ug/l	NA	339	NA	290	345	344	339	336
Beryllium	4	4	2.5	ug/l	NA	0.24 U	NA	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	NA	0.71 U	NA	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	NA	46400	NA	45000	47800	47500	48100	47700
Chromium	100	100	0.035	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	NA	1.4 J	NA	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**200**	200	0.15	ug/l	NA	NA	1.5 U	NA	1.5 U	1.5 U	1.5 U	1.5 U
Cyanide, Total	**200**	200	0.15	ug/l	62.4	NA	13.5	NA	60.1	60.5	62.6	61.5
Iron	--	--	1400	ug/l	NA	42.4 U	NA	42.4 U	42.4 UJ	140 J	42.4 U	42.4 U
Lead	15	15	15	ug/l	NA	0.38 U	NA	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	NA	18700	NA	17400	20000	19900	17700	17500
Manganese	--	--	43	ug/l	NA	6.2 J	NA	5.7 J	2.5 UJ	6.5 J	2.5 U	2.5 U
Mercury	2	2	0.063	ug/l	NA	0.17 U	NA	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	NA	1.4 U	NA	1.4 U	1.4 U	1.4 U	2.1 J	1.4 UJ
Potassium	--	--	--	ug/l	NA	982	NA	794	924	945	905	908
Selenium	50	50	10	ug/l	NA	0.73 U	NA	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	NA	1.3 U	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	NA	10400	NA	7410	11200	11100	9880	9840
Thallium	2	2	0.02	ug/l	NA	0.26 U	NA	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	NA	1.9 U	NA	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**2000**	--	600	ug/l	NA	7 U	NA	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-001	CFMW-001	CFMW-001	CFMW-001	CFMW-001	CFMW-002	CFMW-002	CFMW-002	CFMW-002	CFMW-003	CFMW-003
				Sample Date	09/20/2016	12/12/2016	03/20/2017	06/19/2017	06/19/2017	09/12/2016	03/24/2017	06/27/2017	06/27/2017	09/14/2016	12/09/2016
				Sample Designation	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-001-GW	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW	CFMW-002-GW	CFMW-003-GW	CFMW-003-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	DI	T	T	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	200000	206000	212000	214000	NA	416000	482000	283000	NA	664000	673000
Ammonia	--	--	--	ug/l	72 U	72 U	72 U	72 U	NA	93 J	139	72 U	NA	154	362
Chloride	--	--	--	ug/l	611	799 J+	393	338 J+	NA	4130	1800 J+	1750 J+	NA	39100 J-	33400
Fluoride	**4000**	4000	80	ug/l	91.7	132	184	159	120	**18900**	**8900**	**4930**	**5150 J+**	15 U	536 J-
Hardness as calcium carbonate	--	--	--	ug/l	206000	228000	204000	198000	NA	140000	166000	118000	NA	134000	736000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	100 U	100 UJ	100 U	100 U	NA	**14300**	**37200**	6530	NA	5730	9560
Orthophosphate as P	--	--	--	ug/l	42 U	NA	48 U	48 UJ	NA	42 U	NA	48 UJ	NA	42 UJ	NA
Sulfate	--	--	--	ug/l	6600	4980 J-	7000	5660 J+	NA	14400	22000 J+	6730 J+	NA	694000 J-	618000 J
Total Dissolved Solids	--	--	--	mg/l	216	202 J	174	208	NA	590	704	408	NA	1650	1760 J
Total Suspended Solids	--	--	--	mg/l	123 J	434	146 J	41.5	NA	28.4	13.9 J	5.4	NA	39.4	268

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-003	CFMW-003	CFMW-003	CFMW-003a	CFMW-003a	CFMW-003a	CFMW-003a	CFMW-003a	CFMW-007	CFMW-007	CFMW-007
				Sample Date	03/22/2017	06/27/2017	06/27/2017	09/20/2016	12/12/2016	03/20/2017	06/19/2017	06/19/2017	09/21/2016	12/12/2016	03/28/2017
				Sample Designation	CFMW-003-GW	CFMW-003-GW	CFMW-003-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-003a-GW	CFMW-007-GW	CFMW-007-GW	CFMW-007-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	DI	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	695000	674000	NA	112000	90700	120000	130000	NA	374000	203000	204000
Ammonia	--	--	--	ug/l	72 U	72 U	NA	72 U	99 J+	72 U	72 U	NA	72 U	95.6 J+	77.5 J
Chloride	--	--	--	ug/l	46600 J+	36500	NA	8600	8600	8900 J+	6240	NA	1860 J-	1480	1520 J+
Fluoride	**4000**	4000	80	ug/l	60 U	60 U	60 U	312	337	373	276	274	77 J	123	101
Hardness as calcium carbonate	--	--	--	ug/l	820000	780000	NA	164000	96000	132000	124000	NA	184000	220000	210000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	**10100**	9370	NA	100 U	108 J-	100 U	145	NA	100 U	100 UJ	3880
Orthophosphate as P	--	--	--	ug/l	NA	48 UJ	NA	42 U	48 UJ	48 U	48 UJ	NA	42 UJ	48 UJ	48 UJ
Sulfate	--	--	--	ug/l	961000 J+	905000 J-	NA	36700	34700 J-	20200	13900 J+	NA	5530	16100 J-	16300 J+
Total Dissolved Solids	--	--	--	mg/l	1950	2000	NA	254	234 J	198	143	NA	171	220 J	242
Total Suspended Solids	--	--	--	mg/l	52	20.7	NA	1090 J	13.4	493 J	58.3	NA	76	38.3	68.8

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-007	CFMW-007	CFMW-008	CFMW-008	CFMW-008	CFMW-008	CFMW-008	CFMW-008a	CFMW-008a	CFMW-008a	CFMW-008a
				Sample Date	06/19/2017	06/19/2017	09/21/2016	12/16/2016	03/28/2017	06/20/2017	06/20/2017	09/15/2016	12/16/2016	03/28/2017	06/28/2017
				Sample Designation	CFMW-007-GW	CFMW-007-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW	CFMW-008a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	194000	NA	347000	340000	368000	382000	NA	1060000	1320000	1350000	1280000
Ammonia	--	--	--	ug/l	72 U	NA	322	838	659	519	NA	199	639	1540	1070 J+
Chloride	--	--	--	ug/l	1300 J+	NA	2020	3650 J	1460 J+	1230	NA	8430 J-	4930 J	5560 J+	5090
Fluoride	**4000**	4000	80	ug/l	152	126	777	456 J	427	527	431	180	179 J	160	304 J-
Hardness as calcium carbonate	--	--	--	ug/l	190000	NA	28000	180000	160000	129000	NA	1000000	1150000	1240000	1100000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	100 U	NA	100 U	100 U	100 U	2000 UJ	NA	104	121	100 U	168
Orthophosphate as P	--	--	--	ug/l	48 UJ	NA	42 UJ	48 U	48 UJ	48 UJ	NA	42 UJ	48 U	48 UJ	48 UJ
Sulfate	--	--	--	ug/l	12200 J+	NA	7030	15300 J	10400 J+	3150 J+	NA	20200	5440 J	6000 J+	8730
Total Dissolved Solids	--	--	--	mg/l	178	NA	353	391	396	399 J	NA	1210	1140	1800	1300 J
Total Suspended Solids	--	--	--	mg/l	27.6	NA	543	126	170	178 J	NA	26.4	13.9	9.8	6.5 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-008a	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-010	CFMW-011	CFMW-011	CFMW-011	CFMW-011	CFMW-011
				Sample Date	06/28/2017	09/12/2016	12/15/2016	03/24/2017	06/27/2017	06/27/2017	09/13/2016	12/08/2016	03/27/2017	06/28/2017	06/28/2017
				Sample Designation	CFMW-008a-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-010-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-011-GW	CFMW-DUP15-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	FD
				Sample Fraction	DI	T	T	T	T	DI	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	NA	875000	514000	458000	323000	NA	196000	218000	260000	213000	208000
Ammonia	--	--	--	ug/l	NA	1240	477	596	218	NA	72 U	72 U	72 U	72 U	72 U
Chloride	--	--	--	ug/l	NA	4630	442	1890 J+	1710 J+	NA	1590	681 J	1810 J+	1750	1780
Fluoride	**4000**	4000	80	ug/l	277 J+	**30900**	3190	**17200**	**6810**	**6980 J+**	207	241 J	298 J+	297 J-	289 J-
Hardness as calcium carbonate	--	--	--	ug/l	NA	168000	124000	108000	120000	NA	190000	210000	246000	416000 J	180000 J
Nitrate Nitrite as N	**10000**	10000	--	ug/l	NA	**46200**	**21000**	**27600**	7740	NA	1260	1770	2610	1530	1600
Orthophosphate as P	--	--	--	ug/l	NA	42 U	48 U	NA	48 UJ	NA	42 UJ	48 UJ	48 U	48 UJ	48 UJ
Sulfate	--	--	--	ug/l	NA	48000	17900	15600 J+	7130 J+	NA	4630	7350 J-	14600 J+	4590	4410
Total Dissolved Solids	--	--	--	mg/l	NA	1350	802	632	457	NA	219	193	270	214 J	228 J
Total Suspended Solids	--	--	--	mg/l	NA	106	135 J	89.4 J	24.9	NA	242	3.4	1.1 J	1.1 J	1 UJ

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-011	CFMW-011	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-011a	CFMW-012	CFMW-012	CFMW-012	CFMW-012
				Sample Date	06/28/2017	06/28/2017	09/20/2016	12/14/2016	03/21/2017	06/29/2017	06/29/2017	09/12/2016	12/14/2016	03/22/2017	06/23/2017
				Sample Designation	CFMW-011-GW	CFMW-DUP15-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-011a-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW	CFMW-012-GW
				Sample Type	N	FD	N	N	N	N	N	N	N	N	N
				Sample Fraction	DI	DI	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	NA	NA	132000	159000	188000	197000	NA	474000	566000	522000	1480000
Ammonia	--	--	--	ug/l	NA	NA	72 U	72 U	72 U	72 U	NA	224	111	72 U	27900
Chloride	--	--	--	ug/l	NA	NA	4070	1130 J	1070	808 J+	NA	3490	494 J-	1410 J+	577 J+
Fluoride	**4000**	4000	80	ug/l	298 J+	296 J+	200	194 J-	246	197	170 J+	**12400**	**5750 J**	**12600 J+**	**30600**
Hardness as calcium carbonate	--	--	--	ug/l	NA	NA	118000	118000	172000	176000	NA	48000	60000	162000	56000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	NA	NA	100 U	100 U	100 U	208 J+	NA	**16500**	8170	**31500**	**62800**
Orthophosphate as P	--	--	--	ug/l	NA	NA	42 U	48 UJ	48 U	48 UJ	NA	42 U	48 UJ	NA	48 UJ
Sulfate	--	--	--	ug/l	NA	NA	12500	4740	8770	5810 J+	NA	21500	13100	43500 J+	78700 J+
Total Dissolved Solids	--	--	--	mg/l	NA	NA	157	185	211	237 J	NA	660	688	836	2440
Total Suspended Solids	--	--	--	mg/l	NA	NA	221 J	138	147	60.1	NA	3.5	3.3	3.6	1 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-012	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-012a	CFMW-014	CFMW-014	CFMW-014	CFMW-014
				Sample Date	06/23/2017	09/15/2016	09/15/2016	12/13/2016	03/20/2017	06/20/2017	06/20/2017	09/12/2016	12/15/2016	03/29/2017	06/27/2017
				Sample Designation	CFMW-012-GW	CFMW-012a-GW	CFMW-DUP2-GW	CFMW-012a-GW	CFMW-012a-GW	CFMW-012a-GW	CFMW-012a-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW	CFMW-014-GW
				Sample Type	N	N	FD	N	N	N	N	N	N	N	N
				Sample Fraction	DI	T	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	NA	200000	204000	201000	208000	206000	NA	476000	548000	514000	254000
Ammonia	--	--	--	ug/l	NA	72 U	72 U	72 U	72 U	72 U	NA	110	72 U	123	72 U
Chloride	--	--	--	ug/l	NA	571 J-	570 J-	1730	400	385 J+	NA	2450	1610 J	2270 J+	1560 J+
Fluoride	**4000**	4000	80	ug/l	**31900**	54.6 J	55.8 J	119	135	139	90.2	**8300**	**17300 J-**	**13000**	3960
Hardness as calcium carbonate	--	--	--	ug/l	NA	194000	196000	200000	204000	194000	NA	200000	192000	404000	108000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	NA	100 U	100 U	100 UJ	100 U	204 J	NA	**18100**	**33500**	**28300**	2620
Orthophosphate as P	--	--	--	ug/l	NA	42 UJ	42 UJ	48 UJ	48 U	48 UJ	NA	42 U	48 U	48 U	48 UJ
Sulfate	--	--	--	ug/l	NA	5260	5740	4490 J-	5920	4670 J+	NA	35000	45000 J-	48600 J+	6870 J+
Total Dissolved Solids	--	--	--	mg/l	NA	210	214	206	193	217 J	NA	656	854	772	374
Total Suspended Solids	--	--	--	mg/l	NA	40.8	41.2	25.6	62 J	44.3 J	NA	2.9	3.7 J	6.6	1 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-014	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-015	CFMW-016	CFMW-016	CFMW-016	CFMW-016	CFMW-016a
				Sample Date	06/27/2017	09/12/2016	12/15/2016	03/29/2017	06/27/2017	06/27/2017	03/28/2017	03/28/2017	06/29/2017	06/29/2017	09/21/2016
				Sample Designation	CFMW-014-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-015-GW	CFMW-016-GW	CFMW-DUP10-GW	CFMW-016-GW	CFMW-016-GW	CFMW-016a-GW
				Sample Type	N	N	N	N	N	N	N	FD	N	N	N
				Sample Fraction	DI	T	T	T	T	DI	T	T	T	DI	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	NA	1190000	762000	1110000	1570000	NA	209000	212000	183000	NA	64100
Ammonia	--	--	--	ug/l	NA	23600	17500	34100	23000	NA	72 U	72 U	139	NA	674
Chloride	--	--	--	ug/l	NA	5770	1570 J	2570 J+	1810 J+	NA	2060 J+	2040 J+	1490 J+	NA	2280
Fluoride	**4000**	4000	80	ug/l	**4110 J+**	**38400**	**16800 J-**	**4740**	**52900**	**55300 J+**	428	438	338	352 J+	304
Hardness as calcium carbonate	--	--	--	ug/l	NA	70000	30000	50000	80000	NA	184000	176000	176000	NA	116000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	NA	**41100**	**18600**	**54700**	**34100**	NA	267	265	133	NA	100 U
Orthophosphate as P	--	--	--	ug/l	NA	267	48 U	48 U	325 J-	NA	48 UJ	48 UJ	48 UJ	NA	42 UJ
Sulfate	--	--	--	ug/l	NA	87400	44800 J-	22500 J+	103000 J+	NA	6970 J+	7560 J+	2690 J+	NA	5880
Total Dissolved Solids	--	--	--	mg/l	NA	1730	1020	1650	2420	NA	235	234	190 J	NA	63
Total Suspended Solids	--	--	--	mg/l	NA	14	10.3 J	1.1	2.5	NA	9.3 J	17.9 J	3.4	NA	118

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-016a	CFMW-016a	CFMW-016a	CFMW-016a	CFMW-017	CFMW-017	CFMW-017	CFMW-018	CFMW-018	CFMW-018	CFMW-019
				Sample Date	12/14/2016	03/27/2017	06/26/2017	06/26/2017	03/28/2017	06/26/2017	06/26/2017	03/28/2017	06/20/2017	06/20/2017	09/12/2016
				Sample Designation	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-016a-GW	CFMW-017-GW	CFMW-017-GW	CFMW-017-GW	CFMW-018-GW	CFMW-018-GW	CFMW-018-GW	CFMW-019-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	DI	T	T	DI	T	T	DI	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	138000	231000	65500	NA	407000	191000	NA	206000	237000	NA	334000
Ammonia	--	--	--	ug/l	72 U	72 U	109	NA	118	74.6 J	NA	72 U	72 U	NA	72 U
Chloride	--	--	--	ug/l	1320 J-	1860 J+	1820 J+	NA	1400 J+	984 J+	NA	2290 J+	412	NA	5930
Fluoride	**4000**	4000	80	ug/l	293 J-	358 J+	293 J+	275	**13400**	1160 J+	1220	569	451	475	2860
Hardness as calcium carbonate	--	--	--	ug/l	142000	218000	130000	NA	98000	172000	NA	196000	216000	NA	228000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	202	311	195	NA	7200	491	NA	216	213 J-	NA	7230
Orthophosphate as P	--	--	--	ug/l	48 UJ	48 U	48 UJ	NA	48 UJ	48 UJ	NA	48 UJ	48 UJ	NA	42 U
Sulfate	--	--	--	ug/l	6220	9450 J+	3200 J+	NA	7970 J+	2420 J+	NA	3830 J+	4400 J+	NA	95000
Total Dissolved Solids	--	--	--	mg/l	163	252	97	NA	516	206	NA	220	258 J	NA	510
Total Suspended Solids	--	--	--	mg/l	46	12.2 J	142	NA	3.9	1.9	NA	23.8	60 J	NA	7.7

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-019	CFMW-019	CFMW-019	CFMW-019	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-019a	CFMW-020
				Sample Date	12/15/2016	03/29/2017	06/29/2017	06/29/2017	09/20/2016	12/14/2016	03/27/2017	03/27/2017	06/26/2017	06/26/2017	09/20/2016
				Sample Designation	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019-GW	CFMW-019a-GW	CFMW-019a-GW	CFMW-019a-GW	CFMW-DUP9-GW	CFMW-019a-GW	CFMW-019a-GW	CFMW-020-GW
				Sample Type	N	N	N	N	N	N	N	FD	N	N	N
				Sample Fraction	T	T	T	DI	T	T	T	T	T	DI	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	342000	411000	383000	NA	222000	184000	182000	190000	181000	NA	220000
Ammonia	--	--	--	ug/l	72 U	103	97.5 J	NA	97.7 J	72 U	72 U	72 U	72 U	NA	72 U
Chloride	--	--	--	ug/l	4220 J	8350	5620 J+	NA	3180	1080 J-	1180 J	1740 J	917 J+	NA	2250
Fluoride	**4000**	4000	80	ug/l	2890	2950	3720	3390 J+	361	182 J-	214 J+	201 J+	179 J+	145	281
Hardness as calcium carbonate	--	--	--	ug/l	224000	312000	216000	NA	132000	192000	164000	156000	136000	NA	208000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	6910	**13600**	9960	NA	100 U	129	100 U	100 U	109	NA	256
Orthophosphate as P	--	--	--	ug/l	48 U	48 U	48 UJ	NA	42 U	48 UJ	48 U	48 U	48 UJ	NA	42 U
Sulfate	--	--	--	ug/l	115000 J-	206000 J+	130000	NA	14300	7370	6680 J+	6730 J+	5150 J+	NA	20100
Total Dissolved Solids	--	--	--	mg/l	606	756	658 J	NA	234	199	199	180	218	NA	235
Total Suspended Solids	--	--	--	mg/l	23.6 J	5	2.8	NA	568 J	193	95.2 J	172 J	22.4	NA	4.1 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-020	CFMW-020	CFMW-020	CFMW-020	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-021	CFMW-022	CFMW-022
				Sample Date	12/13/2016	03/21/2017	06/26/2017	06/26/2017	09/12/2016	12/14/2016	03/29/2017	06/26/2017	06/26/2017	09/13/2016	12/09/2016
				Sample Designation	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-020-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-021-GW	CFMW-022-GW	CFMW-022-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	DI	T	T	T	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	245000	287000	196000	NA	284000	382000	426000	237000	NA	202000	250000
Ammonia	--	--	--	ug/l	72 U	72 U	72 U	NA	72 U	72 U	86.3 J	72 U	NA	171	72.3 J
Chloride	--	--	--	ug/l	640	2170	1460 J+	NA	3730	4210 J-	7680	2470 J+	NA	1590	500
Fluoride	**4000**	4000	80	ug/l	301	516	489 J+	517	1950	3120 J-	**4500**	1930 J+	1810	432	558 J-
Hardness as calcium carbonate	--	--	--	ug/l	240000	270000	180000	NA	244000	188000	234000	164000	NA	196000	224000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	159 J-	454	163	NA	2590	9440	9150	2680	NA	702	1460
Orthophosphate as P	--	--	--	ug/l	48 UJ	48 U	48 UJ	NA	42 U	48 UJ	48 U	48 UJ	NA	42 UJ	NA
Sulfate	--	--	--	ug/l	5470 J-	8370	2480 J+	NA	57100	81000 J-	189000 J+	25900 J+	NA	5470	4870 J-
Total Dissolved Solids	--	--	--	mg/l	262	304	220	NA	342	540	756	341	NA	226	256 J
Total Suspended Solids	--	--	--	mg/l	8.8	11.5	3.8	NA	5.3	1.6	1 U	1	NA	1	1.9

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-022	CFMW-022	CFMW-022	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-023	CFMW-025a	CFMW-025a	CFMW-025a
				Sample Date	03/28/2017	06/26/2017	06/26/2017	09/21/2016	12/19/2016	03/21/2017	06/27/2017	06/27/2017	09/13/2016	12/05/2016	03/24/2017
				Sample Designation	CFMW-022-GW	CFMW-022-GW	CFMW-022-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-023-GW	CFMW-025a-GW	CFMW-025a-GW	CFMW-025a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	DI	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	270000	189000	NA	242000	235000	254000	212000	NA	182000	560000	202000
Ammonia	--	--	--	ug/l	72 U	72 U	NA	72 U	72 U	72 U	72 U	NA	72 U	72 U	81.4 J
Chloride	--	--	--	ug/l	2060 J+	1330 J+	NA	669 J-	1860	31 U	372 J+	NA	1890	1470	1960 J+
Fluoride	**4000**	4000	80	ug/l	971	573 J+	607	395	452	647	736	708 J+	399	334 J-	524
Hardness as calcium carbonate	--	--	--	ug/l	220000	176000	NA	236000	234000	254000	202000	NA	200000	540000	214000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	1470	219	NA	264	100 U	204	119	NA	100 U	221	100 U
Orthophosphate as P	--	--	--	ug/l	48 UJ	48 UJ	NA	42 UJ	48 U	48 U	48 UJ	NA	42 UJ	48 U	NA
Sulfate	--	--	--	ug/l	7380 J+	2580 J+	NA	5400	4250	6280	3940 J+	NA	13500	10700 J-	15100 J+
Total Dissolved Solids	--	--	--	mg/l	301	206	NA	242	253	266	226	NA	216	522	219
Total Suspended Solids	--	--	--	mg/l	1.1	1 U	NA	3.6	1 U	6.4	1.1	NA	37.6	1180	61.6 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-025a	CFMW-025a	CFMW-025b	CFMW-025b	CFMW-025B	CFMW-025b	CFMW-025b	CFMW-026	CFMW-026	CFMW-026	CFMW-026
				Sample Date	06/22/2017	06/22/2017	09/13/2016	12/07/2016	03/20/2017	06/22/2017	06/22/2017	09/13/2016	12/05/2016	03/20/2017	06/22/2017
				Sample Designation	CFMW-025a-GW	CFMW-025a-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-25B-GW	CFMW-025b-GW	CFMW-025b-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW	CFMW-026-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	205000	NA	212000	207000	238000	210000	NA	218000	238000	226000	222000
Ammonia	--	--	--	ug/l	72 U	NA	72 U	72 U	72 U	72 U	NA	72 U	112	72 U	72 U
Chloride	--	--	--	ug/l	1810 J+	NA	1940	1960 J	2550	1840 J+	NA	2720	2370 J-	1440	1680 J+
Fluoride	**4000**	4000	80	ug/l	413	422	585	970 J-	828	515	525	1650	1440 J-	2010	1150
Hardness as calcium carbonate	--	--	--	ug/l	240000	NA	220000	360000	240000	210000	NA	220000	250000	228000	208000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	100 UJ	NA	145	241	100 U	100 UJ	NA	367	415	960	167
Orthophosphate as P	--	--	--	ug/l	48 UJ	NA	42 UJ	48 UJ	48 U	48 UJ	NA	42 UJ	48 U	48 U	48 UJ
Sulfate	--	--	--	ug/l	12400 J+	NA	13800	12300 J-	19000	9310 J+	NA	20300	15800 J-	20600	12800 J+
Total Dissolved Solids	--	--	--	mg/l	227	NA	243	222	230	194	NA	265	259	217	246
Total Suspended Solids	--	--	--	mg/l	272	NA	18.5	782	20.8 J	16.9	NA	3.5	15.1	2.8 J	1.6

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-026	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-027	CFMW-028	CFMW-028	CFMW-028	CFMW-028	CFMW-028
				Sample Date	06/22/2017	09/13/2016	12/14/2016	03/27/2017	06/26/2017	06/26/2017	09/13/2016	12/05/2016	03/20/2017	06/26/2017	06/26/2017
				Sample Designation	CFMW-026-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-027-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW	CFMW-028-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	DI	T	T	T	T	DI	T	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	NA	284000	288000	314000	283000	NA	206000	231000	234000	247000	NA
Ammonia	--	--	--	ug/l	NA	77.5 J	259	72 U	81.3 J	NA	72 U	72 U	72 U	72 U	NA
Chloride	--	--	--	ug/l	NA	2220	2030 J-	2680 J+	2150 J+	NA	2090	1650 J-	1450	1580 J+	NA
Fluoride	**4000**	4000	80	ug/l	1260	2390	1970 J-	2560 J+	**5160**	**5190**	3170 J+	3130 J-	**4400**	3800 J+	3770
Hardness as calcium carbonate	--	--	--	ug/l	NA	198000	260000	224000	160000	NA	178000	200000	204000	200000	NA
Nitrate Nitrite as N	**10000**	10000	--	ug/l	NA	3970	4310	4930	3560	NA	542	930	1090	1980	NA
Orthophosphate as P	--	--	--	ug/l	NA	42 UJ	48 UJ	48 U	48 UJ	NA	42 UJ	48 U	48 U	48 UJ	NA
Sulfate	--	--	--	ug/l	NA	27300	24700	42000	29400	NA	8380	7810 J-	12100	7420 J+	NA
Total Dissolved Solids	--	--	--	mg/l	NA	392	358	398	424	NA	231	246	232	314	NA
Total Suspended Solids	--	--	--	mg/l	NA	40.2	118	1.5 J	10.6	NA	5.6	40	30.1 J	4.3	NA

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-028a	CFMW-028a	CFMW-028a	CFMW-028a	CFMW-028a	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029	CFMW-029
				Sample Date	09/20/2016	12/09/2016	03/21/2017	06/27/2017	06/27/2017	09/13/2016	09/13/2016	12/14/2016	03/24/2017	06/26/2017	06/26/2017
				Sample Designation	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-028a-GW	CFMW-029-GW	CFMW-DUP1-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW	CFMW-029-GW
				Sample Type	N	N	N	N	N	N	FD	N	N	N	N
				Sample Fraction	T	T	T	T	DI	T	T	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	46000	69200	26700	55300	NA	226000	238000	234000	299000	214000	NA
Ammonia	--	--	--	ug/l	72 U	111	72 U	196	NA	113 J	72.1 J	72 U	72 U	72 U	NA
Chloride	--	--	--	ug/l	16900	8950	9900 J+	7510	NA	1000	999	623 J-	1240 J+	1250 J+	NA
Fluoride	**4000**	4000	80	ug/l	1020	557 J-	408	286	293 J+	3370 J+	3370 J+	**4180 J**	1810 J+	2570 J+	2570
Hardness as calcium carbonate	--	--	--	ug/l	66000	138000	142000	116000	NA	214000	214000	200000	252000	136000	NA
Nitrate Nitrite as N	**10000**	10000	--	ug/l	100 U	100 U	100 U	100 U	NA	1850	1830	1230	1610	999	NA
Orthophosphate as P	--	--	--	ug/l	84 U	NA	48 U	48 UJ	NA	42 UJ	42 UJ	48 UJ	NA	48 UJ	NA
Sulfate	--	--	--	ug/l	34200	38200 J	48000 J+	33000 J-	NA	18300	18300	13900	10100 J+	3360 J+	NA
Total Dissolved Solids	--	--	--	mg/l	105	166 J	116	154	NA	319	312	274	330	284	NA
Total Suspended Solids	--	--	--	mg/l	4 J	86.7	220	106	NA	6.1	5.3	12.2	21.9 J	1.1	NA

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-031	CFMW-032	CFMW-032	CFMW-032	CFMW-032
				Sample Date	09/15/2016	12/09/2016	03/21/2017	06/21/2017	06/21/2017	06/21/2017	06/21/2017	09/15/2016	12/13/2016	03/27/2017	06/20/2017
				Sample Designation	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-031-GW	CFMW-DUP13-GW	CFMW-031-GW	CFMW-DUP13-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW	CFMW-032-GW
				Sample Type	N	N	N	N	FD	N	FD	N	N	N	N
				Sample Fraction	T	T	T	T	T	DI	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	230000	260000	295000	220000	220000	NA	NA	452000	672000	634000	555000
Ammonia	--	--	--	ug/l	72 U	115	72 U	72 U	72 U	NA	NA	72 U	72 U	72 U	72 U
Chloride	--	--	--	ug/l	1700 J-	1220	2220	1470 J+	1710 J+	NA	NA	2260	1930	1090 J+	1950
Fluoride	**4000**	4000	80	ug/l	2440	2100 J-	2700	2770 J-	2800 J-	2900	2900	**5210 J-**	2490	3060 J+	**8570**
Hardness as calcium carbonate	--	--	--	ug/l	184000	240000	236000	152000	158000	NA	NA	152000	344000	324000	156000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	1280	3260	3340	953 J-	1020 J-	NA	NA	2810	1700 J-	2560	3850 J
Orthophosphate as P	--	--	--	ug/l	42 UJ	NA	48 U	48 R	48 R	NA	NA	42 UJ	48 UJ	48 U	48 UJ
Sulfate	--	--	--	ug/l	8390	21200 J-	25500	6530	6570	NA	NA	10900	10400 J-	14500 J+	13600 J+
Total Dissolved Solids	--	--	--	mg/l	237	311 J	331	219 J	232 J	NA	NA	500	662	570	660 J
Total Suspended Solids	--	--	--	mg/l	6.1	13.3	9	1.3	1 U	NA	NA	5.3	21.1	14.7 J	15.7 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-032	CFMW-032	CFMW-032	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-032a	CFMW-033	CFMW-033	CFMW-033
				Sample Date	06/20/2017	06/20/2017	06/20/2017	09/16/2016	12/16/2016	03/29/2017	06/27/2017	06/27/2017	09/15/2016	12/06/2016	03/21/2017
				Sample Designation	CFMW-DUP12-GW	CFMW-032-GW	CFMW-DUP12-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-032a-GW	CFMW-033-GW	CFMW-033-GW	CFMW-033-GW
				Sample Type	FD	N	FD	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	DI	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	547000	NA	NA	1650000	783000	1240000	1170000	NA	256000	265000	284000
Ammonia	--	--	--	ug/l	84.8 J	NA	NA	95.7 J	72 U	88.4 J	117	NA	72 U	72 U	72 U
Chloride	--	--	--	ug/l	1920	NA	NA	1650 J-	2150 J	1920 J+	1400 J+	NA	2390 J-	1940	2520
Fluoride	**4000**	4000	80	ug/l	**8460**	**8400**	**8420**	49 J-	225 J	171	241	193 J+	2340	2040 J-	2620
Hardness as calcium carbonate	--	--	--	ug/l	152000	NA	NA	1600000	990000	1320000	1120000	NA	208000	228000	230000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	2670 J	NA	NA	100 U	104	100 U	100 U	NA	2920	3140	3580
Orthophosphate as P	--	--	--	ug/l	48 UJ	NA	NA	42 R	48 U	48 U	48 UJ	NA	42 UJ	48 UJ	48 U
Sulfate	--	--	--	ug/l	13400 J+	NA	NA	2820 J-	8740 J	5810	4090 J+	NA	22600 J-	18800 J	27900
Total Dissolved Solids	--	--	--	mg/l	746 J	NA	NA	1610	900	1200	1340	NA	307	303	333
Total Suspended Solids	--	--	--	mg/l	10.5 J	NA	NA	20.2	131	42.9	20.9	NA	1 U	1.3	2.1

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-033	CFMW-033	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-034	CFMW-035	CFMW-035	CFMW-035	CFMW-035
				Sample Date	06/19/2017	06/19/2017	09/14/2016	12/13/2016	03/21/2017	06/19/2017	06/19/2017	09/14/2016	12/13/2016	03/21/2017	06/20/2017
				Sample Designation	CFMW-033-GW	CFMW-033-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-034-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW	CFMW-035-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	232000	NA	254000	344000	358000	249000	NA	362000	394000	418000	426000
Ammonia	--	--	--	ug/l	72 U	NA	142	72 U	72 U	72 U	NA	72 U	72 U	72 U	104
Chloride	--	--	--	ug/l	1680 J+	NA	1810 J-	1140	3150	1570 J+	NA	6880 J-	4670	5580	4520
Fluoride	**4000**	4000	80	ug/l	3250	3220	**4530 J-**	60 U	3200	**6590**	**6500**	415	305	276	209
Hardness as calcium carbonate	--	--	--	ug/l	156000	NA	220000	304000	316000	156000	NA	336000	640000	380000	512000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	1420	NA	1520	1050 J-	1590	1620	NA	100 U	100 UJ	156	144 J-
Orthophosphate as P	--	--	--	ug/l	48 UJ	NA	42 UJ	48 UJ	48 U	48 UJ	NA	42 UJ	48 UJ	48 U	48 UJ
Sulfate	--	--	--	ug/l	9450 J+	NA	13800 J+	11700 J-	15200	5330 J+	NA	29500 J-	24000 J-	27000	15100 J+
Total Dissolved Solids	--	--	--	mg/l	237	NA	271	383	394	275	NA	423	417	442	452 J
Total Suspended Solids	--	--	--	mg/l	2.1	NA	5.3	6.2	134	2.8	NA	6.8	305	74.7	453 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-035	CFMW-037	CFMW-037	CFMW-037	CFMW-037	CFMW-037	CFMW-038	CFMW-038	CFMW-038	CFMW-038	CFMW-038
				Sample Date	06/20/2017	09/16/2016	12/08/2016	03/23/2017	06/20/2017	06/20/2017	09/14/2016	12/09/2016	03/24/2017	06/27/2017	06/27/2017
				Sample Designation	CFMW-035-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-037-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW	CFMW-038-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	DI	T	T	T	T	DI	T	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	NA	192000	199000	213000	210000	NA	284000	278000	281000	289000	NA
Ammonia	--	--	--	ug/l	NA	72 U	87.7 J+	72 U	72 U	NA	72 U	72 U	72 U	72 U	NA
Chloride	--	--	--	ug/l	NA	2760	1170 J-	2030 J+	2210	NA	2810 J	2200	3350 J+	3180 J+	NA
Fluoride	**4000**	4000	80	ug/l	190	1030 J-	1060 J	1530	1030	1100	2590	2400 J-	2830 J+	2810	2830 J+
Hardness as calcium carbonate	--	--	--	ug/l	NA	194000	196000	208000	184000	NA	226000	228000	230000	224000	NA
Nitrate Nitrite as N	**10000**	10000	--	ug/l	NA	1580	781	727	1120 J-	NA	2230	1960	1860	2630	NA
Orthophosphate as P	--	--	--	ug/l	NA	42 R	48 UJ	48 UJ	48 UJ	NA	42 UJ	NA	NA	48 UJ	NA
Sulfate	--	--	--	ug/l	NA	8810 J-	6120 J-	9580 J+	9000 J+	NA	16700 J+	10000 J-	14200 J+	13900 J+	NA
Total Dissolved Solids	--	--	--	mg/l	NA	226	193	225	236 J	NA	311	308 J	305	347	NA
Total Suspended Solids	--	--	--	mg/l	NA	1 U	10.8	31.8	7.5 J	NA	1.9	7.1	5.2 J	2.9	NA

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-040	CFMW-042	CFMW-042	CFMW-042	CFMW-043	CFMW-043	CFMW-043
				Sample Date	09/14/2016	12/13/2016	03/30/2017	06/20/2017	06/20/2017	09/14/2016	06/20/2017	06/20/2017	09/13/2016	12/14/2016	03/20/2017
				Sample Designation	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-040-GW	CFMW-042-GW	CFMW-042-GW	CFMW-042-GW	CFMW-043-GW	CFMW-043-GW	CFMW-043-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	DI	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	256000	248000	265000	281000	NA	252000	281000	NA	254000	258000	271000
Ammonia	--	--	--	ug/l	72 U	72 U	72 U	72 U	NA	72 U	72 U	NA	72 U	79.3 J	72 U
Chloride	--	--	--	ug/l	3240 J	2350	3470 J	2670	NA	2940 J-	2470	NA	2470	1880 J-	2710
Fluoride	**4000**	4000	80	ug/l	2650	2360	3090	2830	2560	2410	2780	2590	2280	2050 J-	2730
Hardness as calcium carbonate	--	--	--	ug/l	214000	212000	218000	224000	NA	208000	192000	NA	206000	220000	200000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	2190	2280 J-	7930	3070 J-	NA	2910	3560 J-	NA	3000	1990	3240
Orthophosphate as P	--	--	--	ug/l	42 UJ	48 UJ	48 U	48 UJ	NA	42 UJ	48 UJ	NA	42 UJ	48 UJ	48 U
Sulfate	--	--	--	ug/l	16700 J+	14200 J-	14900 J+	25200 J+	NA	25500 J-	29900 J+	NA	26000	18600	29500 J+
Total Dissolved Solids	--	--	--	mg/l	323	304	299	363 J	NA	346	395 J	NA	354	323	307
Total Suspended Solids	--	--	--	mg/l	2.5	5.4	43.2	1.4 J	NA	5.9	2.7 J	NA	6.4	23.8	17.1 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-043	CFMW-043	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044	CFMW-044a	CFMW-044a	CFMW-044a	CFMW-044a
				Sample Date	06/21/2017	06/21/2017	09/15/2016	12/09/2016	03/28/2017	06/21/2017	06/21/2017	09/19/2016	12/19/2016	03/21/2017	06/23/2017
				Sample Designation	CFMW-043-GW	CFMW-043-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW	CFMW-044a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	296000	NA	262000	282000	284000	349000	NA	360000	80700	157000	164000
Ammonia	--	--	--	ug/l	72 U	NA	110	7520	372	21900	NA	72 U	72 U	72 U	72 U
Chloride	--	--	--	ug/l	2440 J+	NA	2960 J-	2260	2280 J+	2770 J+	NA	5340	2890	4570	3960 J+
Fluoride	**4000**	4000	80	ug/l	2020 J-	2210	2150	1670 J-	2050	1400 J-	1580	1720	2280	2720	2250 J+
Hardness as calcium carbonate	--	--	--	ug/l	240000	NA	202000	194000	220000	200000	NA	408000	116000	148000	124000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	5450 J-	NA	2830	1880	2500	359 J-	NA	2640	1240	563	810 J+
Orthophosphate as P	--	--	--	ug/l	48 R	NA	42 UJ	NA	48 UJ	48 R	NA	42 R	48 U	48 U	48 UJ
Sulfate	--	--	--	ug/l	32500 J+	NA	26200 J-	21900 J-	36100	22800	NA	63000	52000	48800 J+	41900 J+
Total Dissolved Solids	--	--	--	mg/l	350 J	NA	313	296 J	369	309 J	NA	458	215	261	284
Total Suspended Solids	--	--	--	mg/l	21.2	NA	1.5	13.8	3.5	45.6	NA	13.8	18.6	39.7	29.4

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-044a	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-044b	CFMW-045	CFMW-045	CFMW-045	CFMW-045	CFMW-045
				Sample Date	06/23/2017	09/19/2016	12/19/2016	03/24/2017	06/23/2017	06/23/2017	09/15/2016	12/14/2016	03/23/2017	06/28/2017	06/28/2017
				Sample Designation	CFMW-044a-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-044b-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW	CFMW-045-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	DI	T	T	T	T	DI	T	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	NA	132000	177000	208000	213000	NA	254000	258000	270000	280000	NA
Ammonia	--	--	--	ug/l	NA	6400	207	521	394	NA	72 U	72 U	72 U	72 U	NA
Chloride	--	--	--	ug/l	NA	3500	2030	2180 J+	1870 J+	NA	2840 J-	2150 J-	3280 J+	2430	NA
Fluoride	**4000**	4000	80	ug/l	2350	153	142	176	138 J+	116	2300	1920 J-	2550	2150 J-	2370 J+
Hardness as calcium carbonate	--	--	--	ug/l	NA	108000	174000	204000	196000	NA	208000	212000	232000	320000	NA
Nitrate Nitrite as N	**10000**	10000	--	ug/l	NA	100 U	100 U	100 U	369	NA	2730	3020	2630	3060	NA
Orthophosphate as P	--	--	--	ug/l	NA	42 R	48 U	NA	48 UJ	NA	42 UJ	48 UJ	48 UJ	48 UJ	NA
Sulfate	--	--	--	ug/l	NA	826	4820	3580 J+	5240 J+	NA	23100 J-	19300	27700 J+	28200	NA
Total Dissolved Solids	--	--	--	mg/l	NA	98	166	208	218	NA	296	323	316	355 J	NA
Total Suspended Solids	--	--	--	mg/l	NA	9.5	12.1	23 J	15.5	NA	9.3	20.9	31.3	5 J	NA

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-045a	CFMW-045a	CFMW-045a	CFMW-045a	CFMW-045a	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-047	CFMW-049
				Sample Date	09/19/2016	12/09/2016	03/24/2017	06/23/2017	06/23/2017	09/14/2016	12/15/2016	03/23/2017	06/21/2017	06/21/2017	09/21/2016
				Sample Designation	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-045a-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-047-GW	CFMW-049-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	DI	T	T	T	T	DI	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	215000	47200	237000	266000	NA	230000	254000	272000	232000	NA	206000
Ammonia	--	--	--	ug/l	72 U	NA	72 U	102	NA	72 U	72 U	72 U	72 U	NA	72 U
Chloride	--	--	--	ug/l	2870	7770	3120 J+	2750 J+	NA	2690 J	751 J	2350 J+	1900	NA	1780 J-
Fluoride	**4000**	4000	80	ug/l	2980	1650 J-	3520 J+	3400 J+	3230	2160	1960	2470	1920	2100	861
Hardness as calcium carbonate	--	--	--	ug/l	214000	54000	226000	222000	NA	208000	236000	258000	192000	NA	188000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	100 U	NA	100 U	190	NA	1300	1890	1740	978 J-	NA	759
Orthophosphate as P	--	--	--	ug/l	42 R	NA	NA	48 UJ	NA	42 UJ	48 U	48 UJ	48 U	NA	42 UJ
Sulfate	--	--	--	ug/l	21500	21000 J-	30400	25300 J+	NA	10300 J+	7730	11300 J+	5320	NA	3550
Total Dissolved Solids	--	--	--	mg/l	189	97 J	289	336	NA	245	302	302	245 J	NA	188
Total Suspended Solids	--	--	--	mg/l	75.3	22.6	21 J	6.7	NA	1 U	8.5 J	51	3	NA	1

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-049	CFMW-049a	CFMW-049a	CFMW-049a	CFMW-049a	CFMW-049a	CFMW-050
				Sample Date	12/15/2016	12/15/2016	03/23/2017	06/21/2017	06/21/2017	09/16/2016	12/15/2016	03/23/2017	06/21/2017	06/21/2017	09/19/2016
				Sample Designation	CFMW-049-GW	CFMW-DUP6-GW	CFMW-049-GW	CFMW-049-GW	CFMW-049-GW	CFMW-049a-GW	CFMW-049a-GW	CFMW-049a-GW	CFMW-049a-GW	CFMW-049a-GW	CFMW-050-GW
				Sample Type	N	FD	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	DI	T	T	T	T	DI	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	210000	209000	218000	219000	NA	422000	108000	880000	312000	NA	208000
Ammonia	--	--	--	ug/l	72 U	72 U	72 U	72 U	NA	74.6 J	72 U	72 U	72 U	NA	72 U
Chloride	--	--	--	ug/l	637 J	639 J	1760 J+	1660 J+	NA	2300 J-	1320	2040 J+	1660 J+	NA	30 U
Fluoride	**4000**	4000	80	ug/l	834	827	980 J+	720 J-	815	470 J-	433	439	405 J-	444	811
Hardness as calcium carbonate	--	--	--	ug/l	196000	200000	202000	192000	NA	700000	216000	850000	270000	NA	192000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	568	551	598	706 J-	NA	442	518	426	619 J	NA	307
Orthophosphate as P	--	--	--	ug/l	48 U	48 U	48 UJ	48 R	NA	42 R	48 U	48 UJ	48 R	NA	42 R
Sulfate	--	--	--	ug/l	3440	3440	4530 J+	4030	NA	4710 J-	2820	2660 J+	3170	NA	3320
Total Dissolved Solids	--	--	--	mg/l	221	230	205	208 J	NA	512	83	895	163 J	NA	192
Total Suspended Solids	--	--	--	mg/l	1 UJ	1 UJ	2.6	1.1	NA	133	140 J	42.4	176	NA	1.2

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-050	CFMW-050	CFMW-050	CFMW-050	CFMW-053	CFMW-053	CFMW-053	CFMW-053	CFMW-053a	CFMW-053a	CFMW-053a
				Sample Date	12/15/2016	03/23/2017	06/21/2017	06/21/2017	09/14/2016	12/12/2016	06/28/2017	06/28/2017	09/19/2016	12/19/2016	03/27/2017
				Sample Designation	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-050-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053-GW	CFMW-053a-GW	CFMW-053a-GW	CFMW-053a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	DI	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	207000	216000	228000	NA	264000	270000	264000	NA	2320000	2020000	2040000
Ammonia	--	--	--	ug/l	72 U	72 U	72 U	NA	72 U	72 U	72 U	NA	232	72 U	444
Chloride	--	--	--	ug/l	759 J	2100 J+	1710 J+	NA	2900 J	2180	1960	NA	6360	5210	13100
Fluoride	**4000**	4000	80	ug/l	809	945	744 J-	808	1990	1870	1610 J-	1740 J+	15 U	537	428 J+
Hardness as calcium carbonate	--	--	--	ug/l	212000	208000	192000	NA	212000	240000	236000	NA	2220000	2800000	1700000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	447	506	757 J-	NA	2810	3670 J-	1770	NA	100 U	186	100 U
Orthophosphate as P	--	--	--	ug/l	48 U	48 UJ	48 R	NA	42 UJ	48 UJ	48 UJ	NA	42 R	48 U	48 U
Sulfate	--	--	--	ug/l	3520	4480 J+	4670	NA	24800	20400 J-	19000	NA	1570	1510	3120 J+
Total Dissolved Solids	--	--	--	mg/l	230	211	218 J	NA	302	310 J	325 J	NA	2280	2750	2300
Total Suspended Solids	--	--	--	mg/l	13.5 J	10.2	5.4	NA	21	141	5.9 J	NA	8.1	36.6	30.7 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-053a	CFMW-053a	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-054	CFMW-056	CFMW-056	CFMW-056	CFMW-056
				Sample Date	06/28/2017	06/28/2017	09/14/2016	12/12/2016	03/22/2017	06/21/2017	06/21/2017	09/20/2016	09/20/2016	12/13/2016	03/22/2017
				Sample Designation	CFMW-053a-GW	CFMW-053a-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-054-GW	CFMW-056-GW	CFMW-DUP3-GW	CFMW-056-GW	CFMW-056-GW
				Sample Type	N	N	N	N	N	N	N	N	FD	N	N
				Sample Fraction	T	DI	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	1840000	NA	262000	265000	273000	269000	NA	206000	206000	51500	222000
Ammonia	--	--	--	ug/l	100 J+	NA	72 U	72 U	72 U	72 U	NA	76.2 J	80.9 J	72 U	108 J+
Chloride	--	--	--	ug/l	5720	NA	2600 J	2480	3720 J+	1950	NA	459 J+	386	2690 J-	367 J+
Fluoride	**4000**	4000	80	ug/l	487 J-	595 J+	1920	1610	2070	1880	1910	138	131	107	242
Hardness as calcium carbonate	--	--	--	ug/l	690000	NA	220000	236000	222000	220000	NA	202000	202000	48000	222000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	100 U	NA	2620	1930 J-	2900	2460 J-	NA	100 U	100 U	100 UJ	100 U
Orthophosphate as P	--	--	--	ug/l	48 UJ	NA	42 UJ	48 UJ	NA	48 U	NA	42 U	42 U	48 UJ	48 UJ
Sulfate	--	--	--	ug/l	1990	NA	22300	20000 J-	29600 J+	19600	NA	4530	4430	1030 J-	5200 J+
Total Dissolved Solids	--	--	--	mg/l	1850 J	NA	302	321 J	336	291 J	NA	222	202	53	211
Total Suspended Solids	--	--	--	mg/l	5 J	NA	2.9	3.5	27.7	79.3	NA	16 J	17.4 J	11.3	74

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-056	CFMW-056	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056a	CFMW-056b	CFMW-056b	CFMW-056b
				Sample Date	06/22/2017	06/22/2017	09/20/2016	12/06/2016	12/06/2016	03/30/2017	06/22/2017	06/22/2017	09/13/2016	12/12/2016	03/21/2017
				Sample Designation	CFMW-056-GW	CFMW-056-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-DUP4-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-056a-GW	CFMW-056b-GW	CFMW-056b-GW	CFMW-0566-GW
				Sample Type	N	N	N	N	FD	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	217000	NA	118000	121000	125000	187000	161000	NA	236000	238000	241000
Ammonia	--	--	--	ug/l	156	NA	72 U	117	89 J	72.1 J	101	NA	72 U	72 U	72 U
Chloride	--	--	--	ug/l	287 J+	NA	17900	3470	3360	1720 J	2780 J+	NA	3160	1880	2510
Fluoride	**4000**	4000	80	ug/l	194	180	405	400 J-	394 J-	258	569	649	156	194	271
Hardness as calcium carbonate	--	--	--	ug/l	202000	NA	102000	124000	116000	184000	130000	NA	250000	240000	248000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	124 J-	NA	100 U	100 U	100 U	4750 J+	100 UJ	NA	443	377 J-	112 J
Orthophosphate as P	--	--	--	ug/l	48 UJ	NA	42 U	48 UJ	48 UJ	48 U	48 UJ	NA	42 UJ	48 UJ	48 U
Sulfate	--	--	--	ug/l	4310 J+	NA	96400	21700 J	21600 J	5200 J+	3540 J+	NA	27000	9670 J-	4470
Total Dissolved Solids	--	--	--	mg/l	227	NA	242	179	163	199	239	NA	312	238 J	256
Total Suspended Solids	--	--	--	mg/l	19.5	NA	223 J	224 J	140 J	88.8	73.3	NA	2.4	2.6	29.6 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-056b	CFMW-056b	CFMW-056b	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057	CFMW-057a	CFMW-057a
				Sample Date	03/21/2017	06/22/2017	06/22/2017	09/19/2016	12/05/2016	03/29/2017	03/29/2017	06/28/2017	06/28/2017	09/19/2016	12/16/2016
				Sample Designation	CFMW-Dup7-GW	CFMW-056b-GW	CFMW-056b-GW	CFMW-057-GW	CFMW-057-GW	CFMW-057-GW	CFMW-DUP11-GW	CFMW-057-GW	CFMW-057-GW	CFMW-057a-GW	CFMW-057a-GW
				Sample Type	FD	N	N	N	N	N	FD	N	N	N	N
				Sample Fraction	T	T	DI	T	T	T	T	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	241000	255000	NA	126000	128000	161000	160000	219000	NA	1860000	1200000
Ammonia	--	--	--	ug/l	72 U	72 U	NA	209	323	284 J	110 J	72 U	NA	500	1060
Chloride	--	--	--	ug/l	2460	3050 J+	NA	630	620 J-	721 J+	716 J+	314 J+	NA	6520	3590 J
Fluoride	**4000**	4000	80	ug/l	266	188	188	66.6 J	127 J-	137	136	204 J-	209	15 U	180 J
Hardness as calcium carbonate	--	--	--	ug/l	240000	256000	NA	124000	132000	152000	150000	216000	NA	1800000	1200000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	155 J	824	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	100 U
Orthophosphate as P	--	--	--	ug/l	48 U	48 UJ	NA	42 R	48 U	48 U	48 U	48 UJ	NA	42 R	48 U
Sulfate	--	--	--	ug/l	4460	29700 J+	NA	797	848 J-	127 U	127 U	4150 J+	NA	1080	1400 J
Total Dissolved Solids	--	--	--	mg/l	263	337	NA	110	78	128	127	211 J	NA	1780	1080
Total Suspended Solids	--	--	--	mg/l	19.2 J	7.3	NA	11.9	8.8	24.1	25.2	44.7 J	NA	34.7	186

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-057a	CFMW-057a	CFMW-057a	CFMW-059	CFMW-059	CFMW-059	CFMW-059	CFMW-059	CFMW-059a	CFMW-059a	CFMW-059a
				Sample Date	03/22/2017	06/28/2017	06/28/2017	09/15/2016	12/12/2016	03/23/2017	06/21/2017	06/21/2017	09/19/2016	12/16/2016	03/29/2017
				Sample Designation	CFMW-057a-GW	CFMW-057a-GW	CFMW-057a-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059-GW	CFMW-059a-GW	CFMW-059a-GW	CFMW-059a-GW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	DI	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	509000	313000	NA	232000	244000	241000	236000	NA	1080000	117000	114000
Ammonia	--	--	--	ug/l	202 J+	205 J+	NA	72 U	72 U	72 U	72 U	NA	211	103	142
Chloride	--	--	--	ug/l	6880 J+	5660	NA	30400 J-	24600	91000	30700	NA	4270	205 J	624 J+
Fluoride	**4000**	4000	80	ug/l	425	322 J-	337 J+	59.5 J	114	120	124	96	147	198 J	233
Hardness as calcium carbonate	--	--	--	ug/l	476000	296000	NA	236000	260000	264000	236000	NA	1060000	124000	144000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	100 U	100 U	NA	3180	2180 J-	5240	4950 J-	NA	100 U	100 U	100 U
Orthophosphate as P	--	--	--	ug/l	NA	48 UJ	NA	42 UJ	48 UJ	48 UJ	48 U	NA	42 R	48 U	48 U
Sulfate	--	--	--	ug/l	13800 J+	25900	NA	6980	4610 J-	7400 J+	5300	NA	12400	10900 J	8570
Total Dissolved Solids	--	--	--	mg/l	680	396 J	NA	310	306 J	314	315 J	NA	920	158	129
Total Suspended Solids	--	--	--	mg/l	23.2	20.5 J	NA	1 U	4	21.1	44.9	NA	26.6	50.8	54.3

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-059a	CFMW-059a	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-061	CFMW-064	CFMW-064	CFMW-064
				Sample Date	06/28/2017	06/28/2017	09/15/2016	12/07/2016	12/07/2016	03/23/2017	06/23/2017	06/23/2017	09/15/2016	12/07/2016	03/23/2017
				Sample Designation	CFMW-059a-GW	CFMW-059a-GW	CFMW-061-GW	CFMW-061-GW	CFMW-DUP5-GW	CFMW-061-GW	CFMW-061-GW	CFMW-061-GW	CFMW-064-GW	CFMW-064-GW	CFMW-064-GW
				Sample Type	N	N	N	N	FD	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	135000	NA	204000	267000	266000	217000	226000	NA	206000	268000	218000
Ammonia	--	--	--	ug/l	122 J+	NA	72 U	72 U	72 U	72 U	72 U	NA	72 U	72 U	72 U
Chloride	--	--	--	ug/l	469	NA	2350 J-	2150 J-	2120 J-	977 J+	1480 J+	NA	2100 J-	1980 J-	2110 J+
Fluoride	**4000**	4000	80	ug/l	185 J-	157 J+	780	669 J-	640 J-	786	601 J+	638	303	311 J-	344
Hardness as calcium carbonate	--	--	--	ug/l	72000	NA	200000	264000	260000	222000	204000	NA	198000	256000	224000
Nitrate Nitrite as N	**10000**	10000	--	ug/l	134	NA	113	100 U	134	104	303	NA	346	507	293
Orthophosphate as P	--	--	--	ug/l	48 UJ	NA	42 UJ	48 UJ	48 UJ	48 UJ	48 UJ	NA	42 UJ	48 UJ	48 UJ
Sulfate	--	--	--	ug/l	6610	NA	7720	5410 J-	5440 J-	5640 J+	3310 J+	NA	4560	4250 J-	6500 J+
Total Dissolved Solids	--	--	--	mg/l	138 J	NA	231	296	266	221	213	NA	223	183	214
Total Suspended Solids	--	--	--	mg/l	69.7 J	NA	1.2	30.3	40.8	26.9	1 U	NA	2	181	88.8

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix G4. General Chemistry in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFMW-064	CFMW-064	CFMW-064	CFMW-064
				Sample Date	06/23/2017	06/23/2017	06/23/2017	06/23/2017
				Sample Designation	CFMW-064-GW	CFMW-DUP14-GW	CFMW-064-GW	CFMW-DUP14-GW
				Sample Type	N	FD	N	FD
				Sample Fraction	T	T	DI	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
Alkalinity	--	--	--	ug/l	238000	230000	NA	NA
Ammonia	--	--	--	ug/l	72 U	72 U	NA	NA
Chloride	--	--	--	ug/l	2060 J+	1880 J+	NA	NA
Fluoride	**4000**	4000	80	ug/l	288 J+	302 J+	312	307
Hardness as calcium carbonate	--	--	--	ug/l	216000	210000	NA	NA
Nitrate Nitrite as N	**10000**	10000	--	ug/l	590	589	NA	NA
Orthophosphate as P	--	--	--	ug/l	48 UJ	48 UJ	NA	NA
Sulfate	--	--	--	ug/l	5140 J+	5130 J+	NA	NA
Total Dissolved Solids	--	--	--	mg/l	257	250	NA	NA
Total Suspended Solids	--	--	--	mg/l	19.9 J	14.5 J	NA	NA

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

APPENDIX H

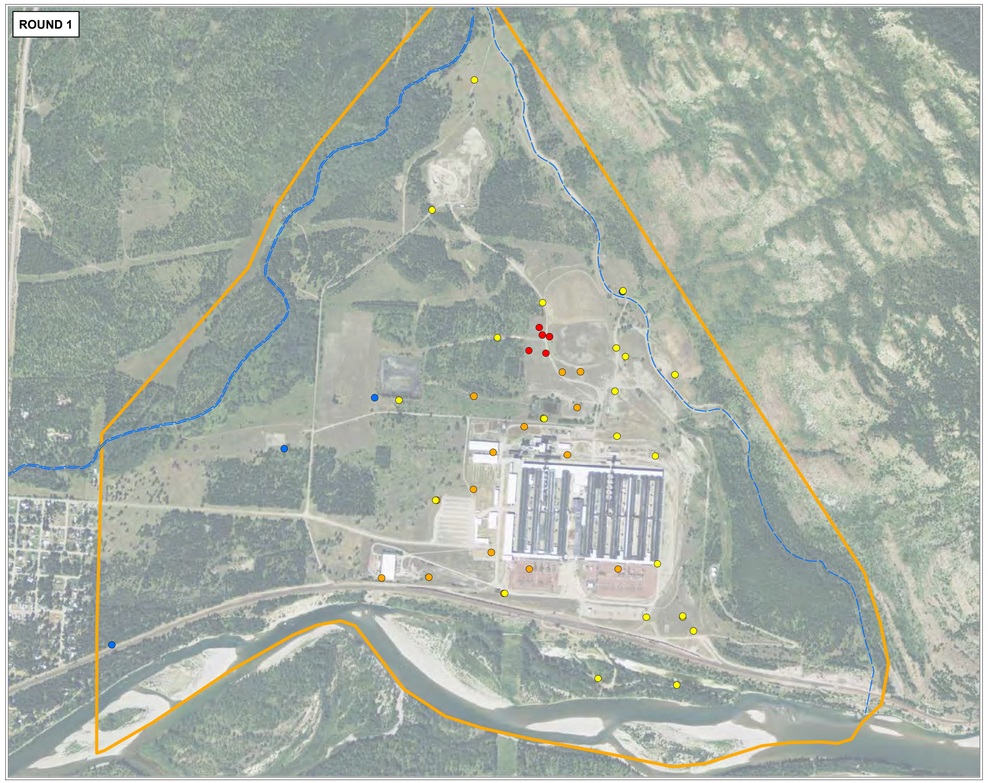
Groundwater Thematic Maps – Rounds 1 through 4

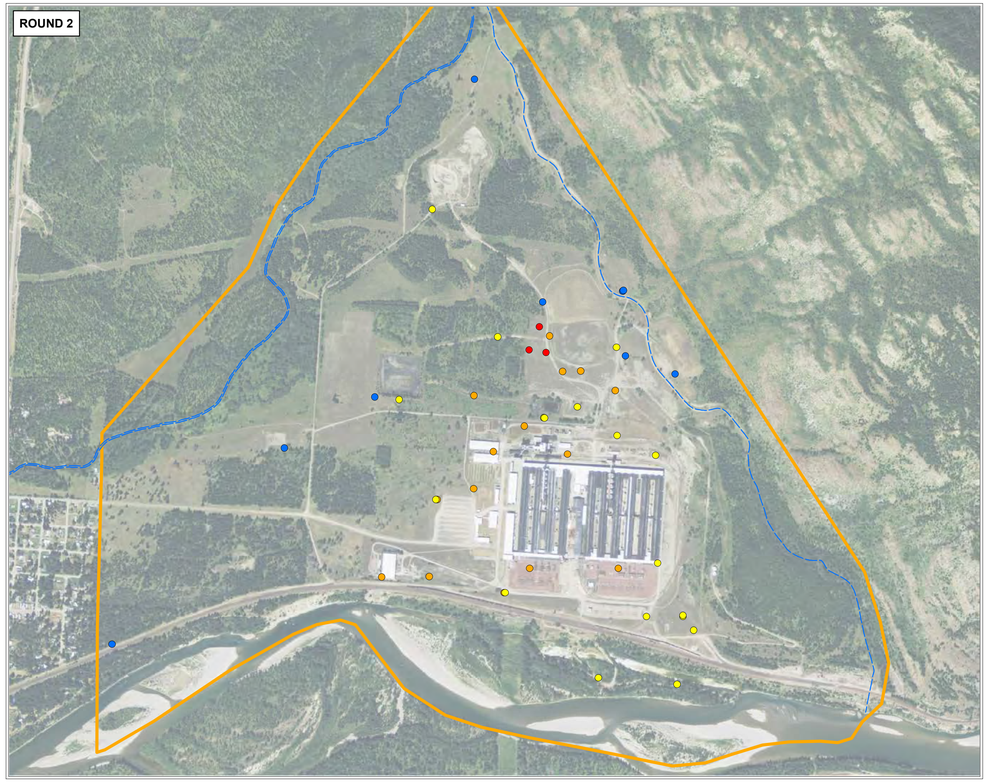
1. Concentrations of Total Cyanide in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
2. Concentrations of Total Free Cyanide Rounds 3 and 4 in Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
3. Concentrations of Dissolved Cyanide in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
4. Concentrations of Dissolved Free Cyanide in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
5. Concentrations of Total Fluoride in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
6. Concentrations of Dissolved Fluoride in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
7. Concentrations of Total Aluminum in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
8. Concentrations of Total Arsenic in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
9. Concentrations of Total Cobalt in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
10. Concentrations of Total Copper in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
11. Concentrations of Total Iron in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
12. Concentrations of Total Lead in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
13. Concentrations of Total Manganese in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
14. Concentrations of Total Thallium in Round 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit

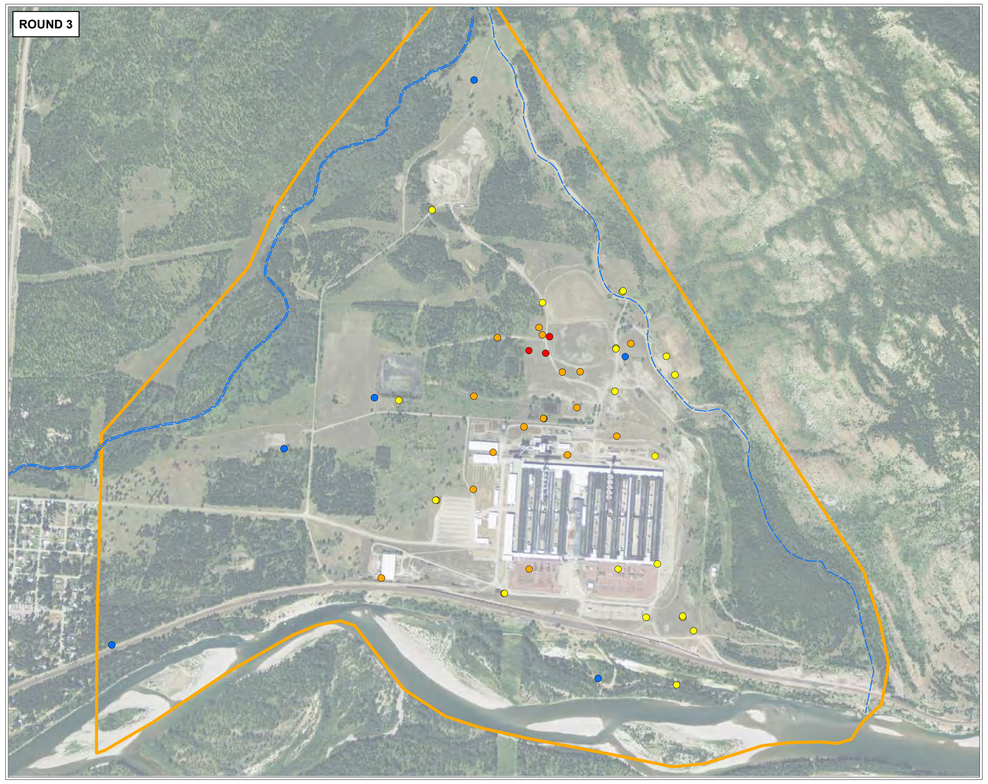
15. Concentrations of Dissolved Aluminum in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
16. Concentrations of Dissolved Arsenic in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
17. Concentrations of Dissolved Cobalt in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
18. Concentrations of Dissolved Copper in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
19. Concentrations of Dissolved Iron in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
20. Concentrations of Dissolved Lead in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
21. Concentrations of Dissolved Manganese in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
22. Concentrations of Dissolved Thallium in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
23. Concentrations of Total Cyanide in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
24. Concentrations of Total Free Cyanide in Rounds 3 and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
25. Concentrations of Dissolved Cyanide in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
26. Concentrations of Dissolved Free Cyanide in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
27. Concentrations of Total Fluoride in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
28. Concentrations of Dissolved Fluoride in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
29. Concentrations of Total Aluminum in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
30. Concentrations of Total Arsenic in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit

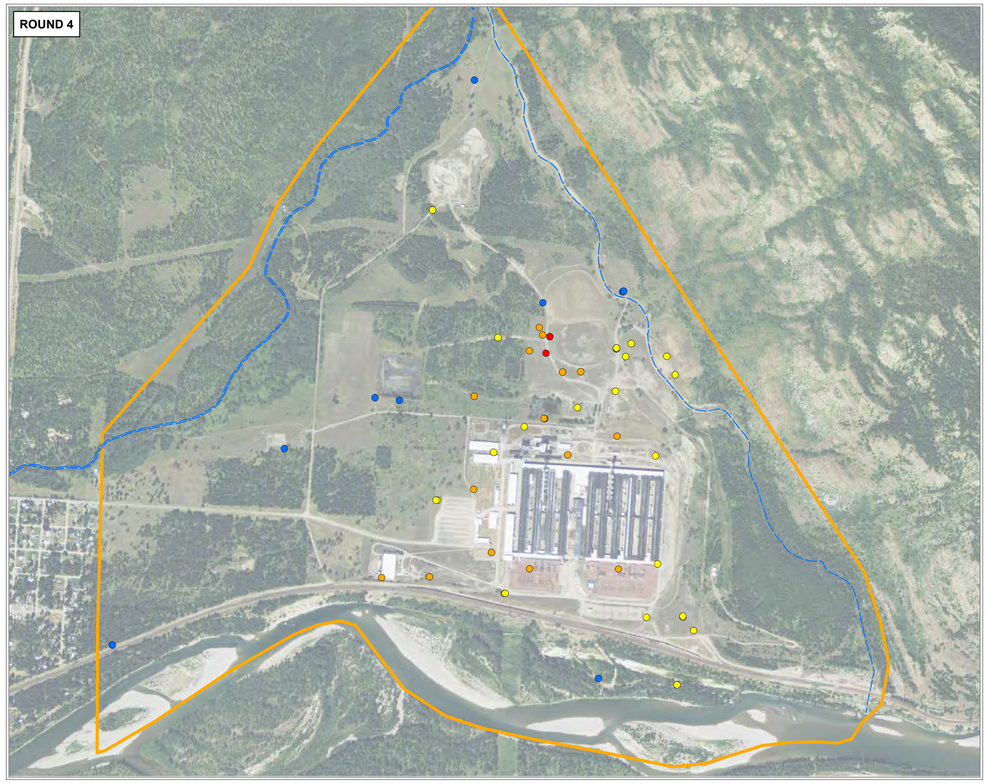
31. Concentrations of Total Cobalt in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
32. Concentrations of Total Copper in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
33. Concentrations of Total Iron in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
34. Concentrations of Total Lead in Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
35. Concentrations of Total Manganese in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
36. Concentrations of Total Thallium in Round 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
37. Concentrations of Dissolved Aluminum in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
38. Concentrations of Dissolved Arsenic in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
39. Concentrations of Dissolved Cobalt in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
40. Concentrations of Dissolved Copper in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
41. Concentrations of Dissolved Iron in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
42. Concentrations of Dissolved Lead in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
43. Concentrations of Dissolved Manganese in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
44. Concentrations of Dissolved Thallium in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
45. Concentrations of Alkalinity in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
46. Concentrations of Ammonia in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit

47. Concentrations of Chloride in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
48. Concentrations of Hardness as Calcium Carbonate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
49. Concentrations of Nitrate and Nitrite in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
50. Concentrations of Orthophosphate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
51. Concentrations of Sulfate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
52. Concentrations of Alkalinity in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened in Upper Hydrogeologic Unit
53. Concentrations of Ammonia in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
54. Concentrations of Chloride in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
55. Concentrations of Total Hardness as Calcium Carbonate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
56. Concentrations of Total Nitrate and Nitrite in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
57. Concentrations of Orthophosphate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit
58. Concentrations of Sulfate in Rounds 1,2,3, and 4 Groundwater from Monitoring Wells Screened Below Upper Hydrogeologic Unit









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CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2U)
- ND – 0.15
- 0.15 – 200
- 200 – 2,000
- >2,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CYANIDE, TOTAL	200	200	0.15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF TOTAL CYANIDE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H1
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H1.2476.0001Y170.24.mxd		

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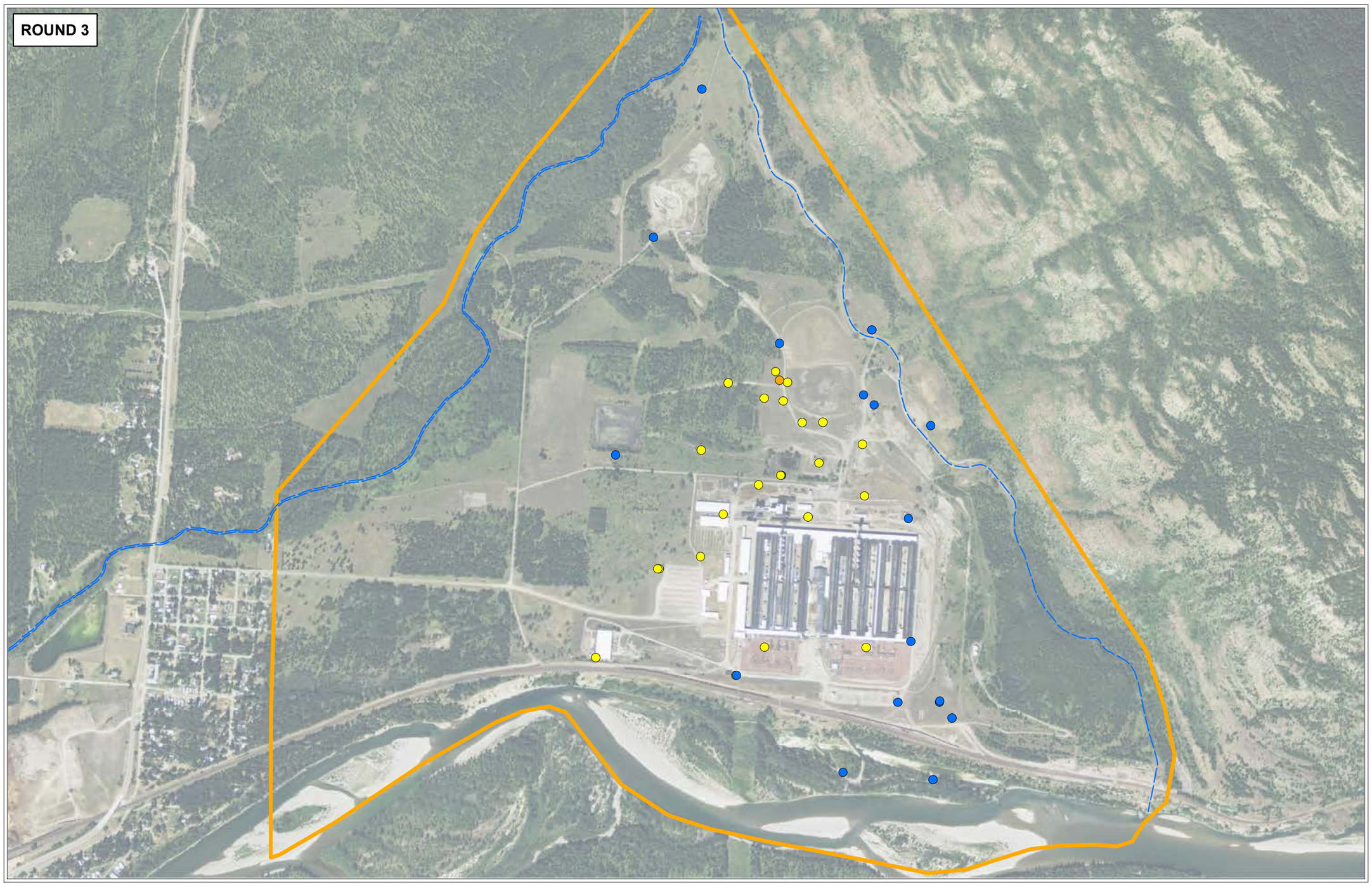

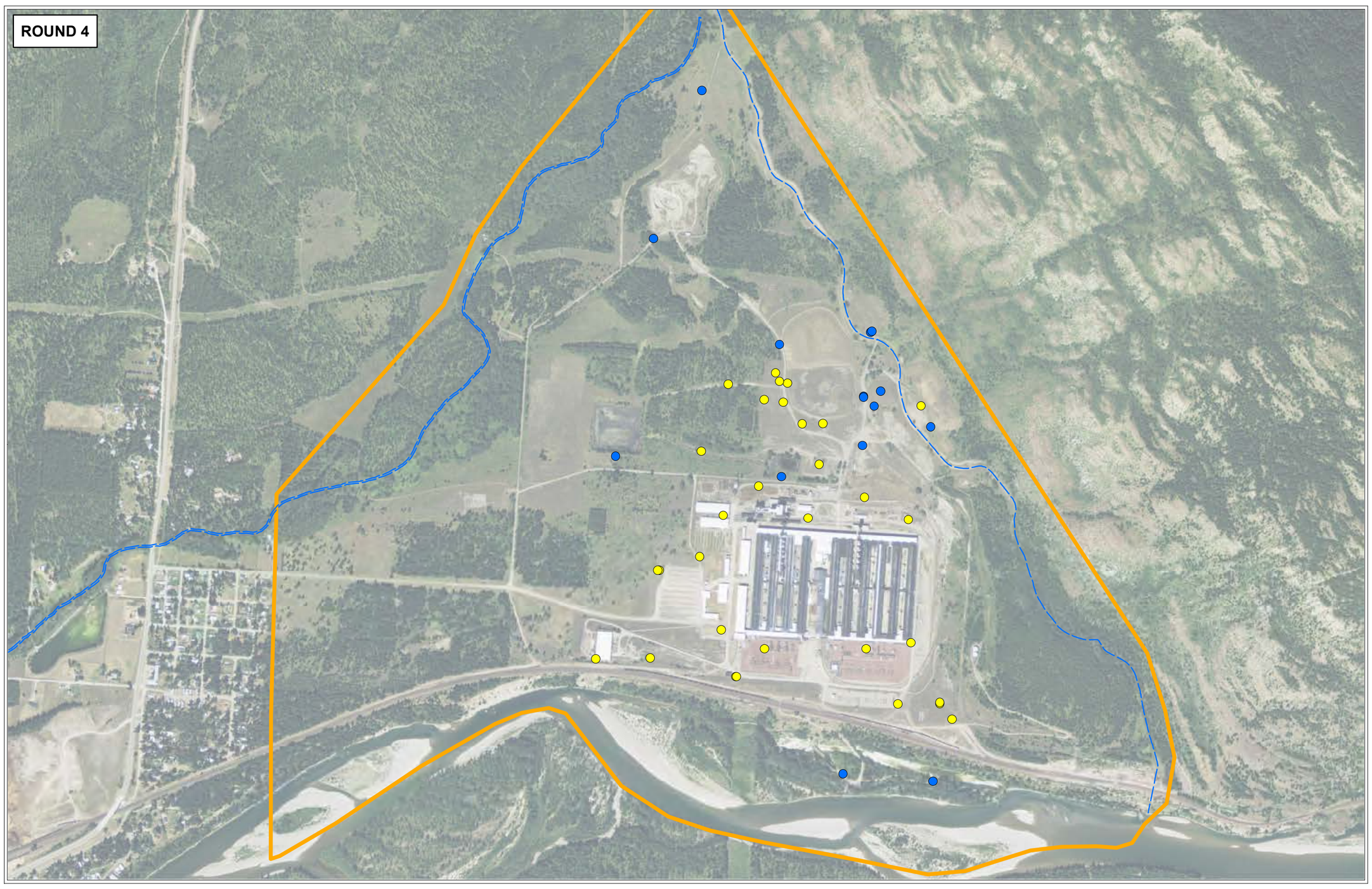

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2U)
- ND – 0.15
- 0.15 – 200
- 200 – 2,000
- >2,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CYANIDE, FREE	200	200	0.15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

N

500 0 500 1,000 Feet

Title:

CONCENTRATIONS OF TOTAL FREE CYANIDE IN ROUNDS 3 AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H2
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H2.2476.0001Y170.23.mxd		

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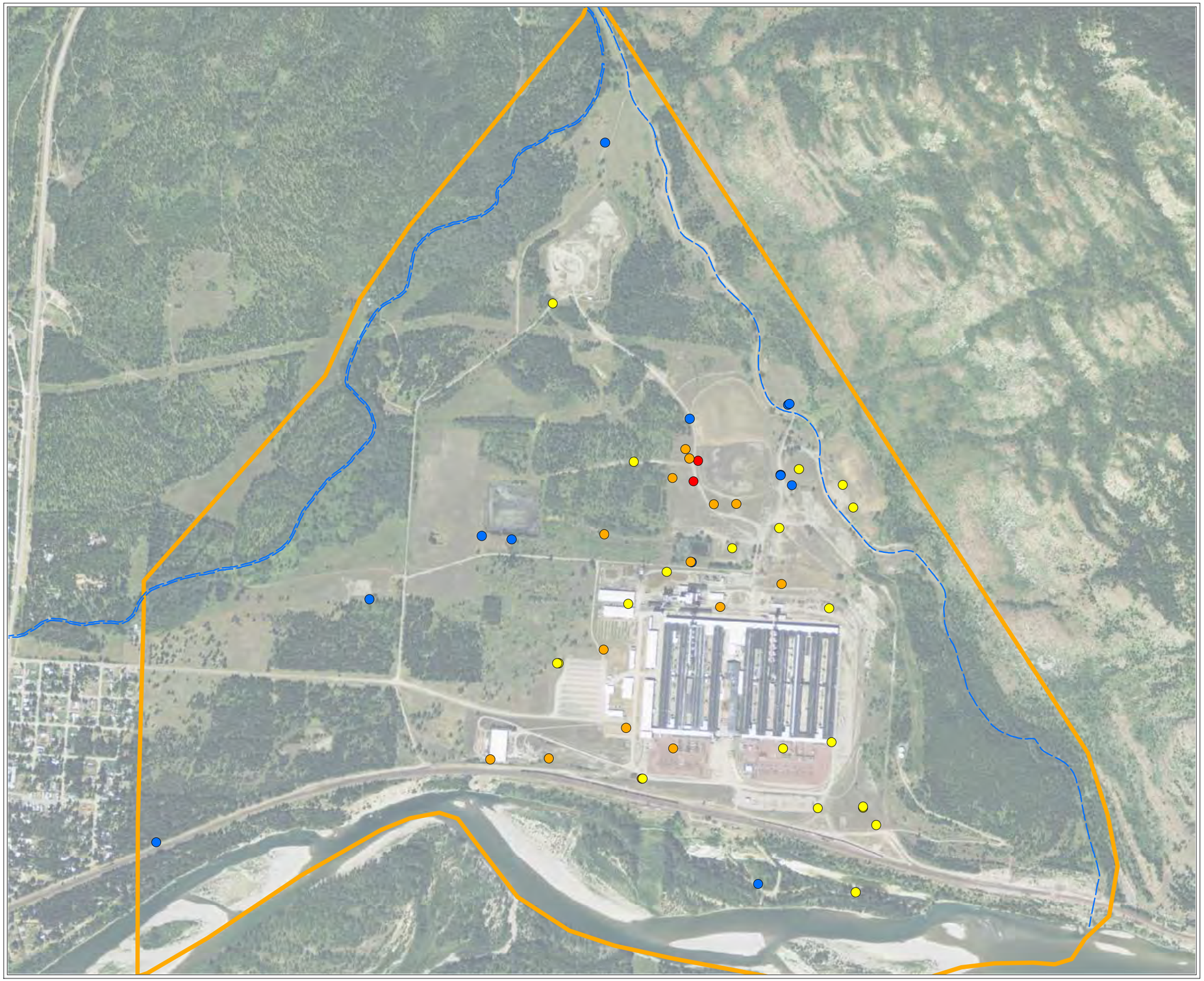

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2U)
- ND – 0.15
- 0.15 – 200
- 200 – 2,000
- >2,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CYANIDE, TOTAL	200	200	0.15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF DISSOLVED CYANIDE IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 20NOV17
Prepared by: M.R.	Scale: AS SHOWN
Project Mgr: M.R.	Project: 2476.0001Y002
File: H3.2476.0001Y170.35.mxd	

APPENDIX
H3

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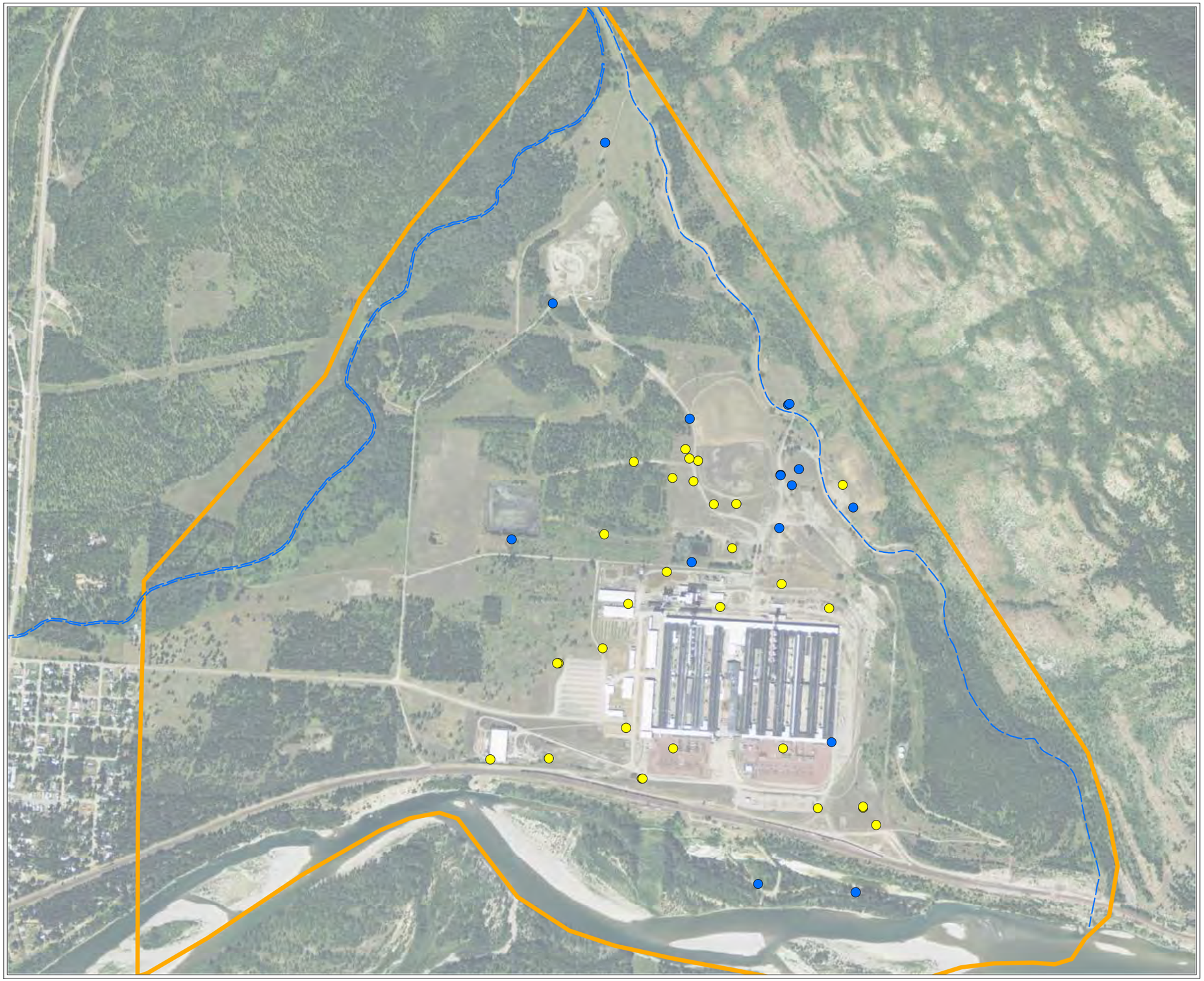

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.5U)
- ND – 0.15
- 0.15 – 200
- 200 – 2,000
- >2,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CYANIDE, FREE	200	200	0.15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title: **CONCENTRATIONS OF DISSOLVED FREE CYANIDE IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 20NOV17
Prepared by: M.R.	Scale: AS SHOWN
Project Mgr: M.R.	Project: 2476.0001Y002
File: H4.2476.0001Y170.34.mxd	

APPENDIX **H4**

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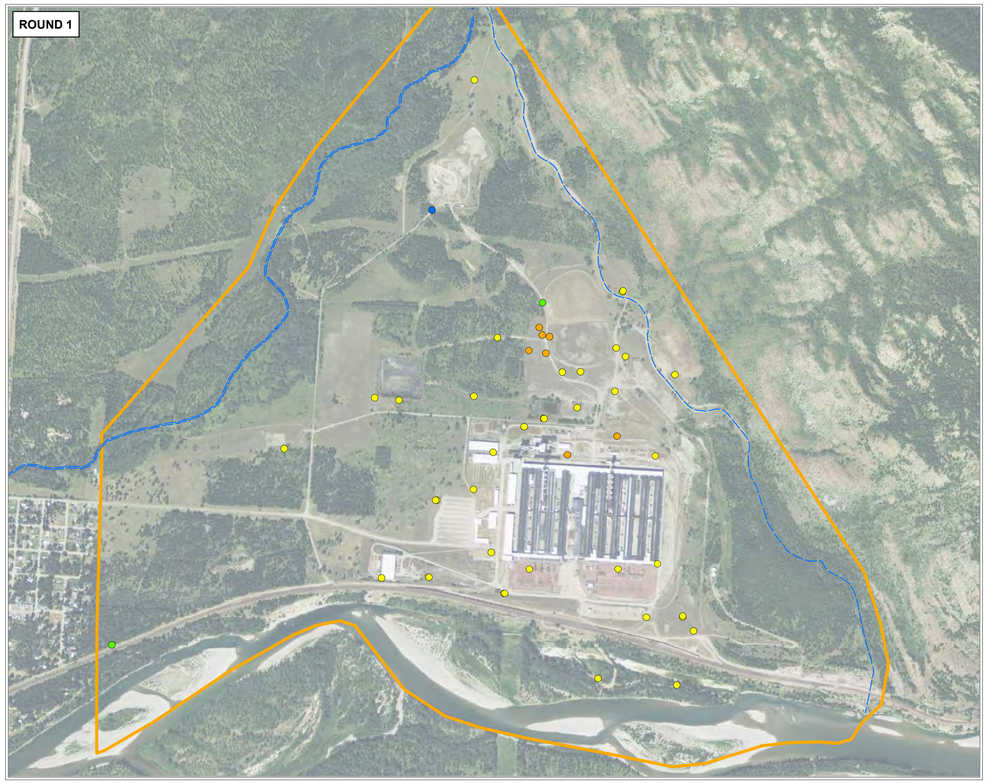

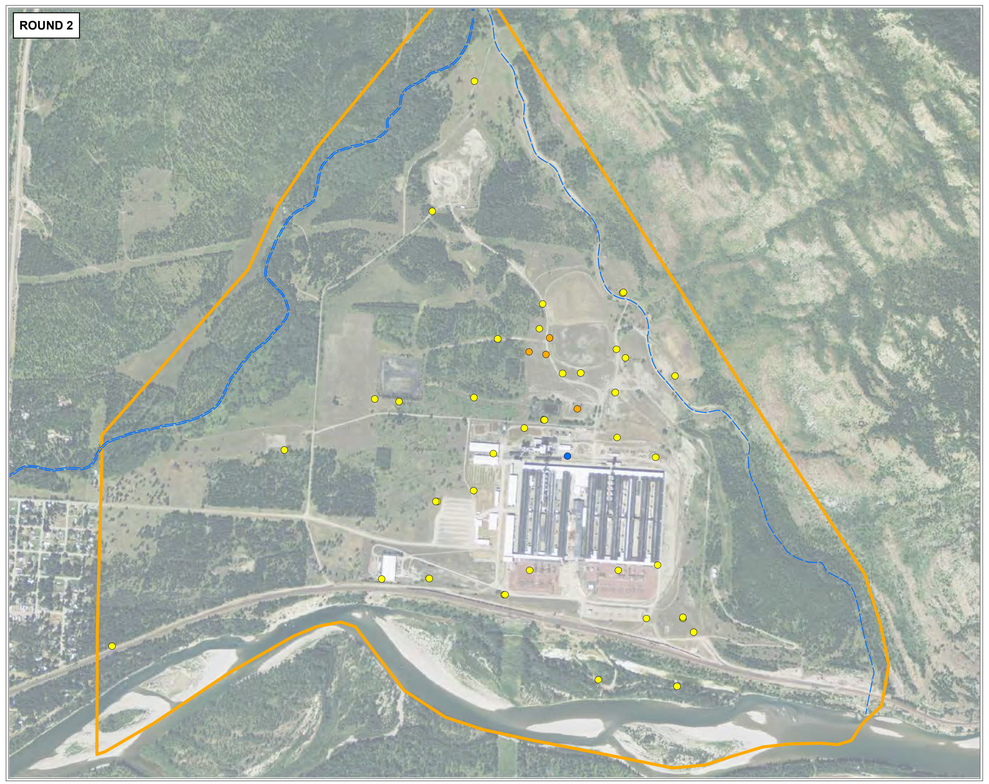

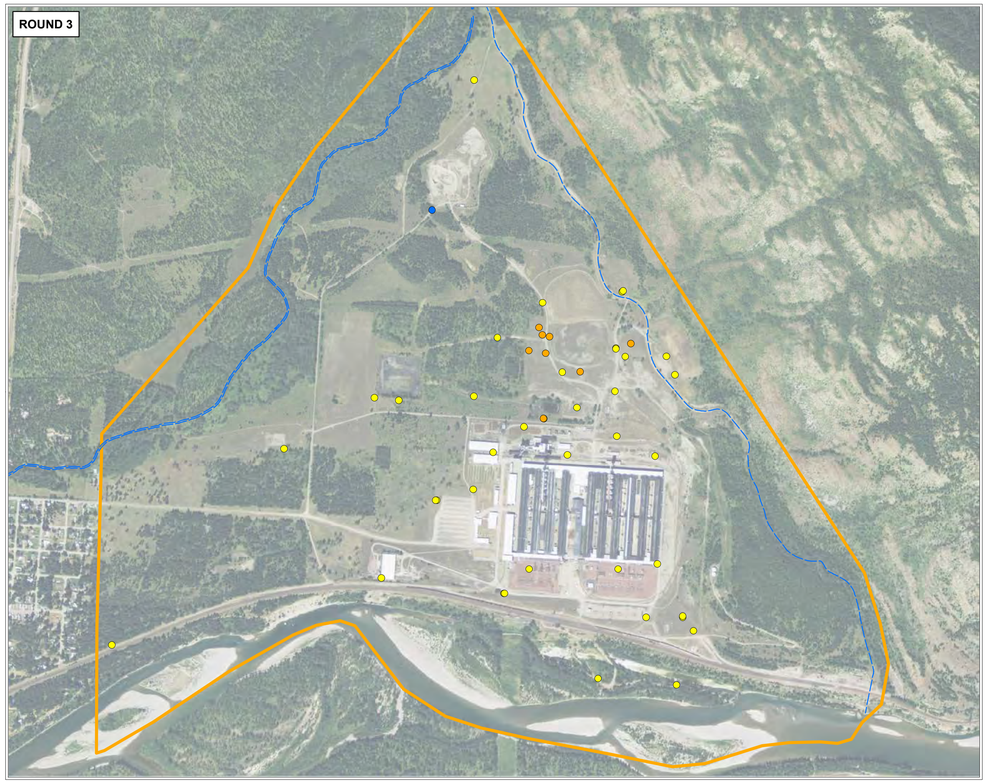

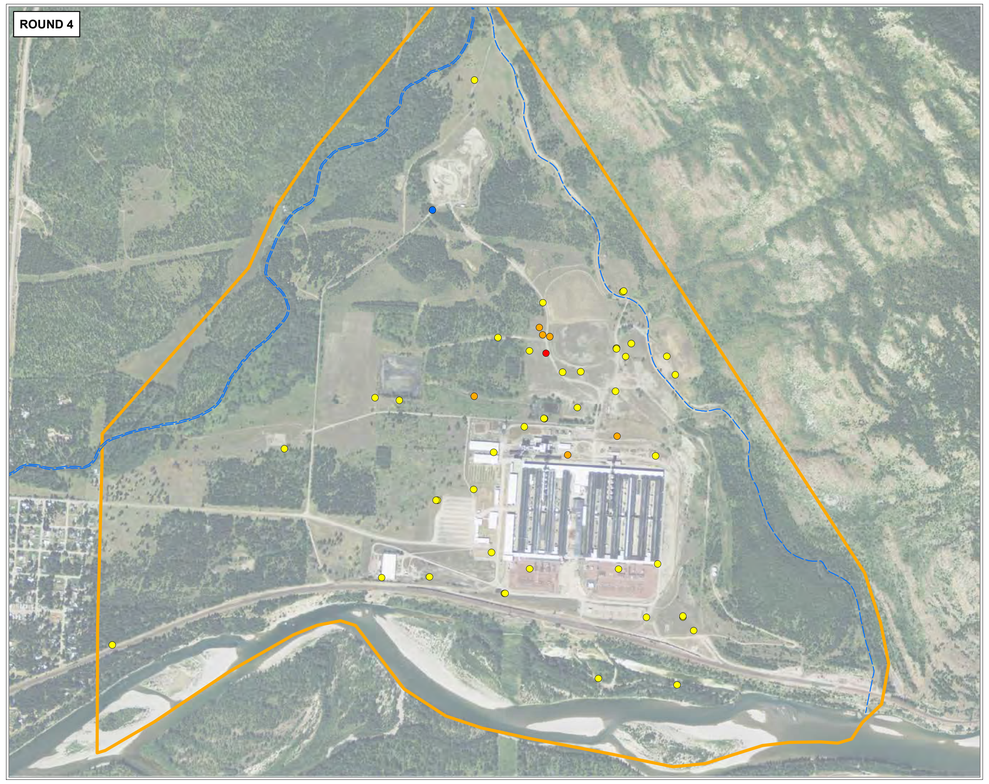

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 80
- 80 – 4,000
- 4,000 – 40,000
- >40,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
FLUORIDE	4000	4000	80

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL FLUORIDE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H5
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H5.2476.0001Y170.25.mxd		

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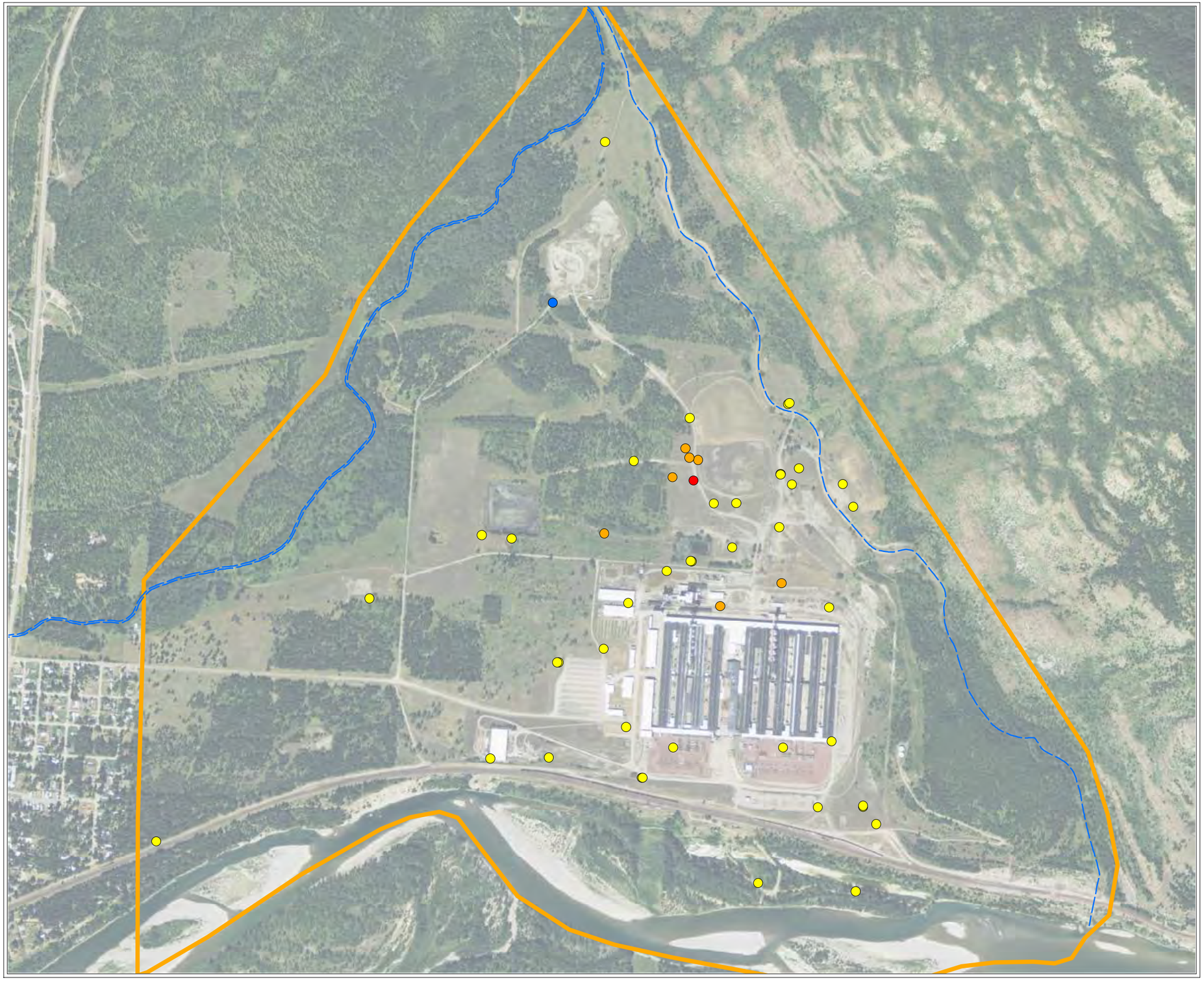

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 80
- 80 – 4,000
- 4,000 – 40,000
- >40,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
FLUORIDE	4000	4000	80

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title: **CONCENTRATIONS OF DISSOLVED FLUORIDE IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H6
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H6.2476.0001Y170.36.mxd		

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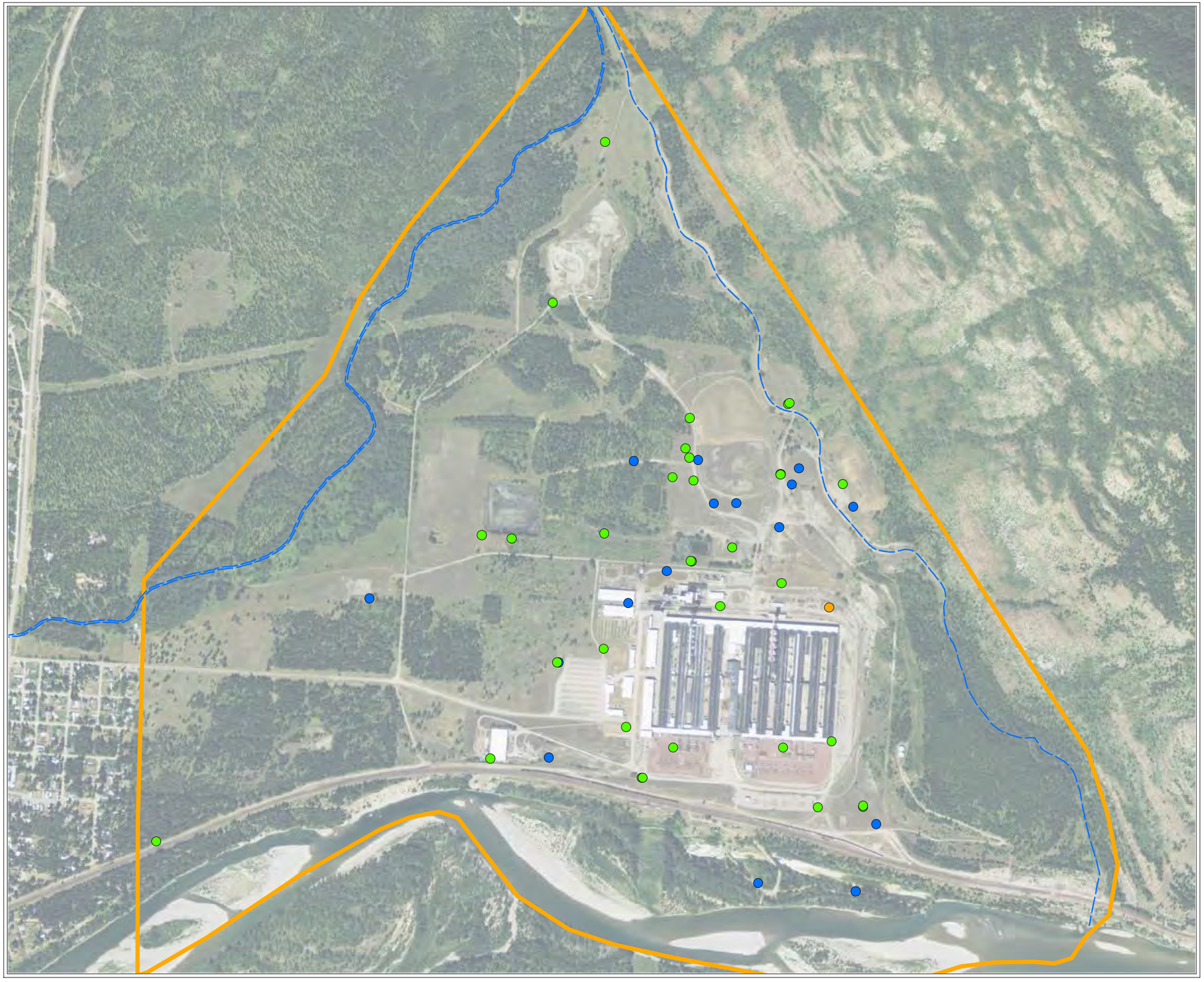

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (18.2U)
- ND – 2,000
- 2,000 – 4,000
- 4,000 – 20,000
- >20,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ALUMINUM	--	--	2000

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
18.2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL ALUMINUM IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H7
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H7.2476.0001Y170.37.mxd		

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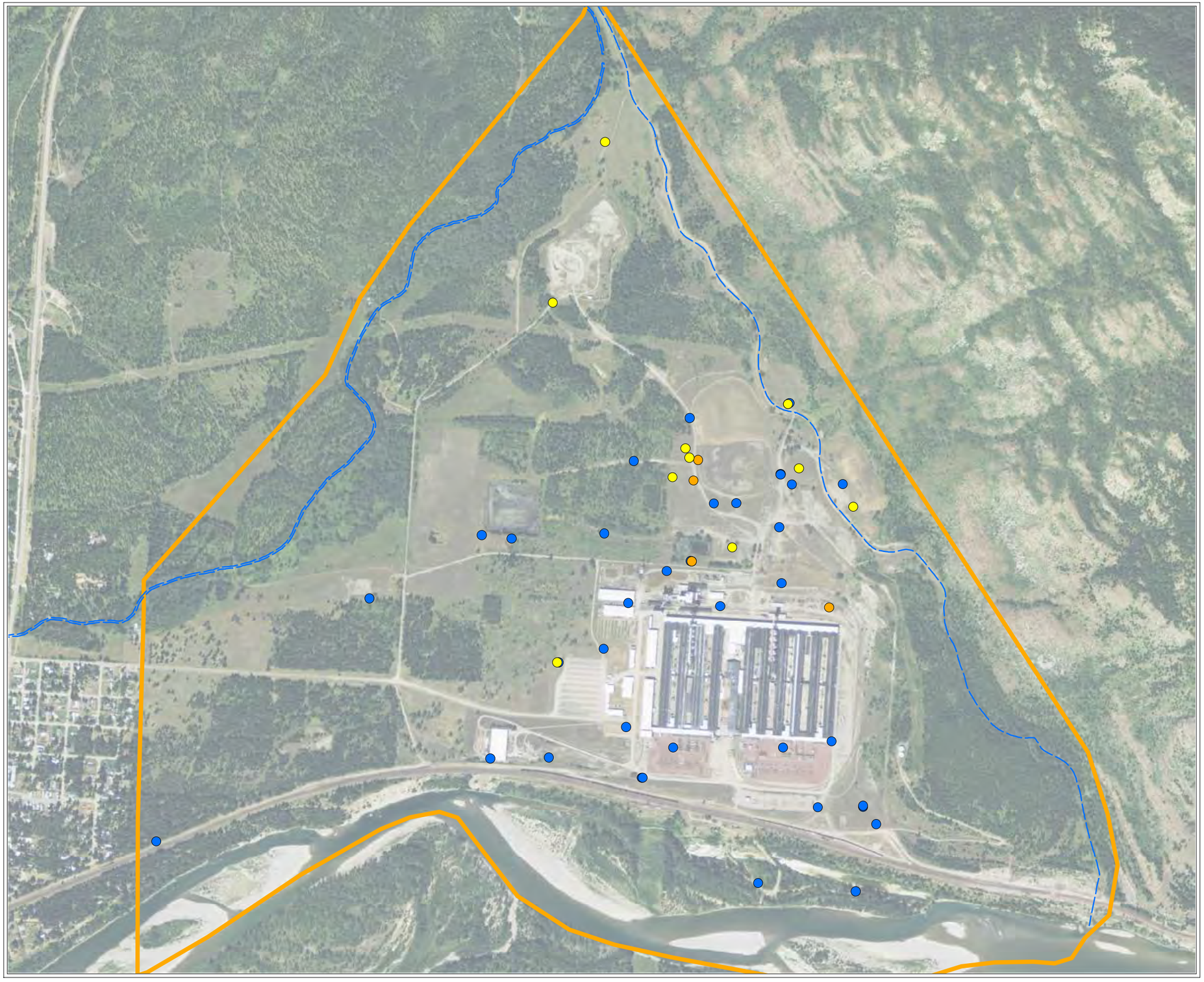

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.64U)
- ND – 0.052
- 0.052 – 10
- 10 – 100
- >100

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ARSENIC	10	10	0.052

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.64U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL ARSENIC IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H8
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H8.2476.0001Y170.38.mxd		

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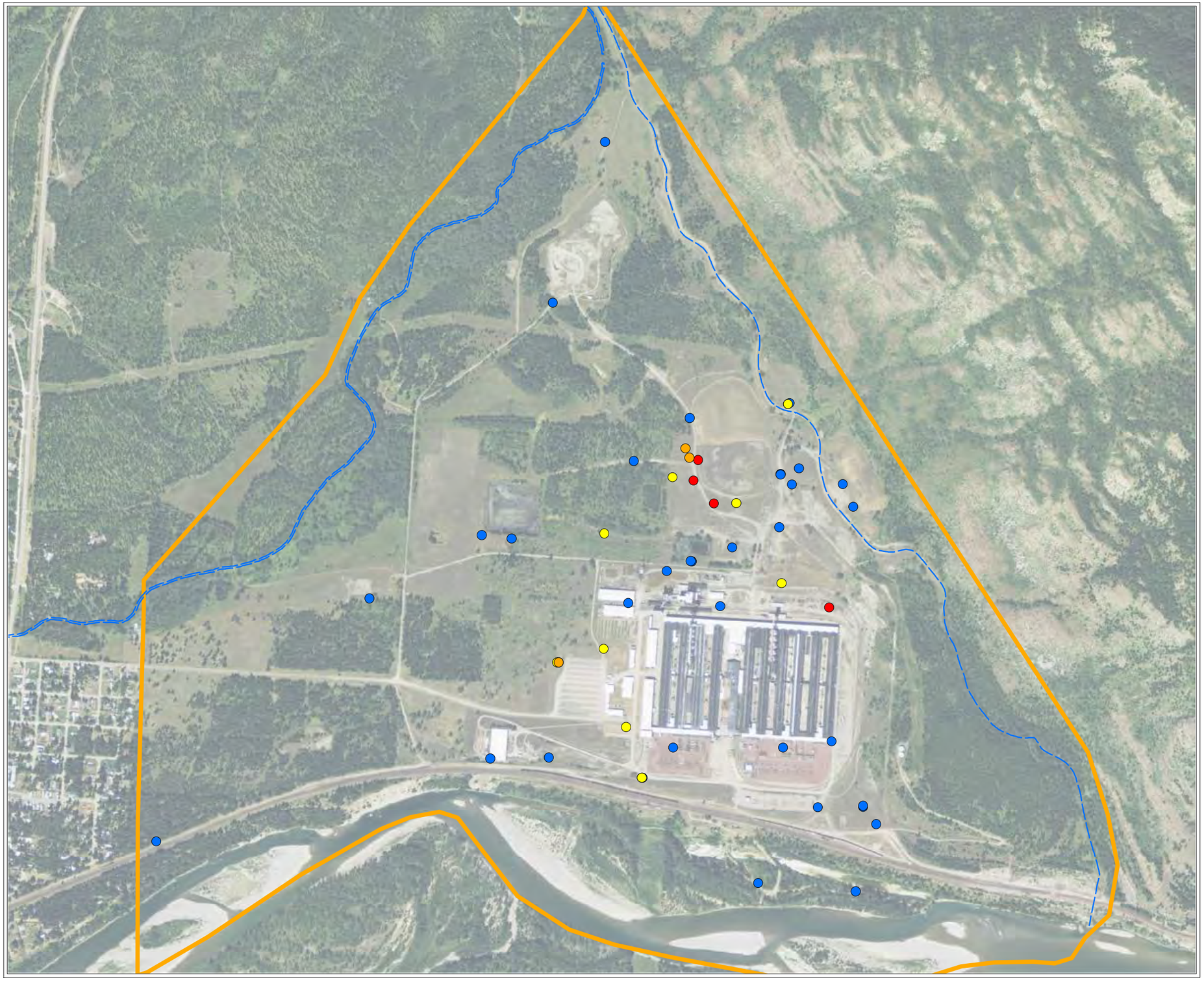

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.3U)
- ND – 0.6
- 0.6 – 2
- 2 – 4
- >4

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
COBALT	--	--	0.6

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.3U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL COBALT IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H9
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H9.2476.0001Y170.39.mxd		

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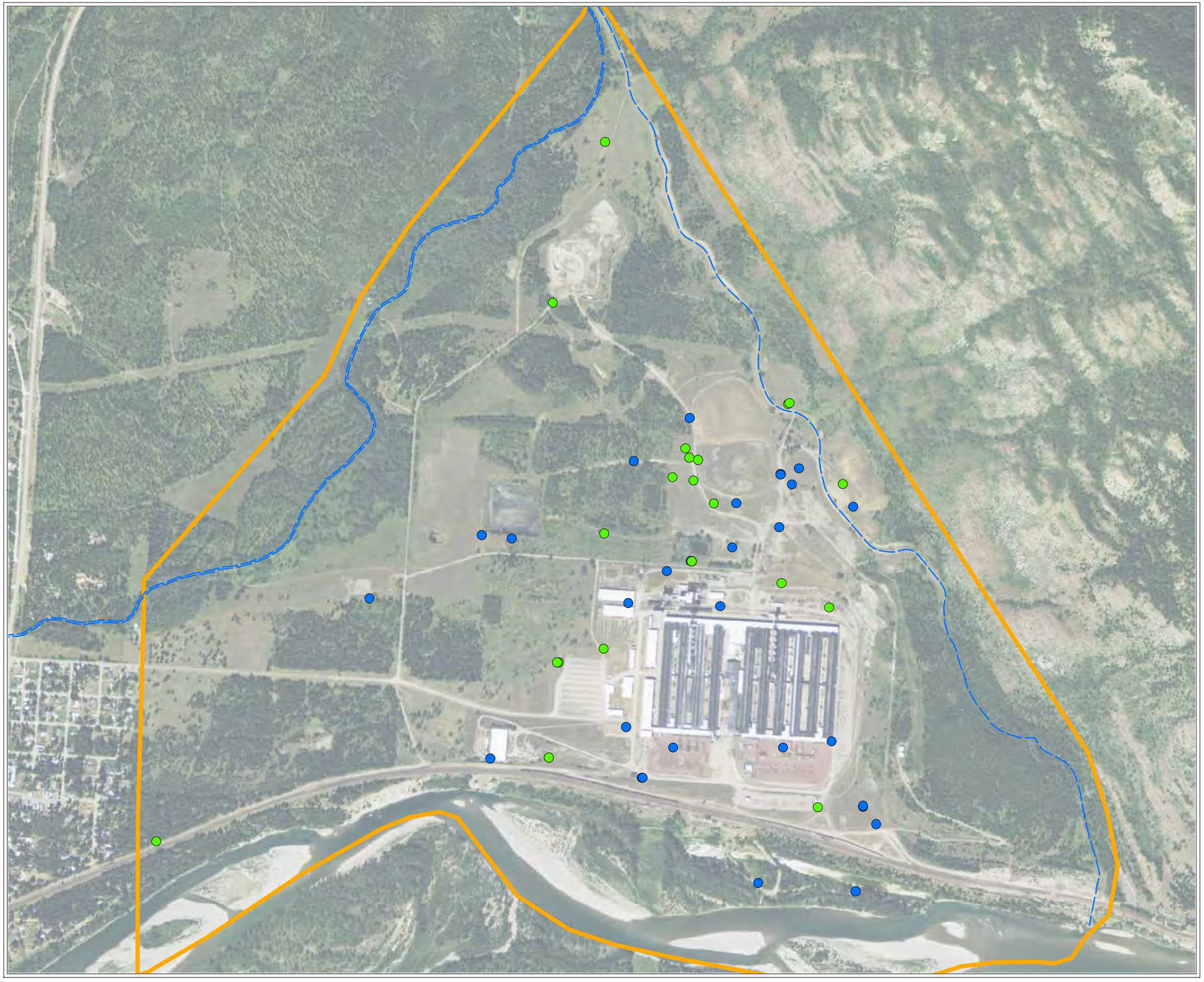

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.4U)
- ND – 80
- 80 – 1,300
- 1,300 – 13,000
- >13,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
COPPER	1300	1300	80

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL COPPER IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H10
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H10.2476.0001Y170.40.mxd		

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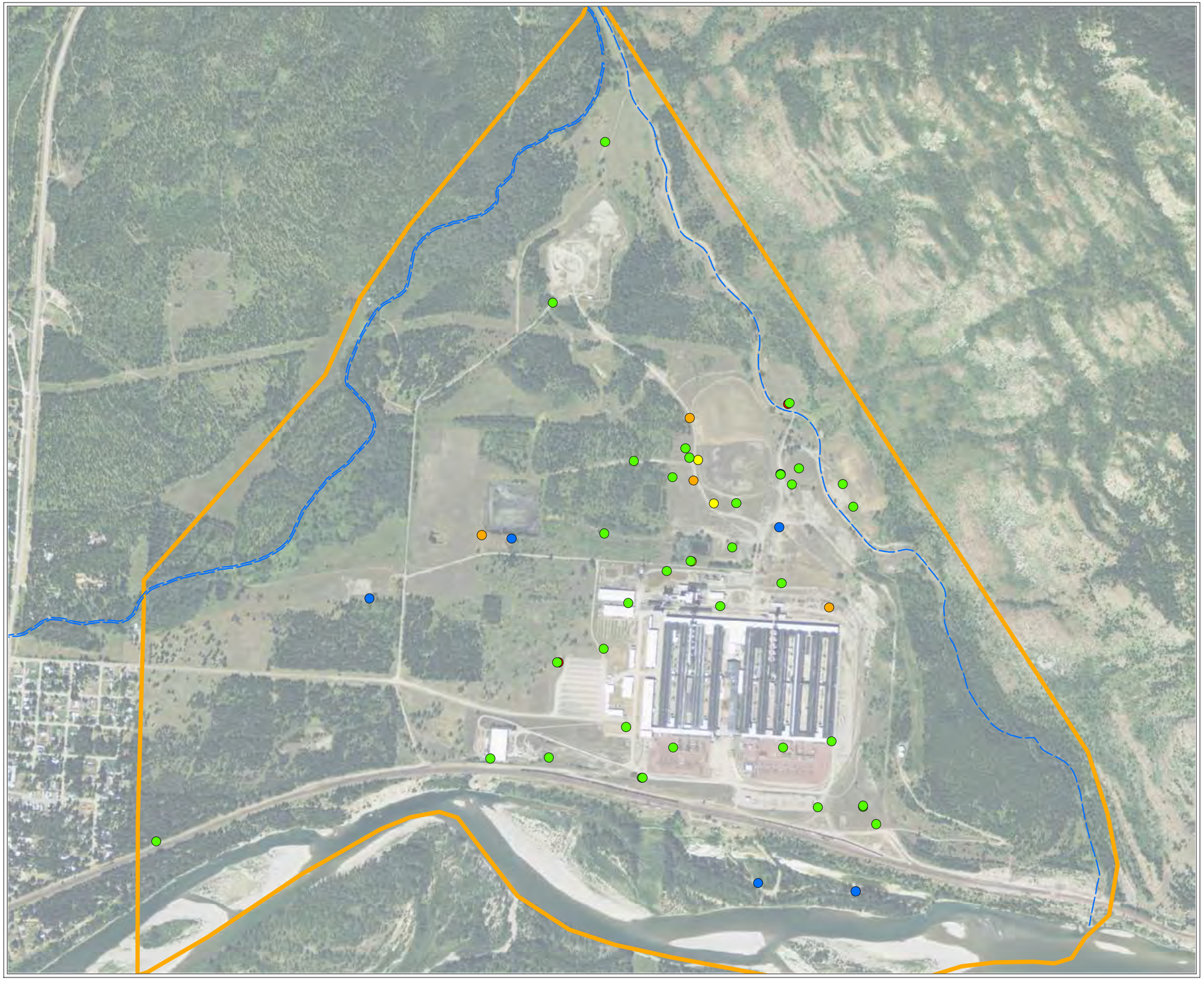

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42.4U)
- ND – 1,400
- 1,400 – 2,800
- 2,800 – 14,000
- >14,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
IRON	--	--	1400

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
42.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL IRON IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H11
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H11.2476.0001Y170.41.mxd		

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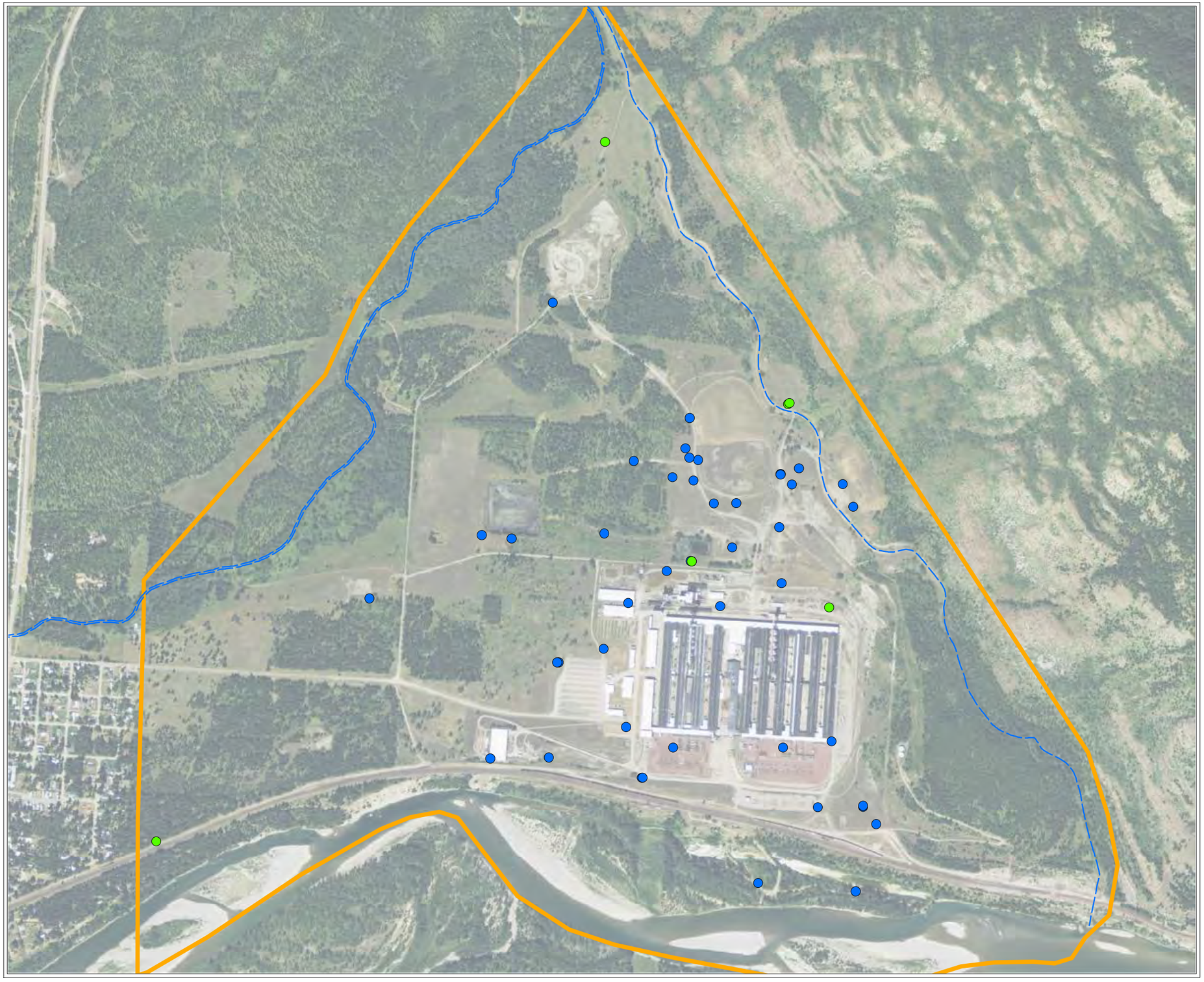

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.38U)
- ND – 15
- 15 – 30
- 30 – 150
- >150

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
LEAD	15	15	15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.38U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title:

CONCENTRATIONS OF TOTAL LEAD IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H12
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H12.2476.0001Y170.42.mxd		

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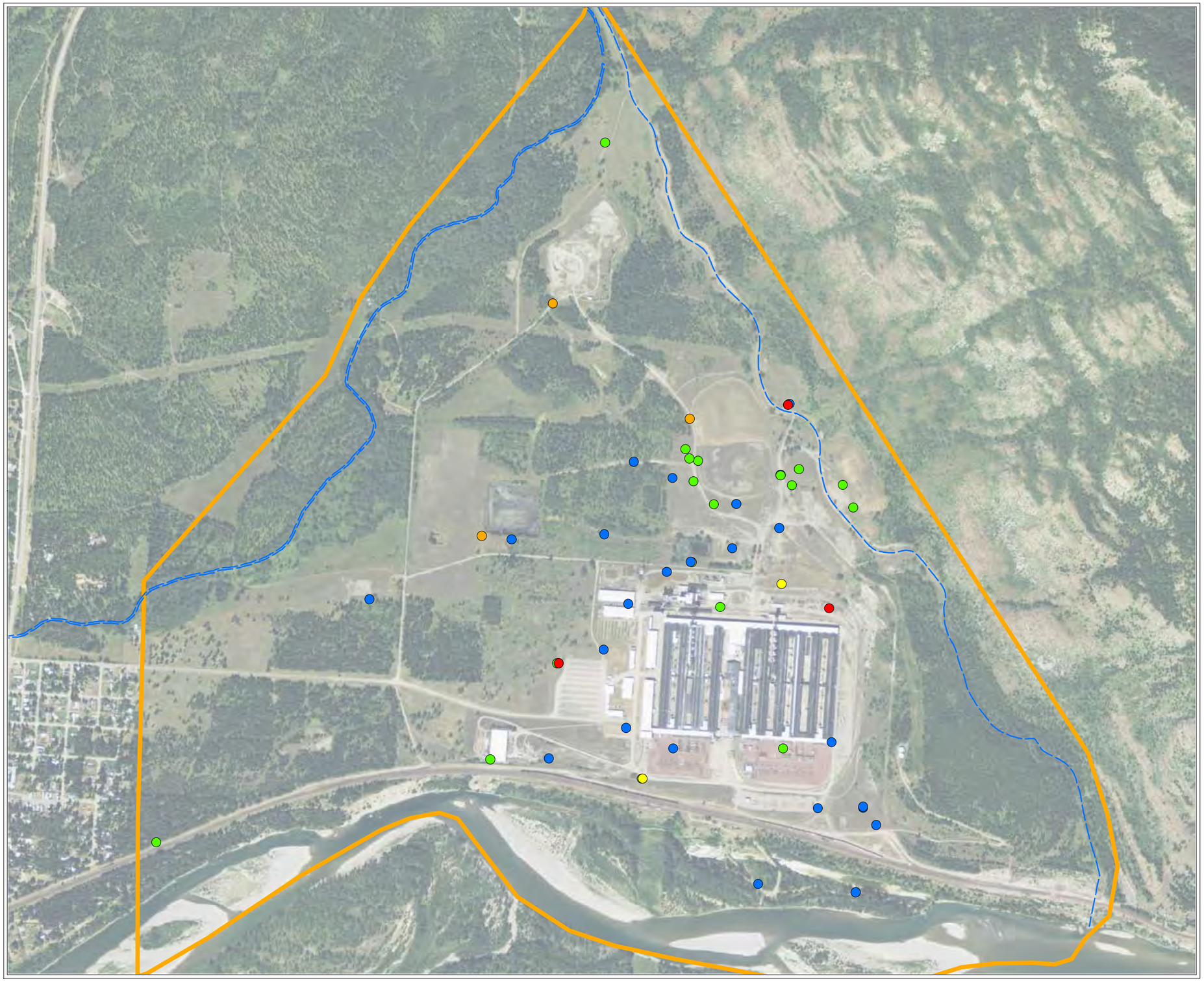

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2.5U)
- ND – 43
- 43 – 86
- 86 – 430
- >430

CHEMICAL NAME	DEQ–7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
MANGANESE	--	--	43

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title: **CONCENTRATIONS OF TOTAL MANGANESE IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H13
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H13.2476.0001Y170.43.mxd		

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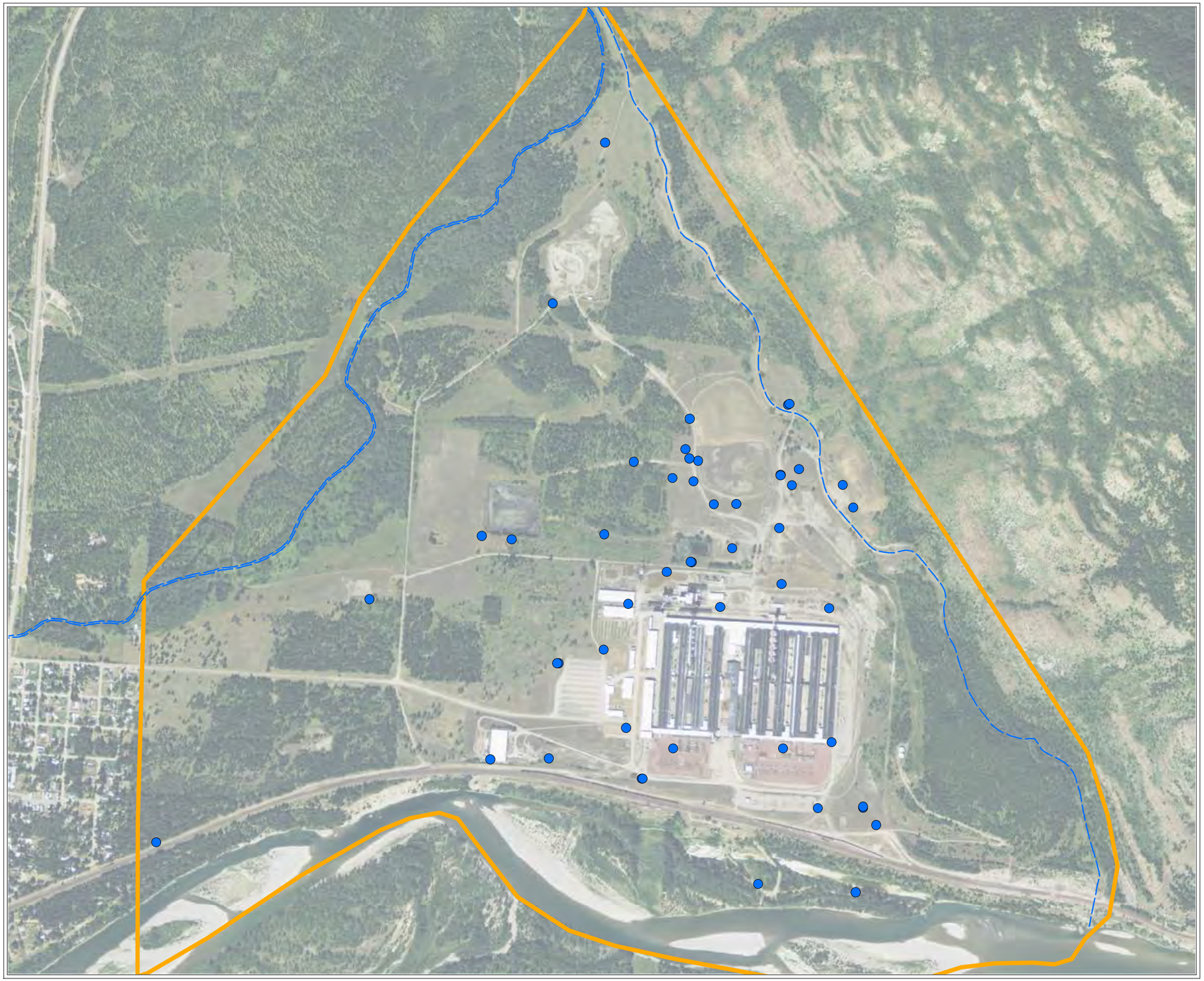

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.26U)
- ND – 1
- 1 – 2
- 1 – 20
- >20

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
THALLIUM	2	2	0.02

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.26U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title:
CONCENTRATIONS OF TOTAL THALLIUM IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17
Prepared by: M.R.	Scale: AS SHOWN
Project Mgr: M.R.	Project: 2476.0001Y002
File: H14.2476.0001Y170.44.mxd	

APPENDIX
H14

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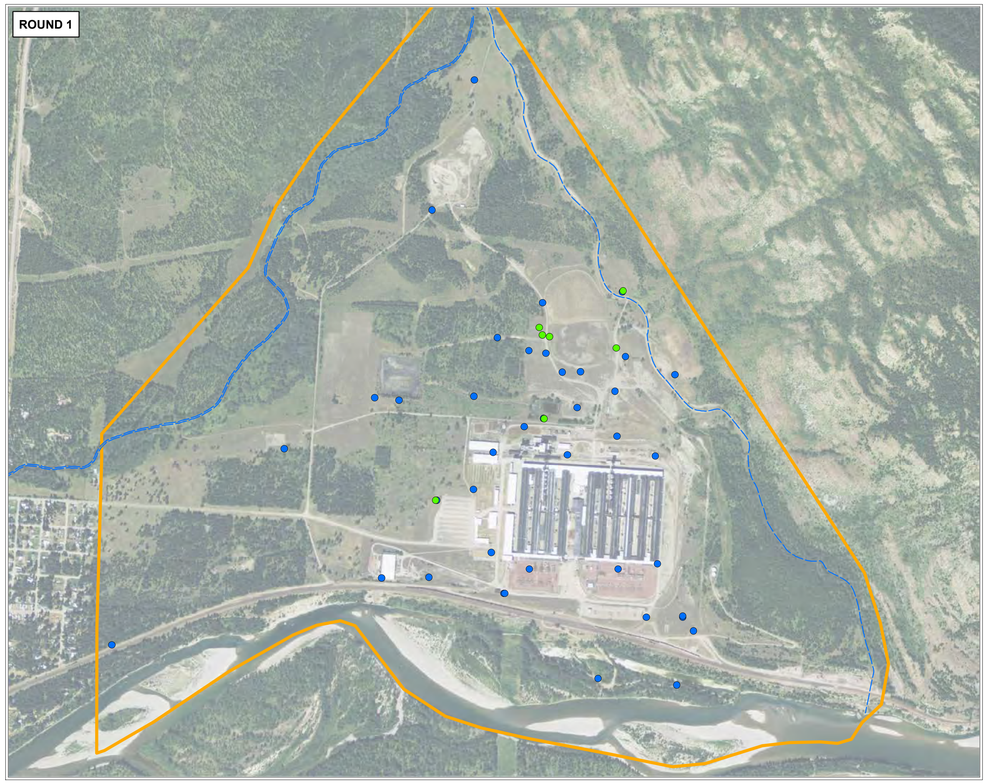

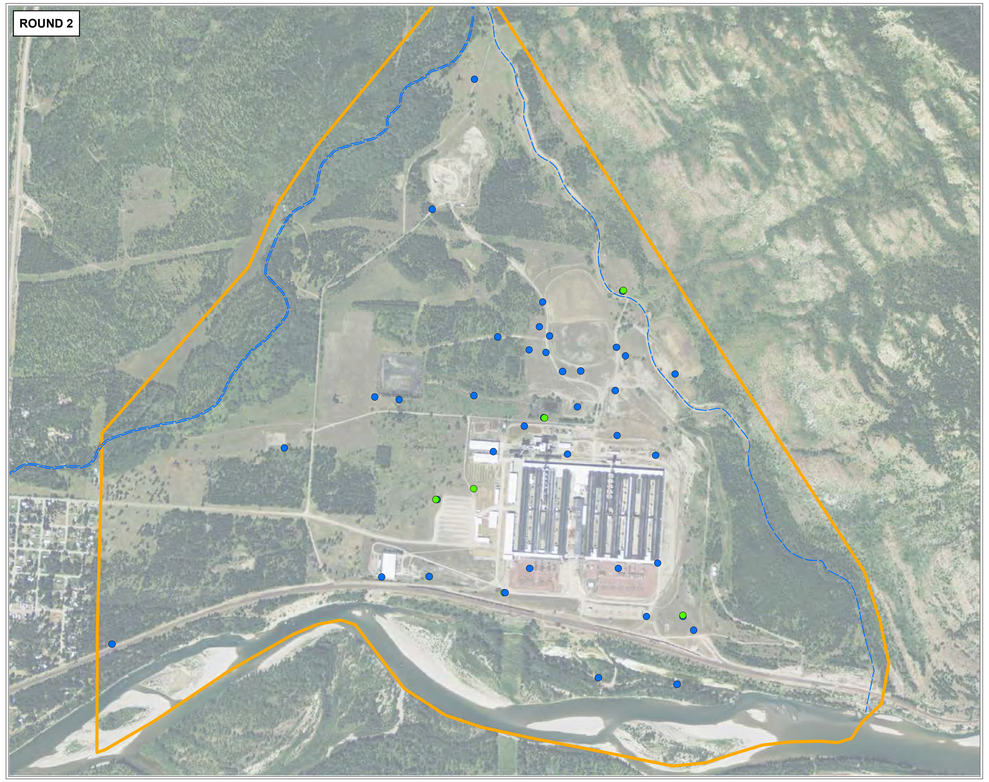

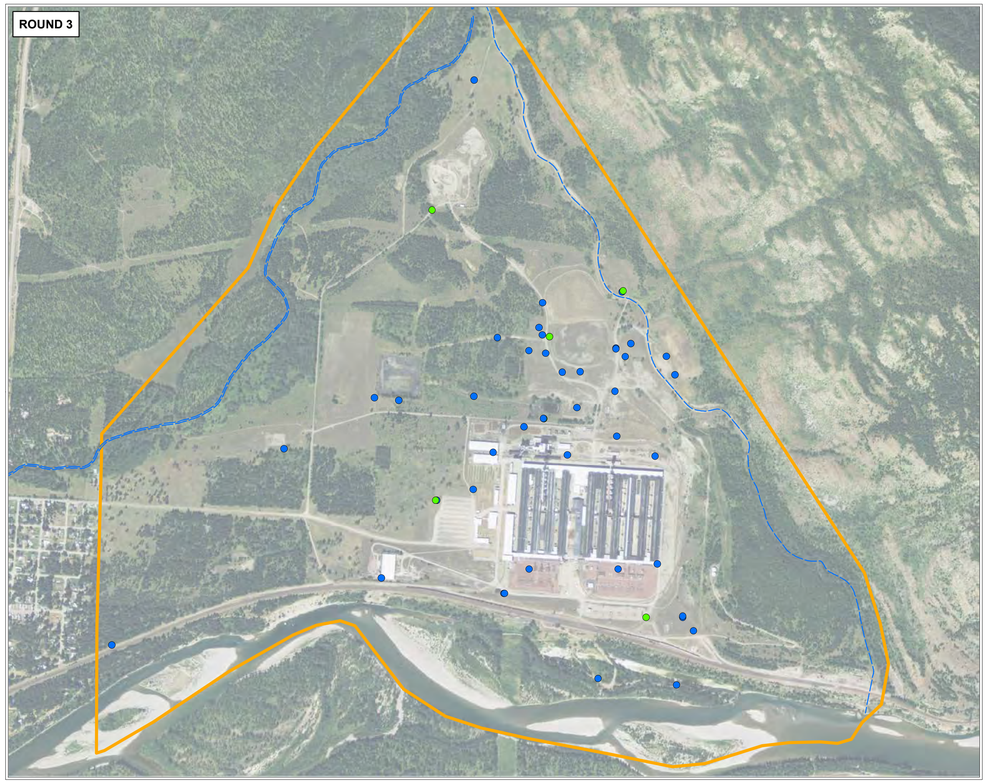

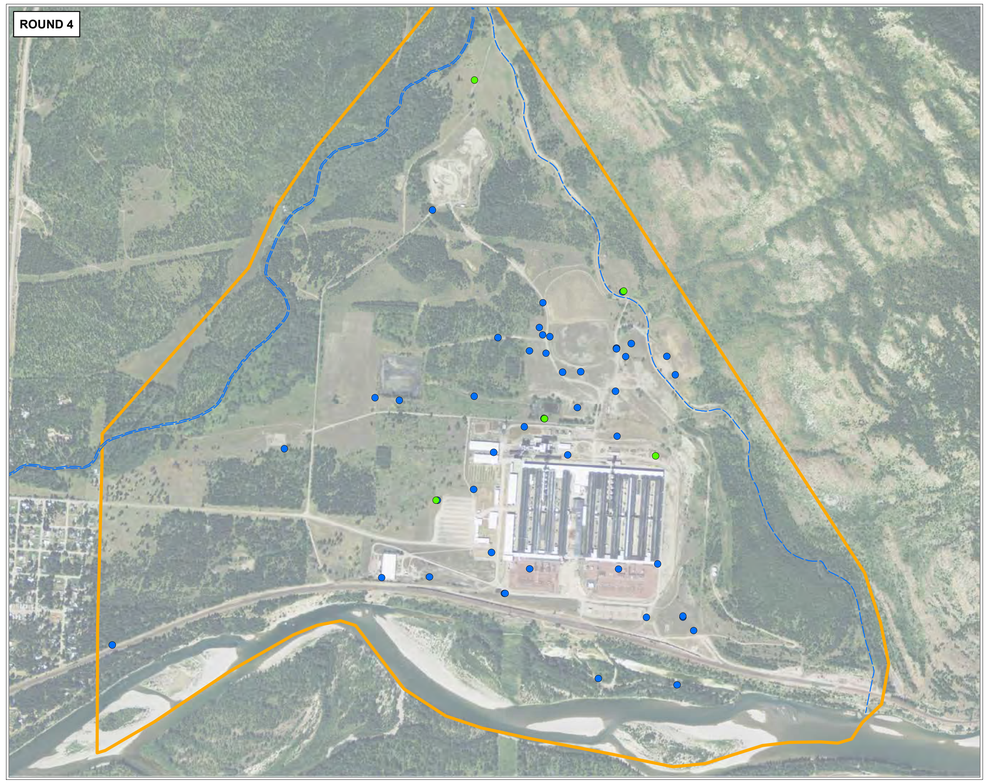

N

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (18.2U)
- ND – 2,000
- 2,000 – 4,000
- 4,000 – 20,000
- >20,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ALUMINUM	--	--	2000

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
18.2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED ALUMINUM IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H15
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H15.2476.0001Y170.26.mxd		

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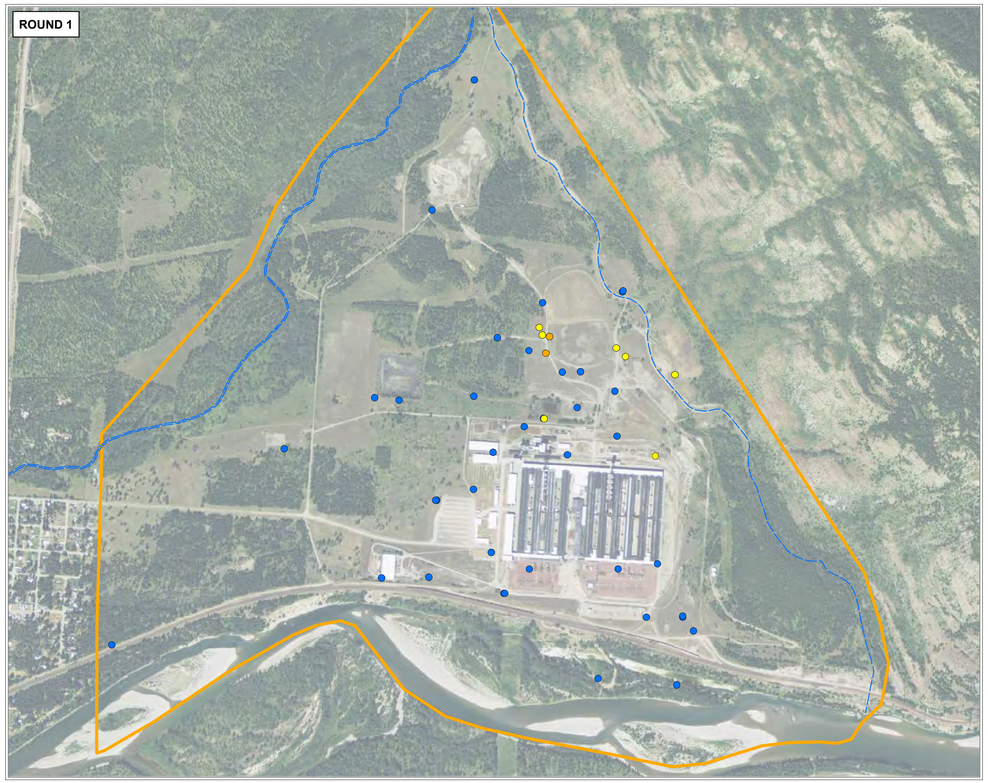

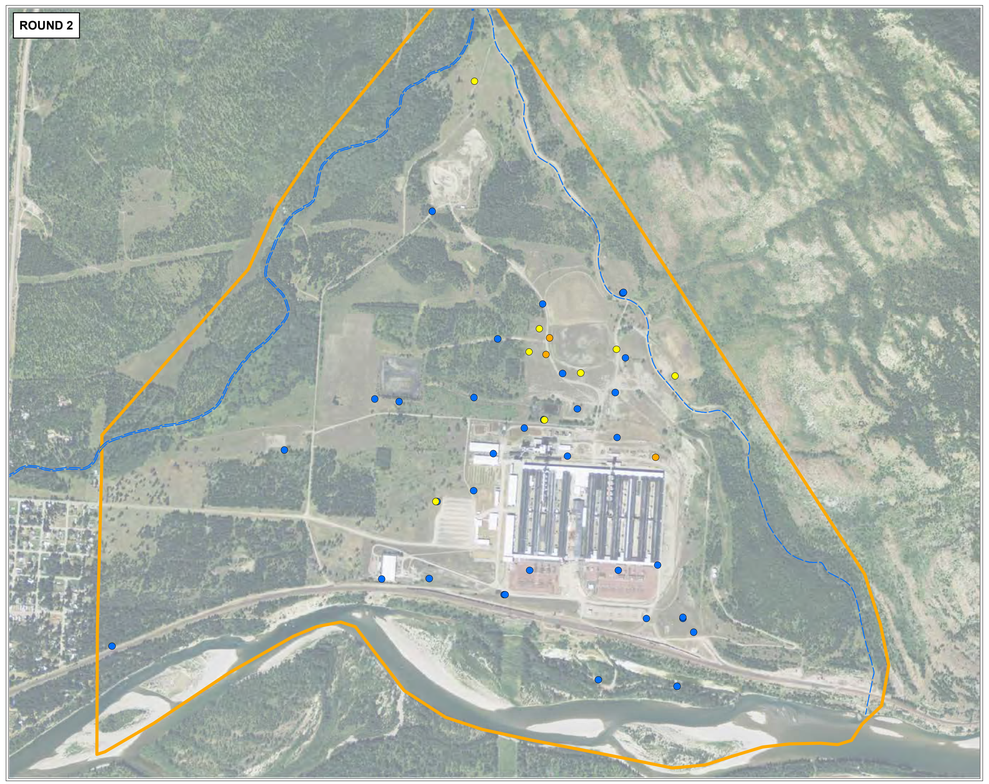

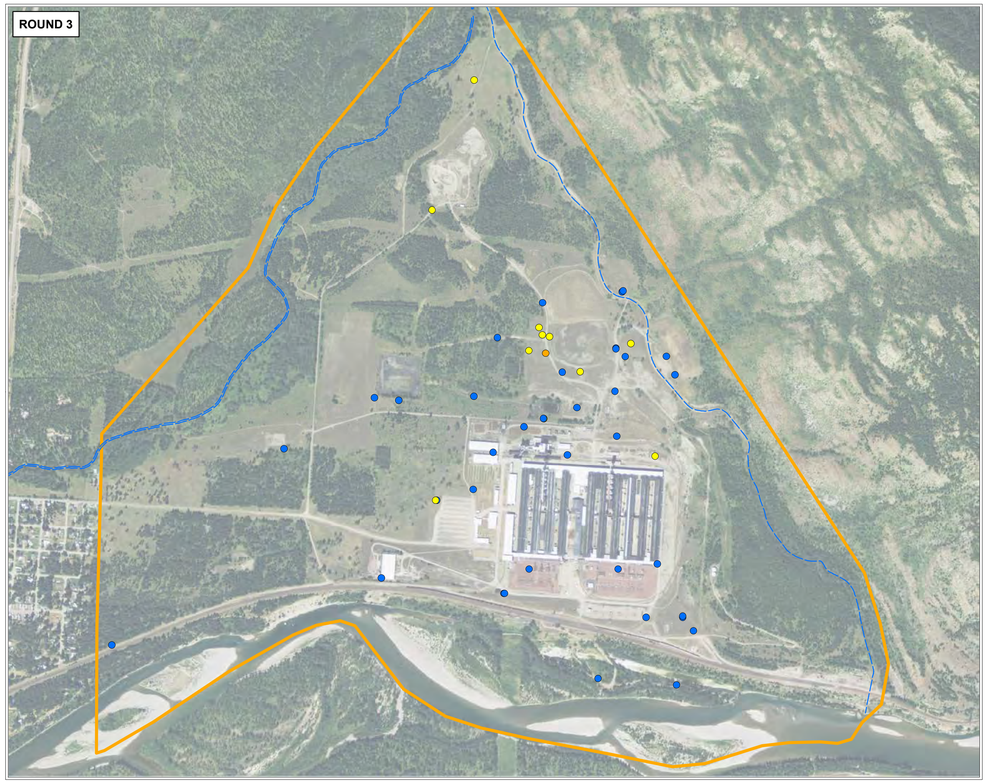

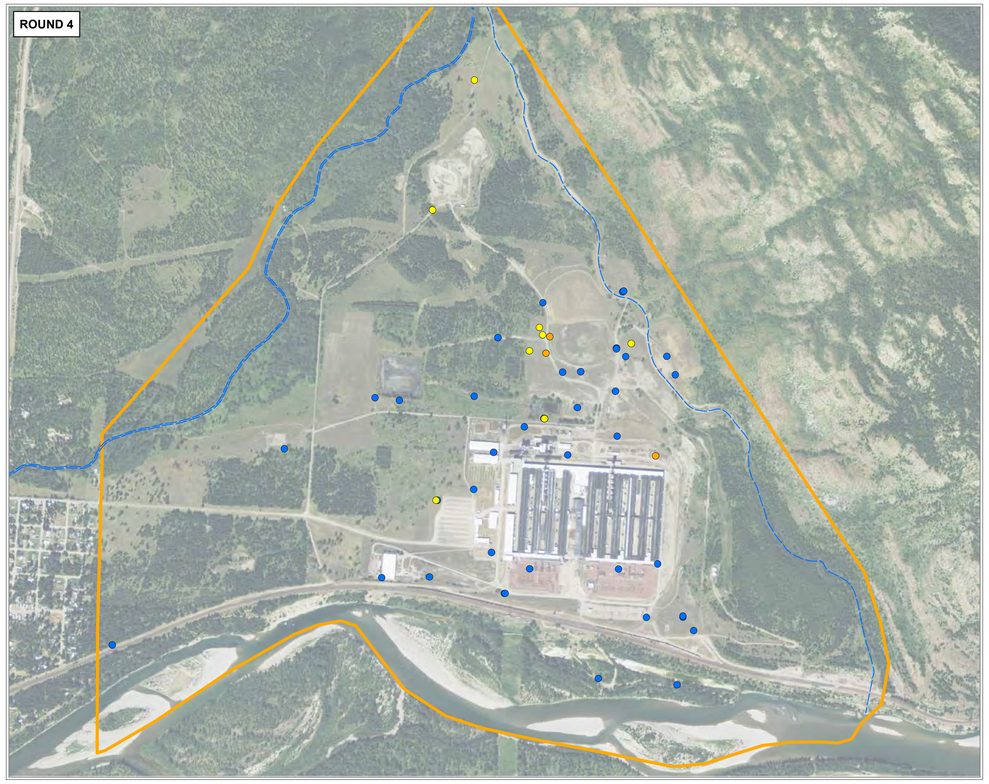

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.64U)
- ND – 0.052
- 0.052 – 10
- 10 – 100
- >100

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ARSENIC	10	10	0.052

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.64U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED ARSENIC IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H16
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H16.2476.0001Y170.27.mxd		

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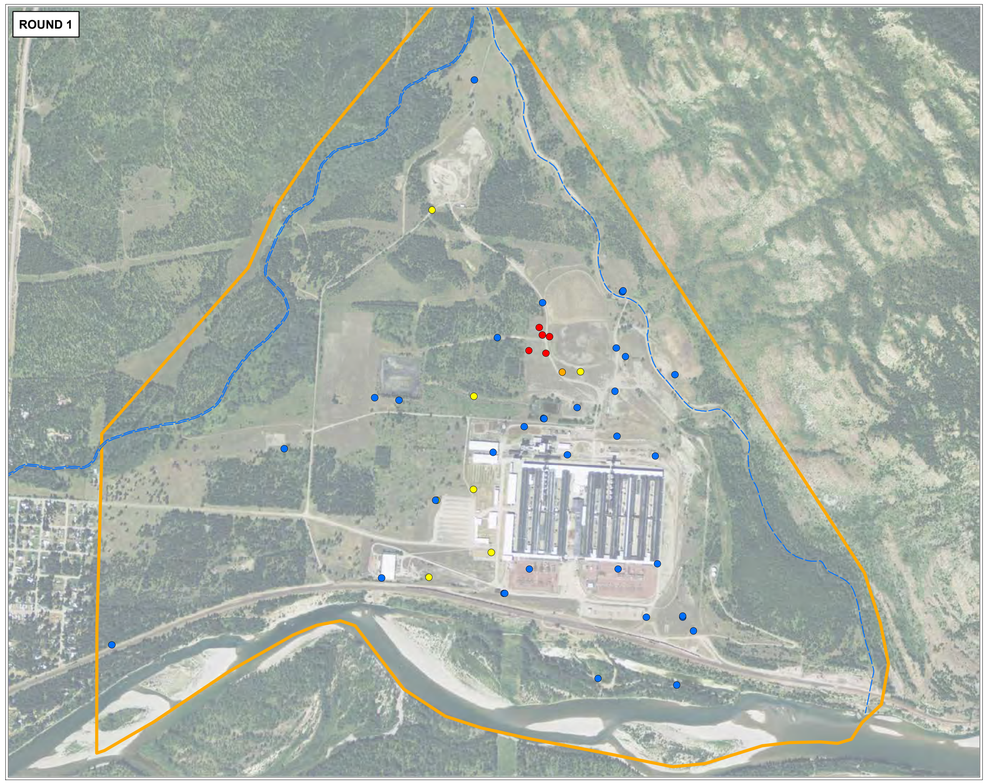

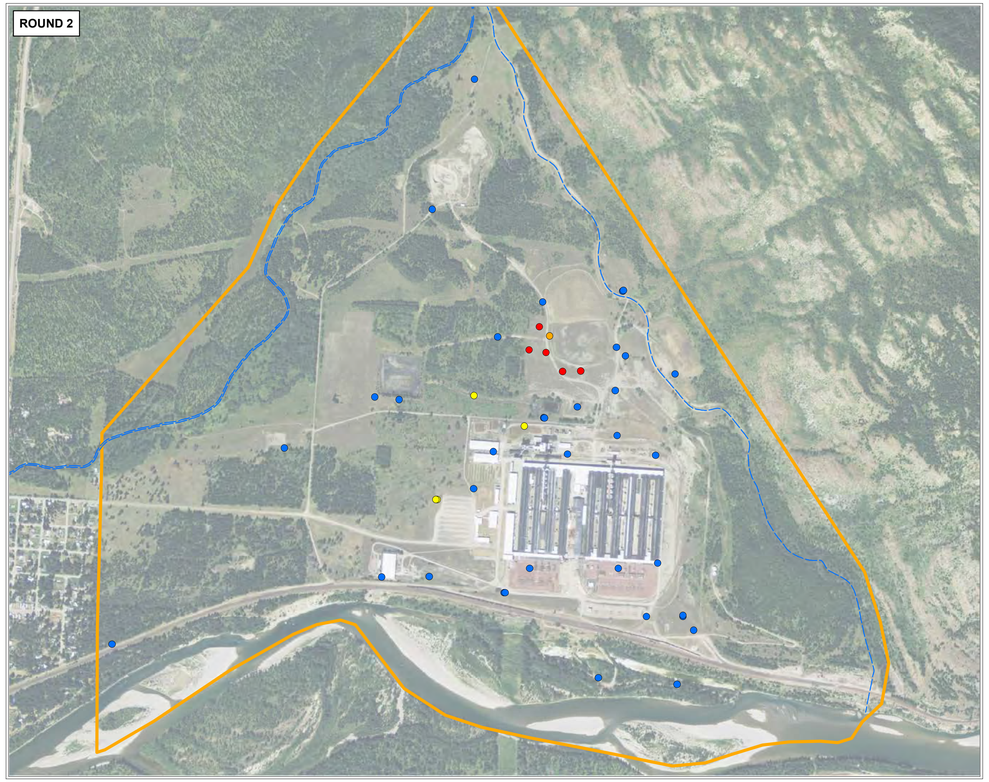

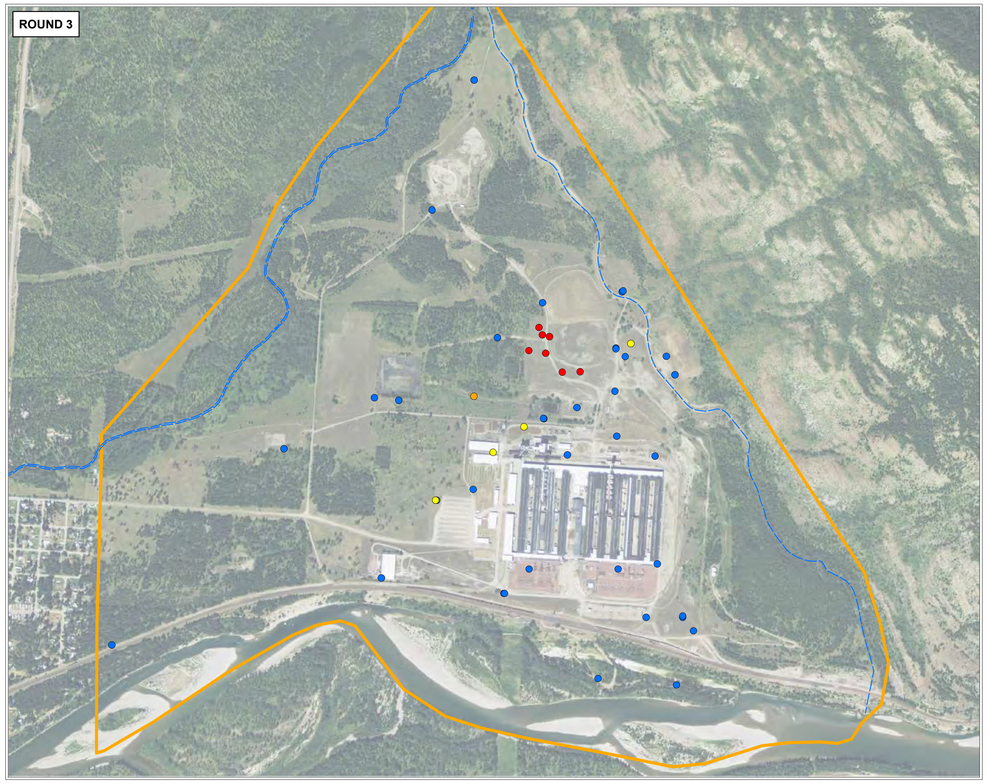

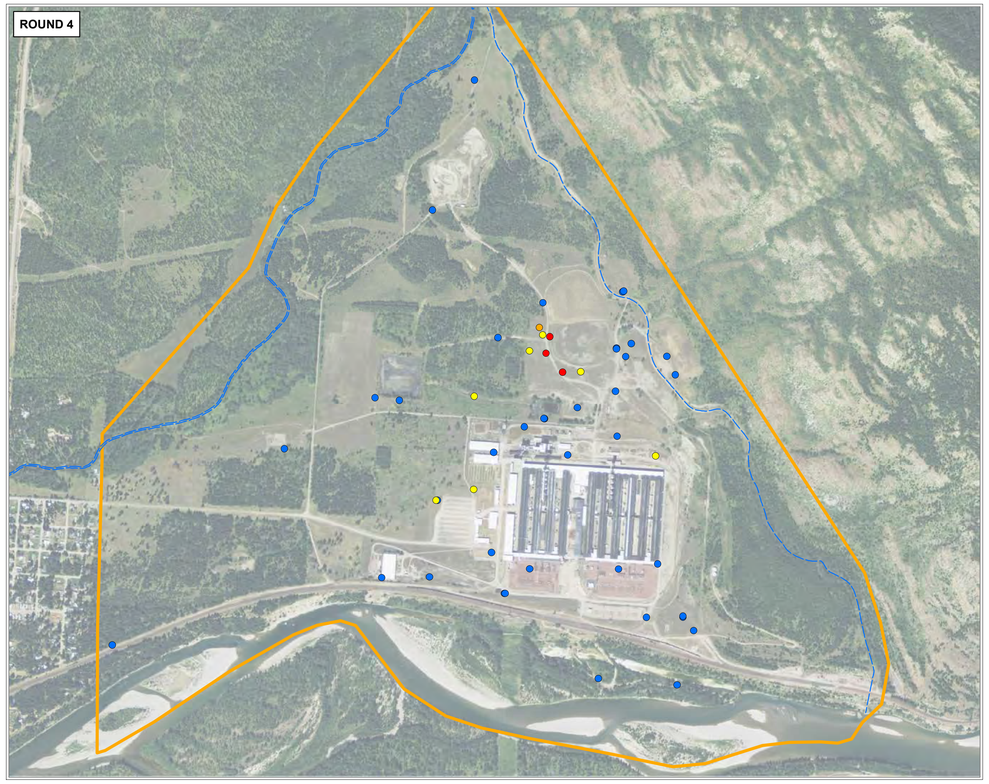

N

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.3U)
- ND – 0.6
- 0.6 – 2
- 2 – 4
- >4

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
COBALT	--	--	0.6

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.3U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF DISSOLVED COBALT IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H17
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H17.2476.0001Y170.28.mxd		

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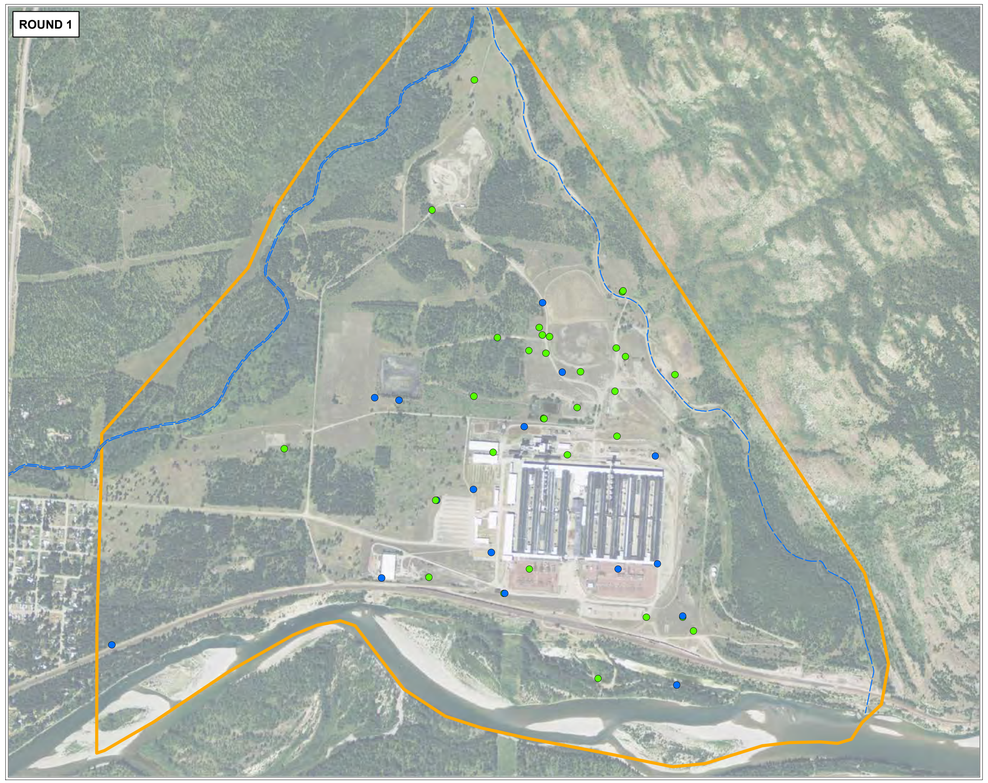

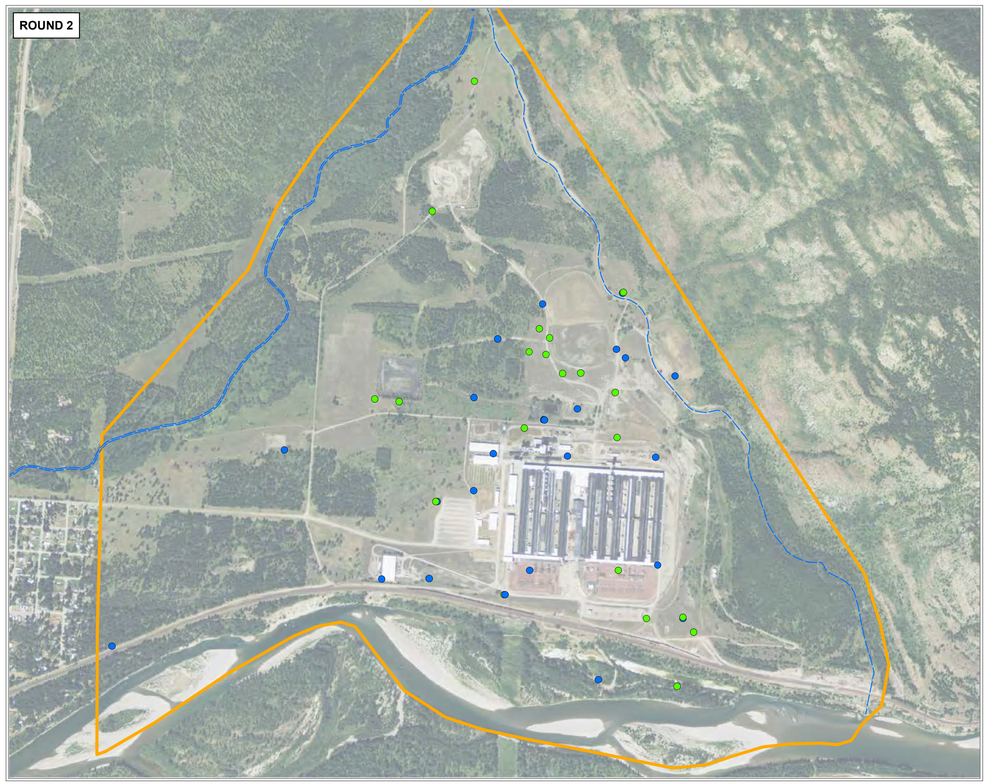

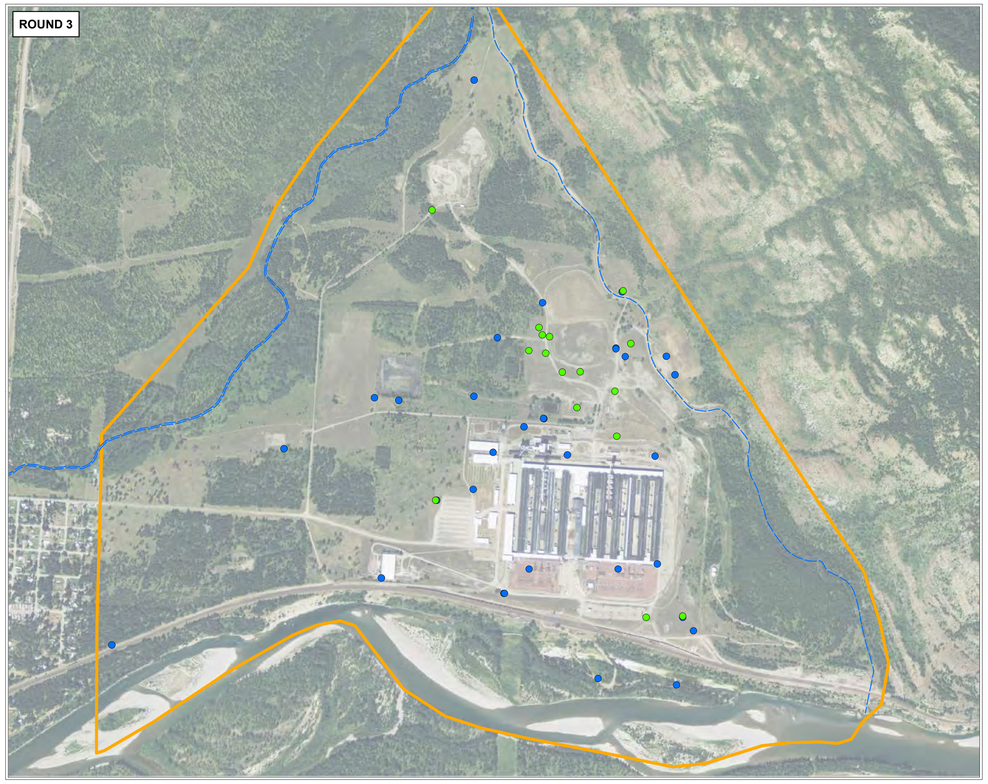

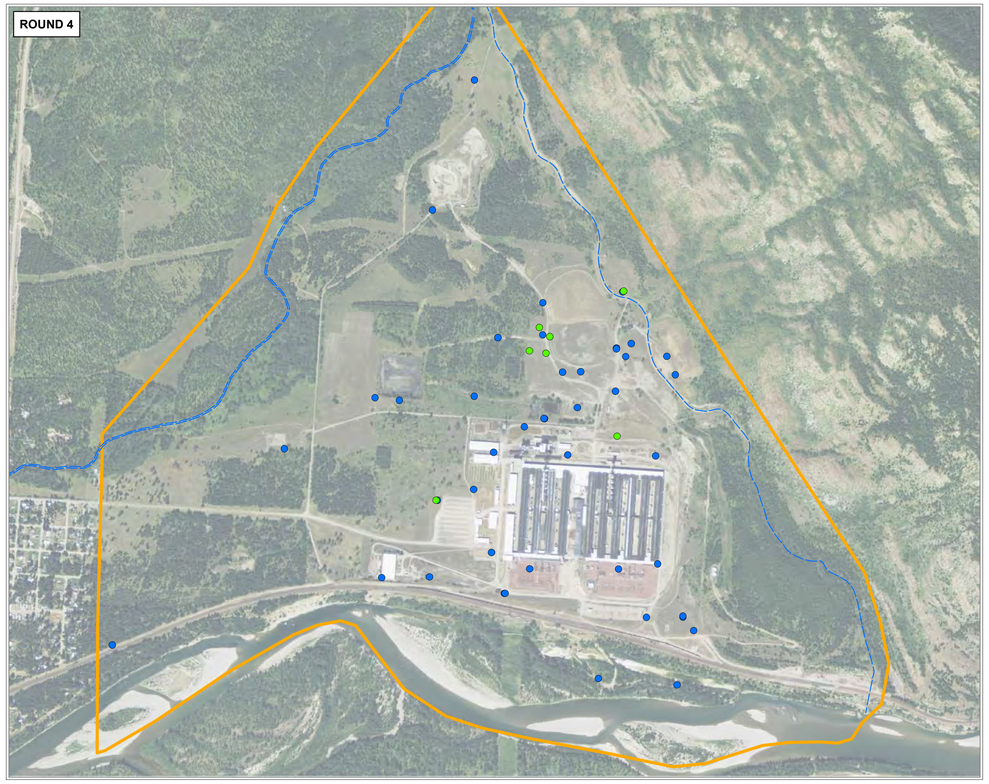

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.4U)
- ND – 80
- 80 – 1,300
- 1,300 – 13,000
- >13,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
COPPER	1300	1300	80

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED COPPER IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H18
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H18.2476.0001Y170.29.mxd		

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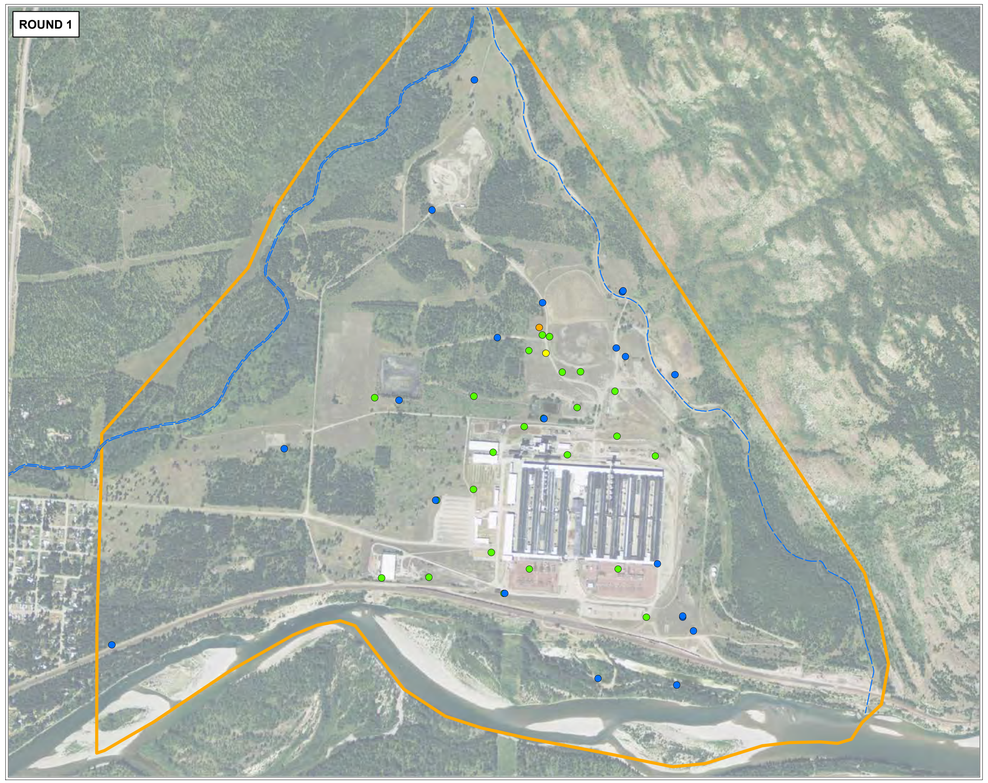

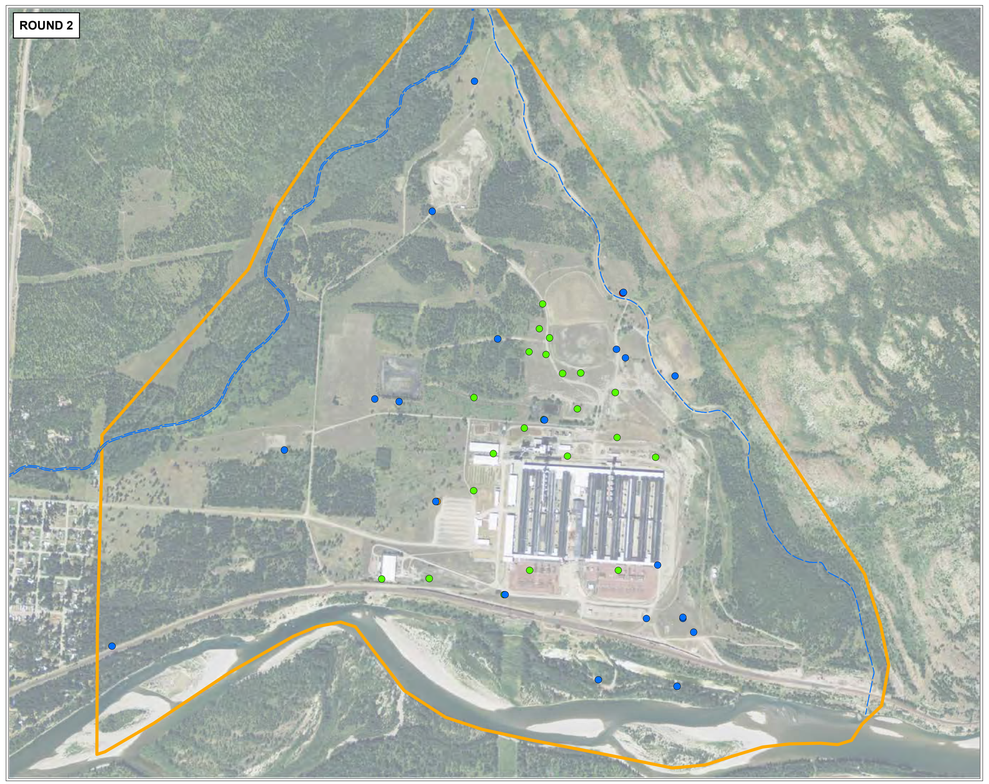

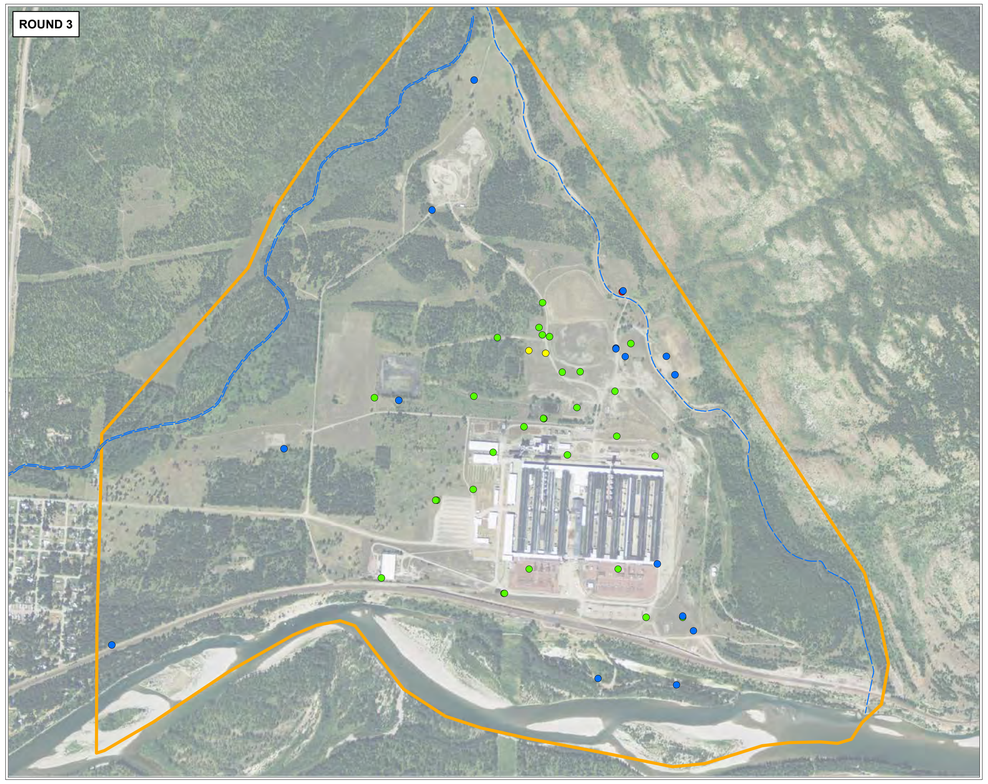

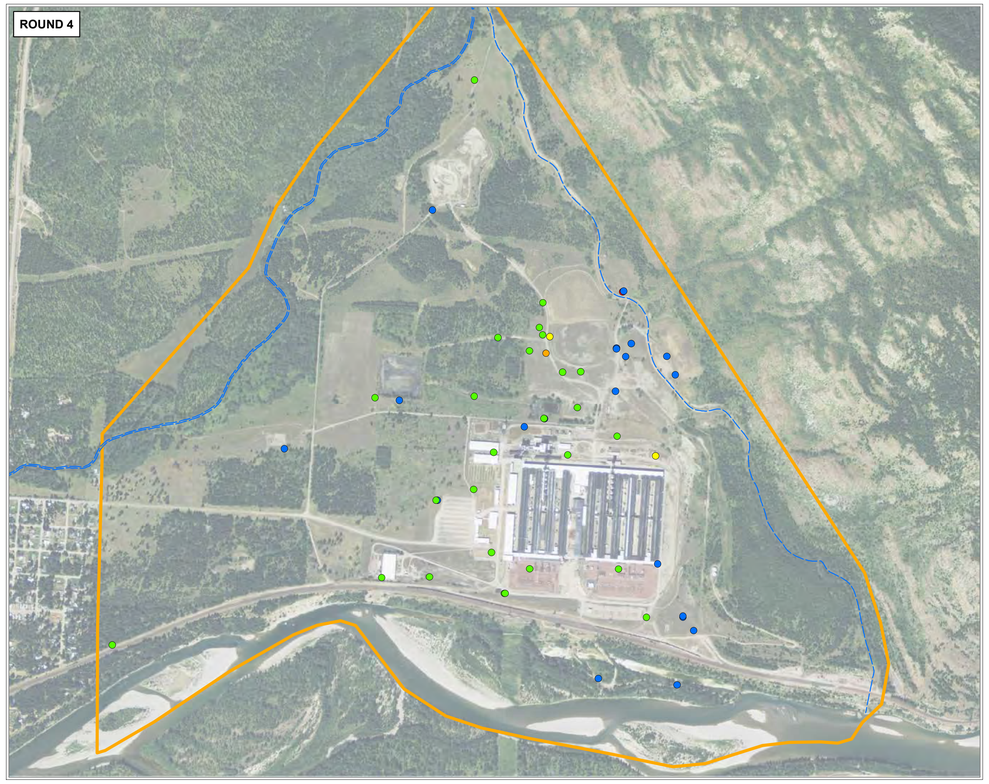

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42.4U)
- ND – 1,400
- 1,400 – 2,800
- 2,800 – 14,000
- >14,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
IRON	--	--	1400

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
42.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED IRON IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H19
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H19.2476.0001Y170.30.mxd		

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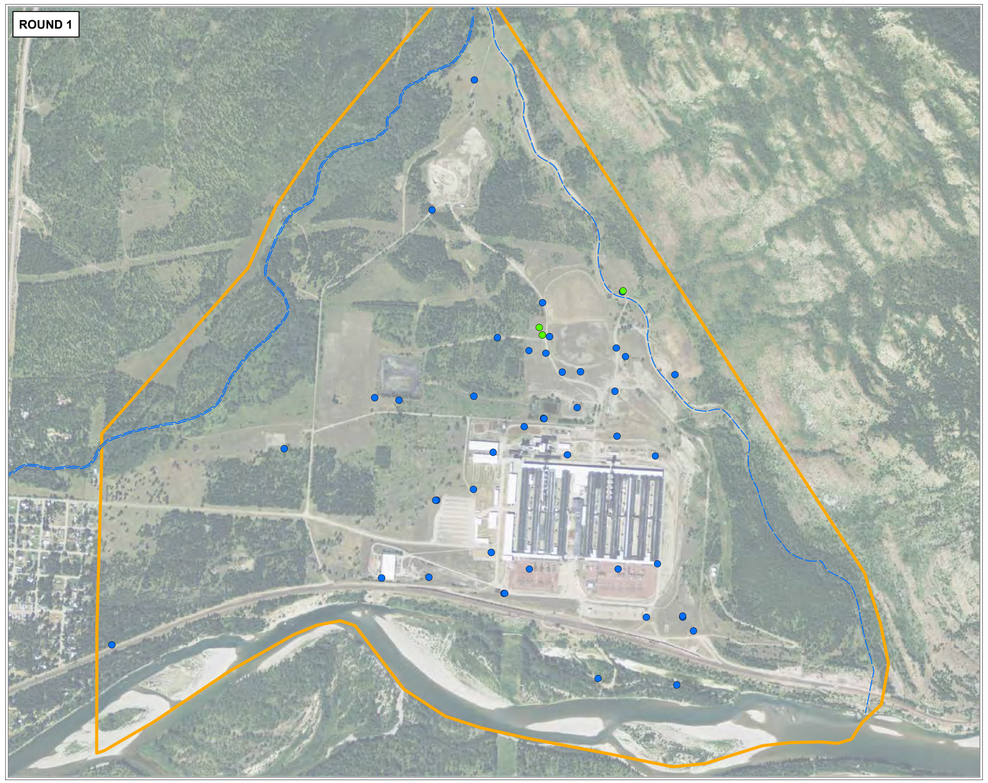

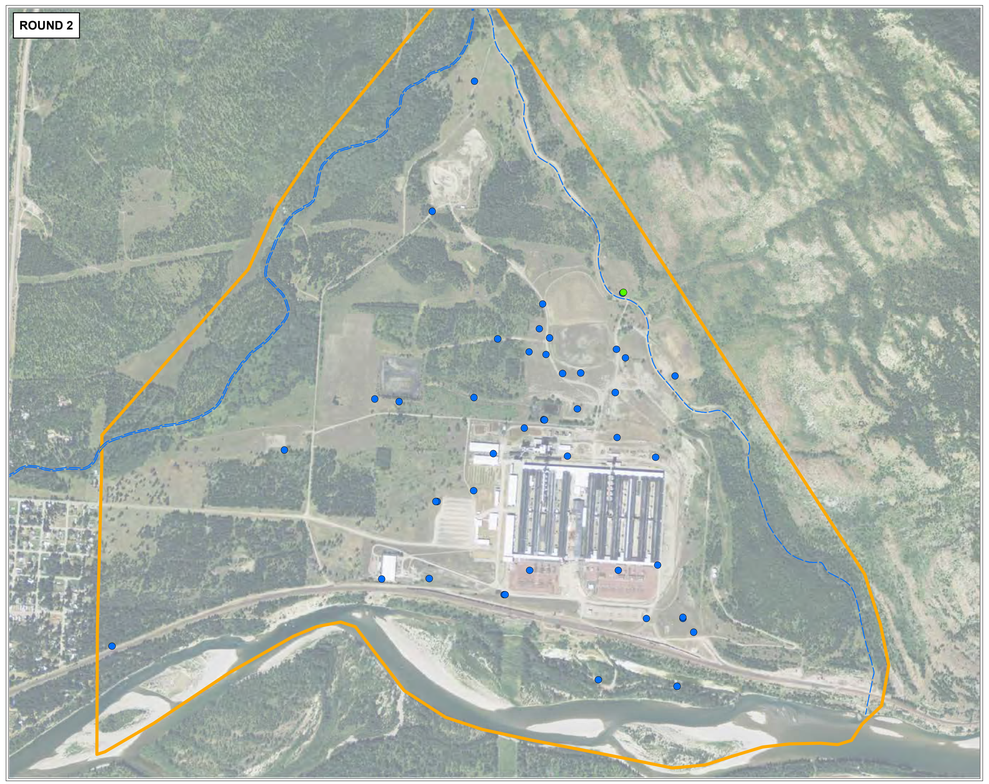

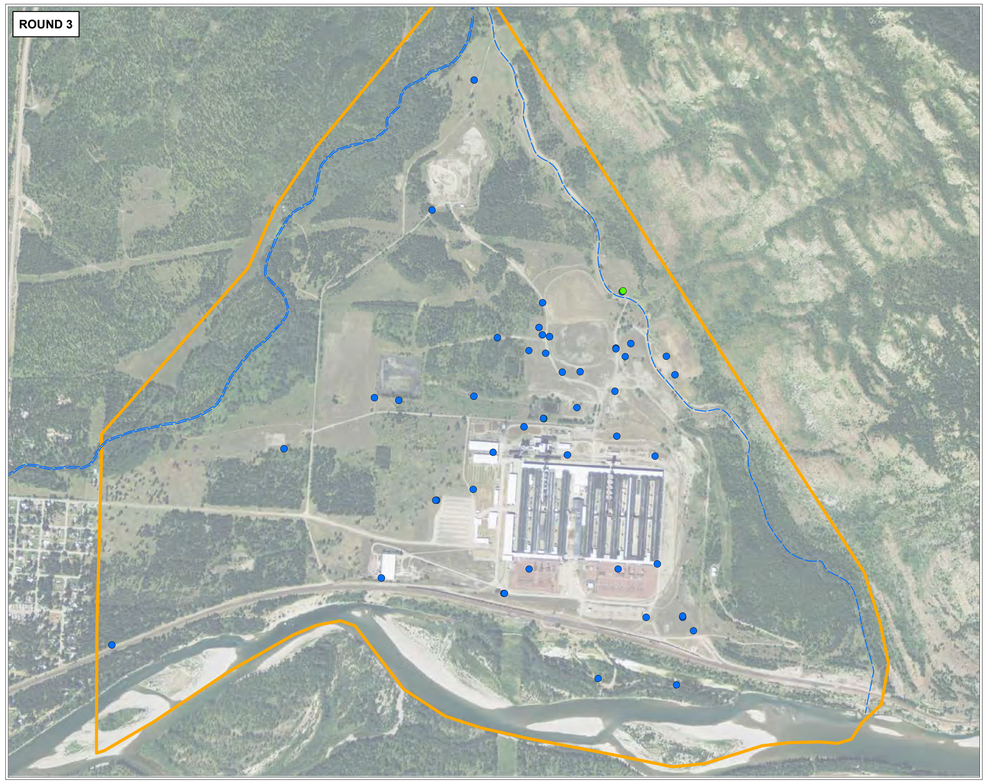

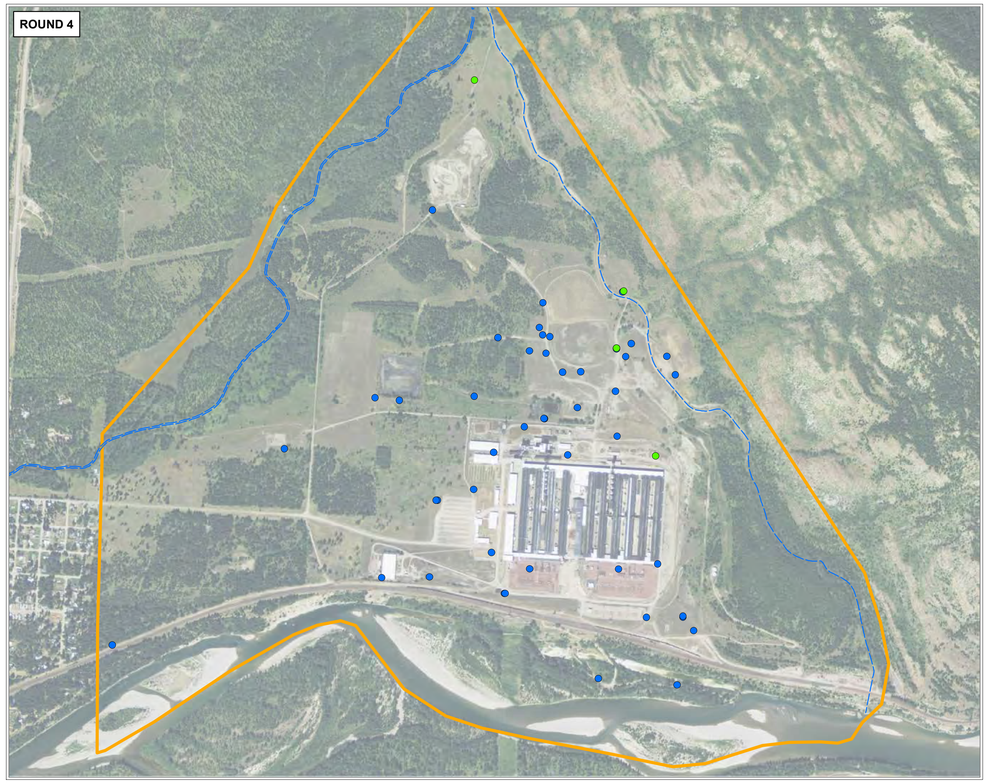

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.38U)
- ND – 15
- 15 – 30
- 30 – 150
- >150

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
LEAD	15	15	15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.38U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED LEAD IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H20
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H20.2476.0001Y170.31.mxd		

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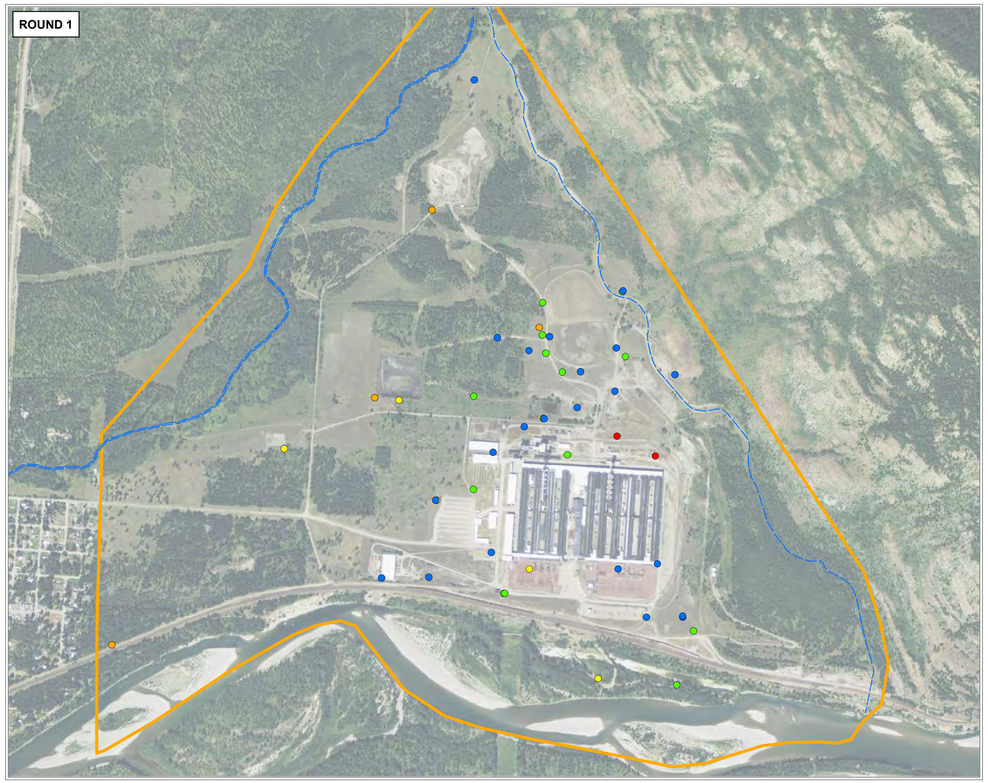

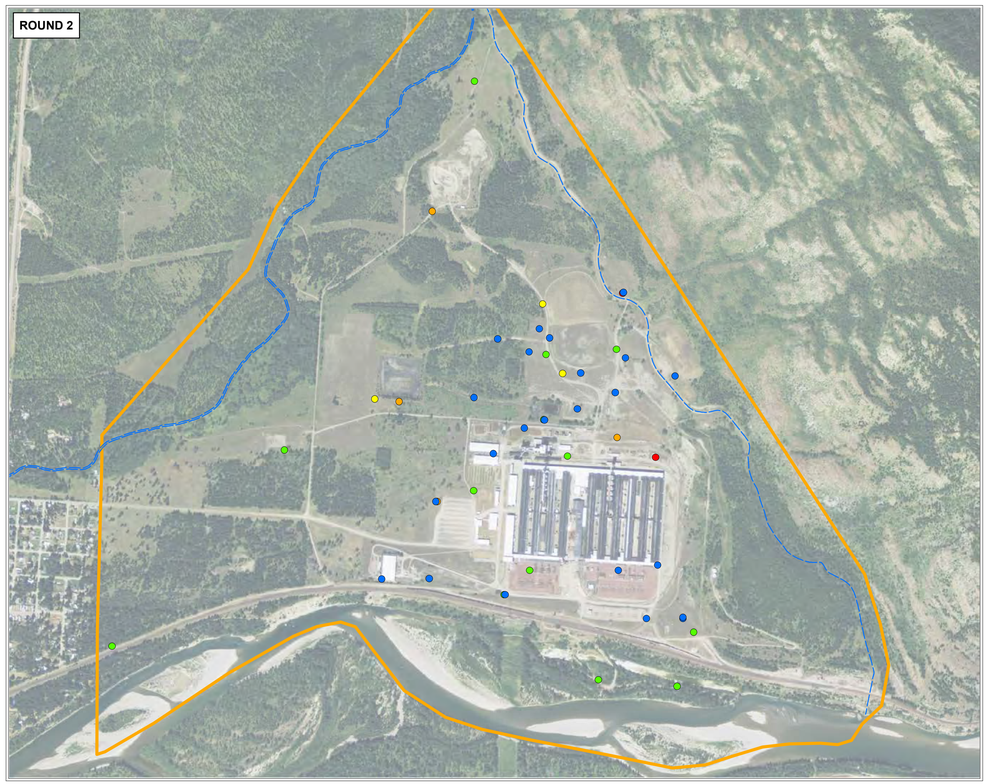

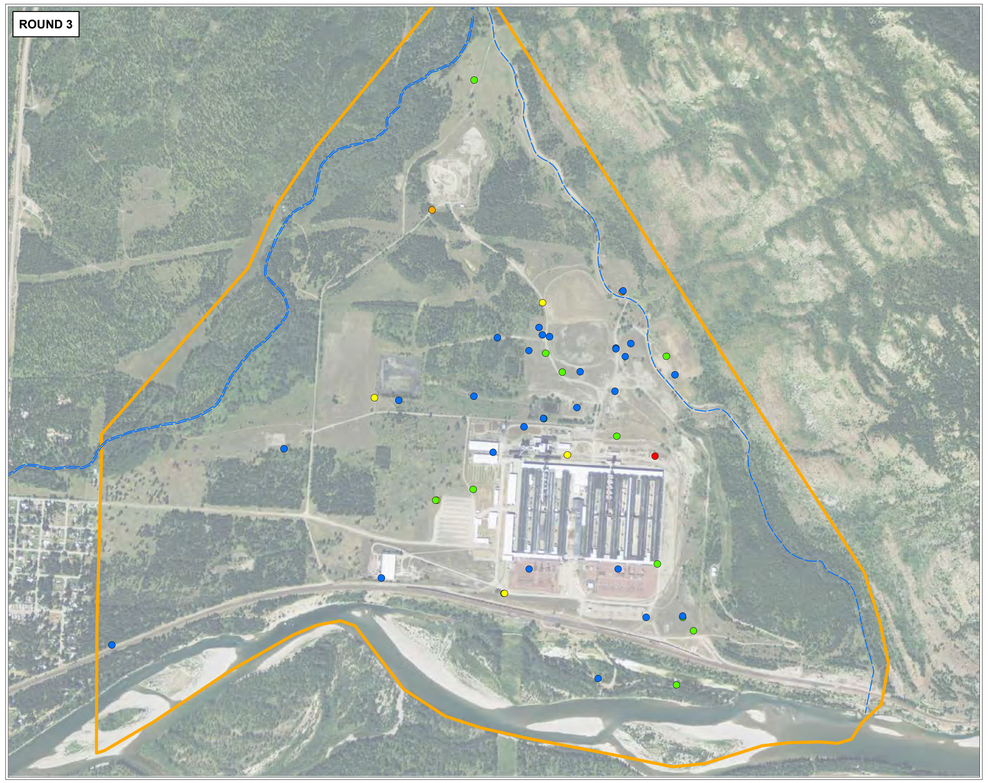

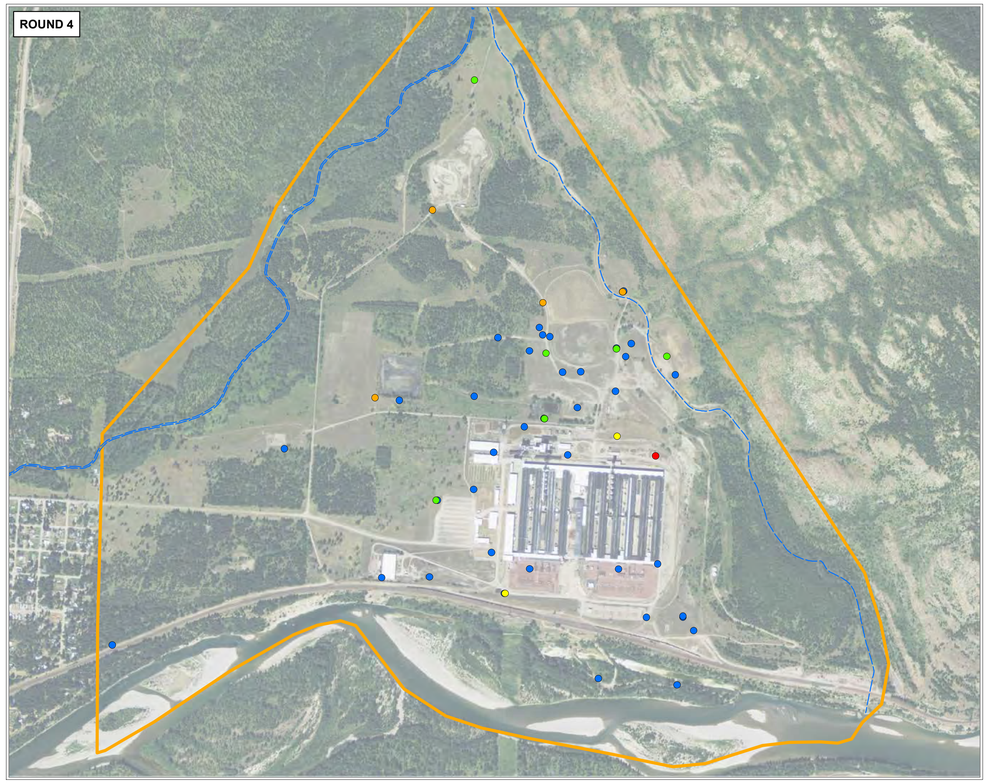

N

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2.5U)
- ND – 43
- 43 – 86
- 86 – 430
- >430

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
MANGANESE	--	--	43

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED MANGANESE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H21
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H21.2476.0001Y170.32.mxd		

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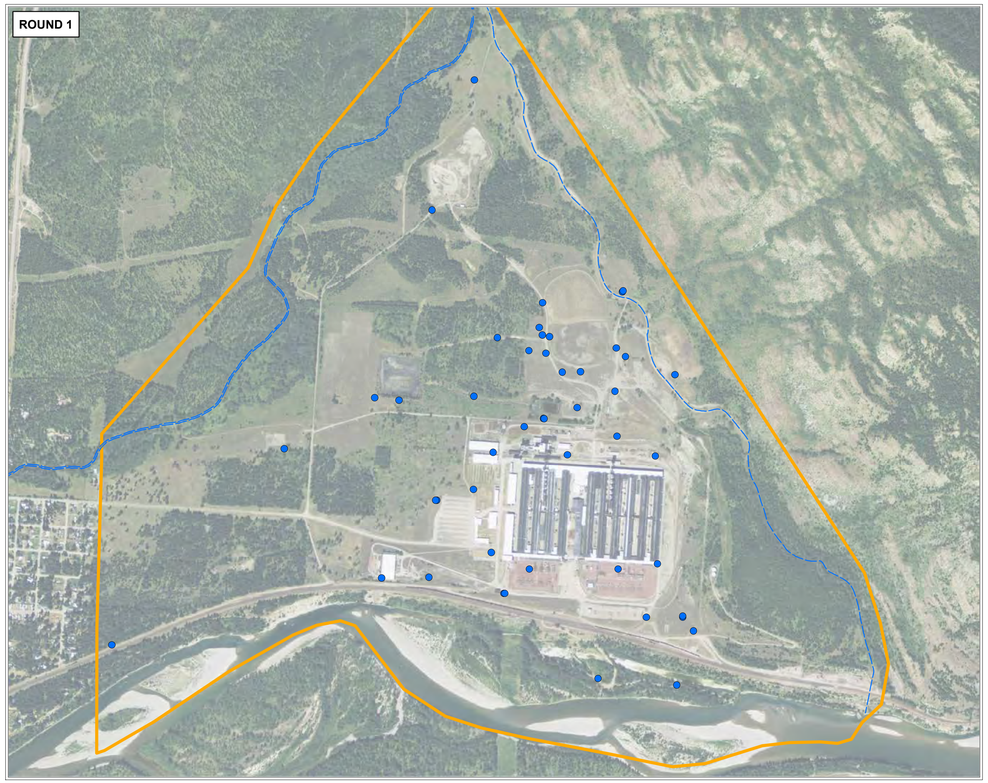

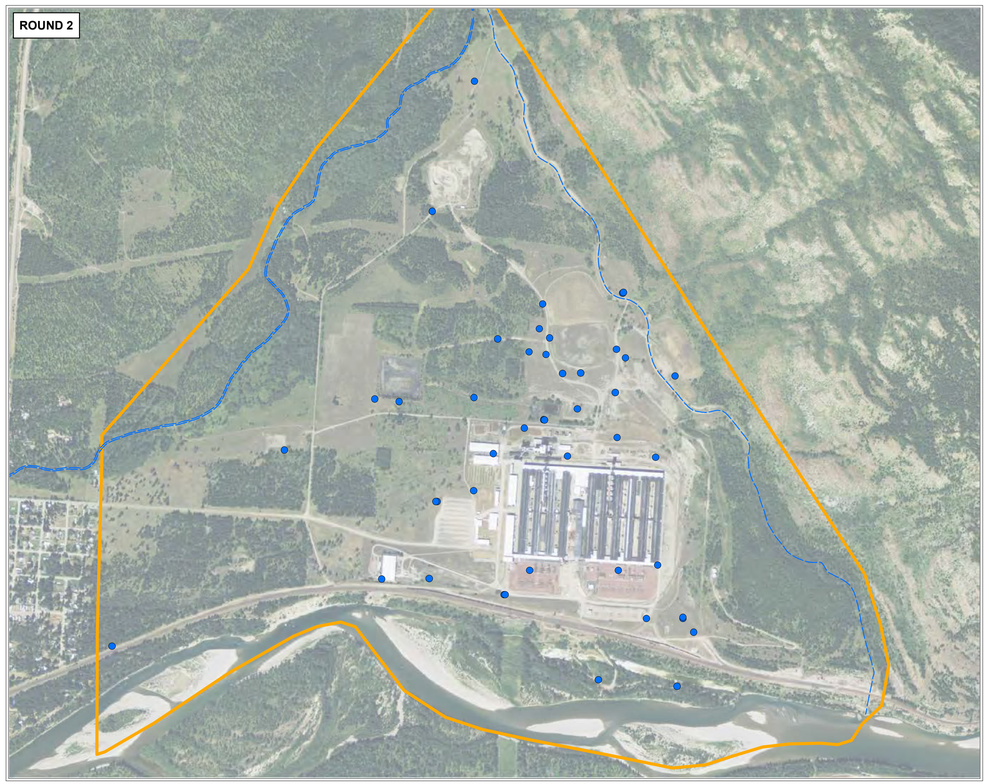

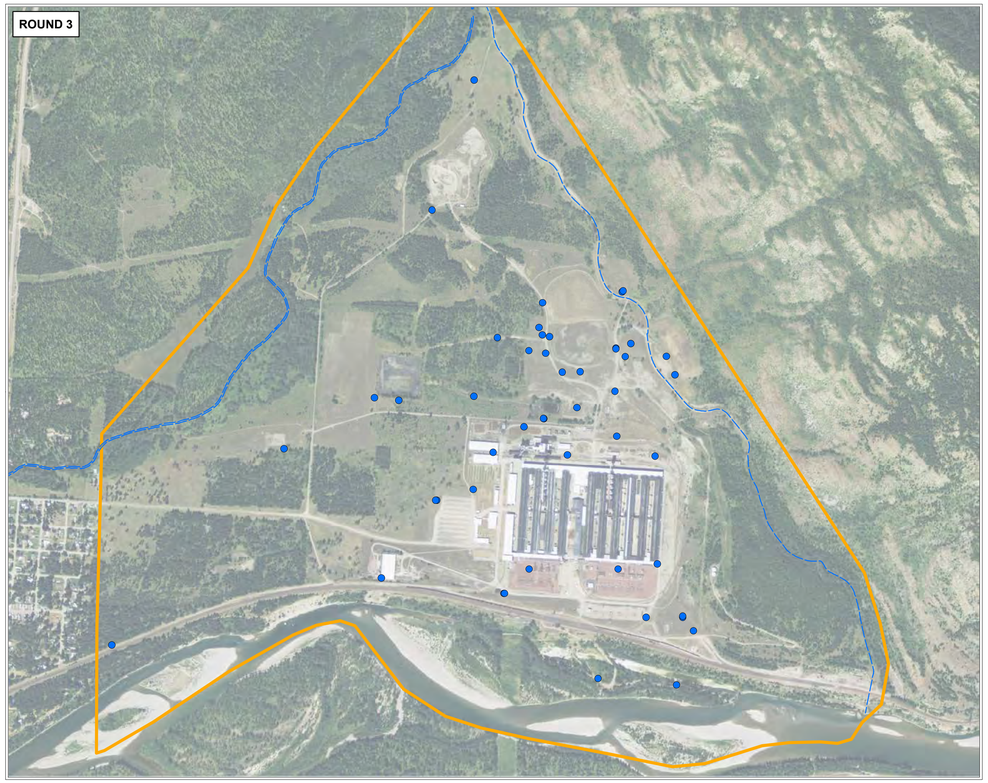

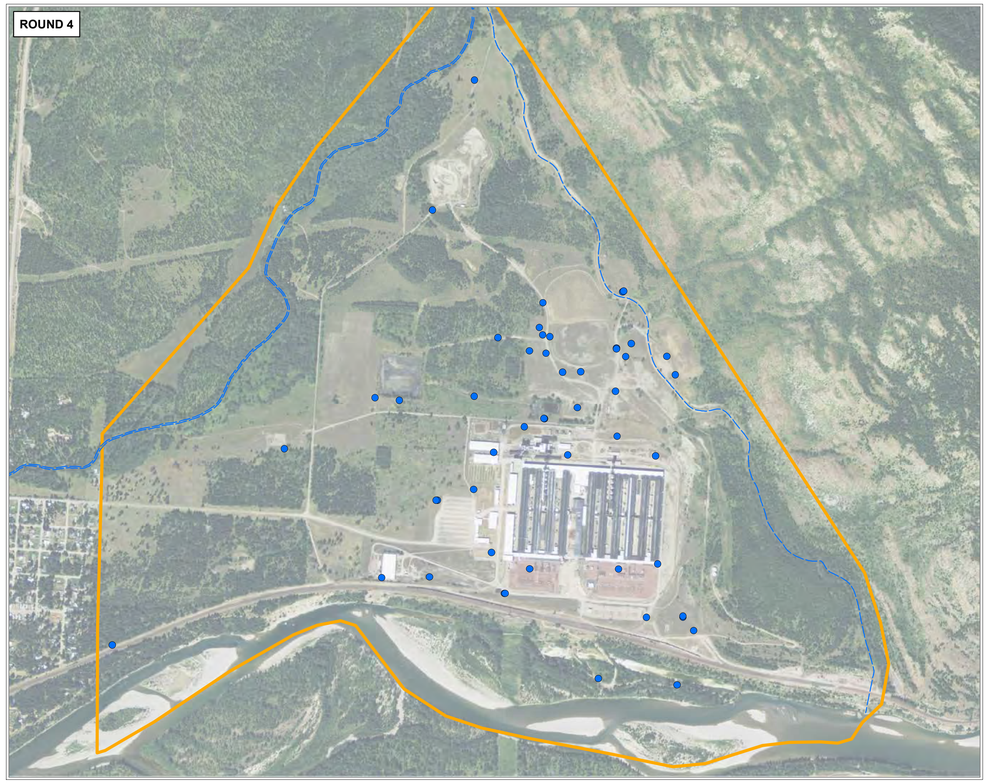

N

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.26U)
- ND – 1
- 1 – 2
- 2 –20
- >20

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
THALLIUM	2	2	0.02

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.26U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF DISSOLVED THALLIUM IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H22
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H22.2476.0001Y170.33.mxd		

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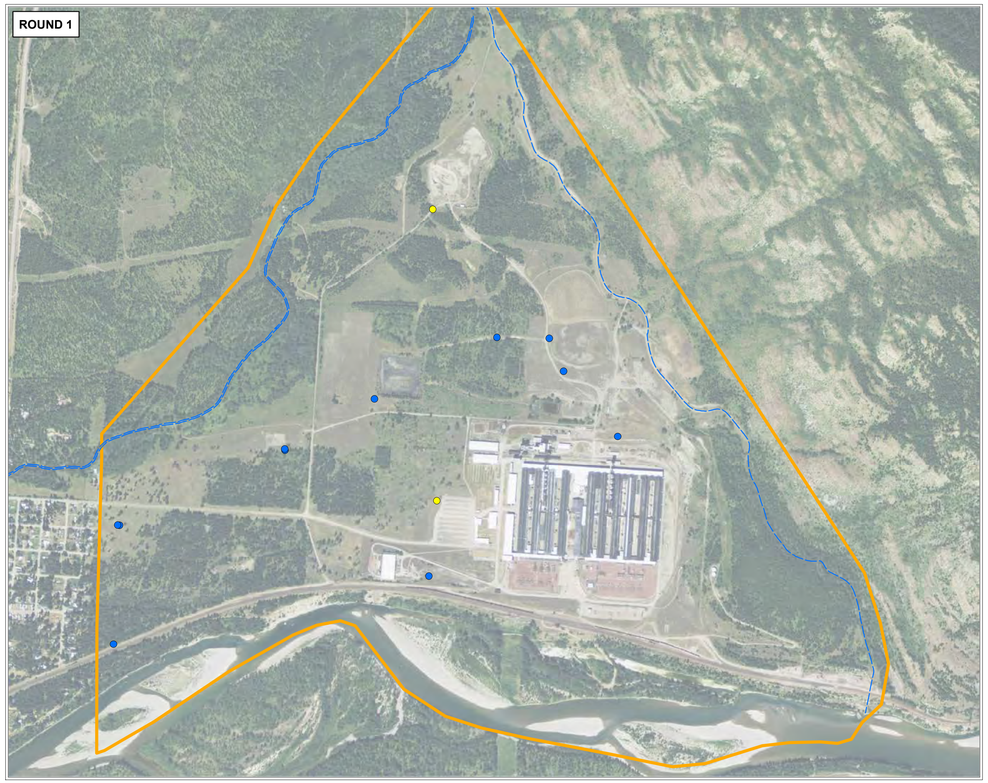

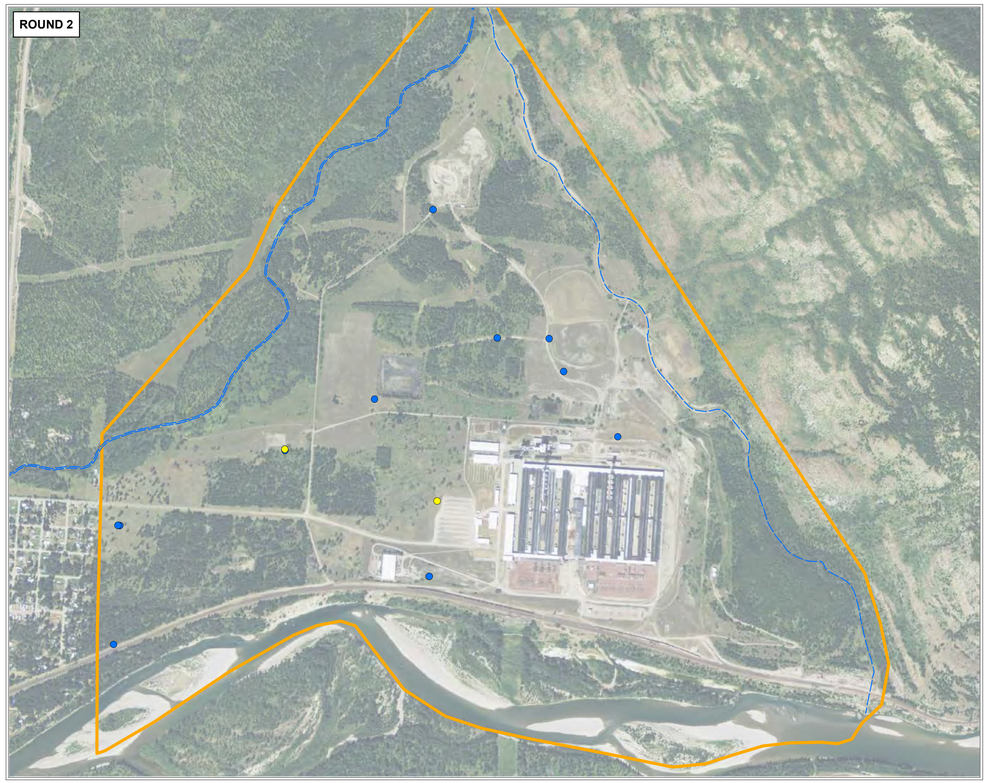

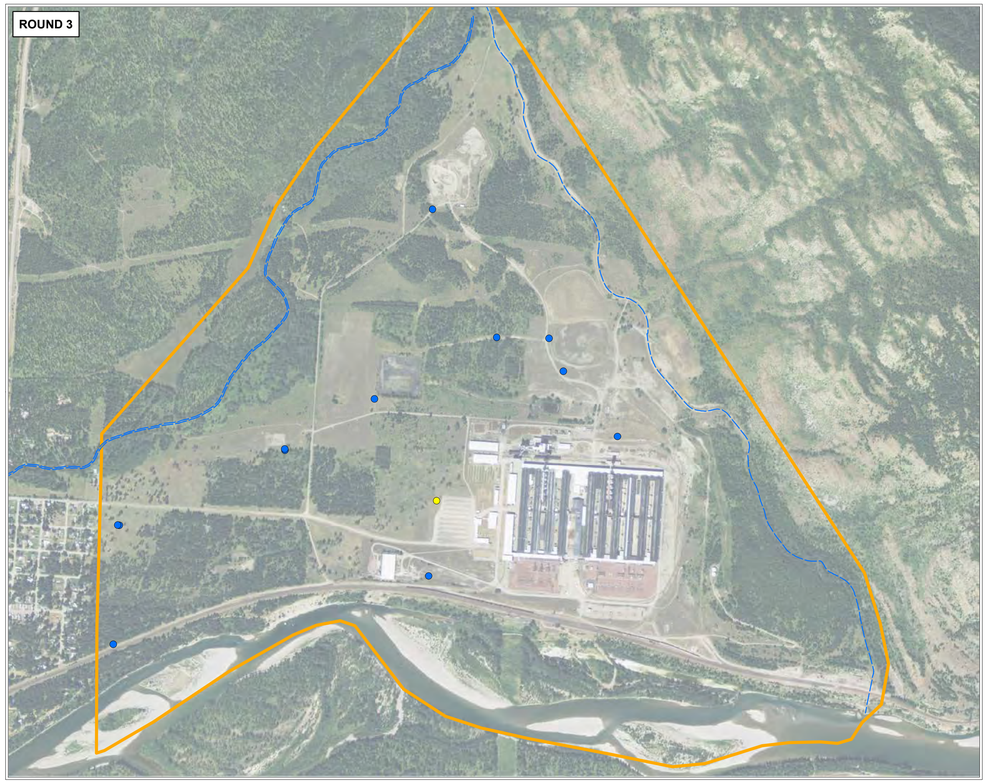

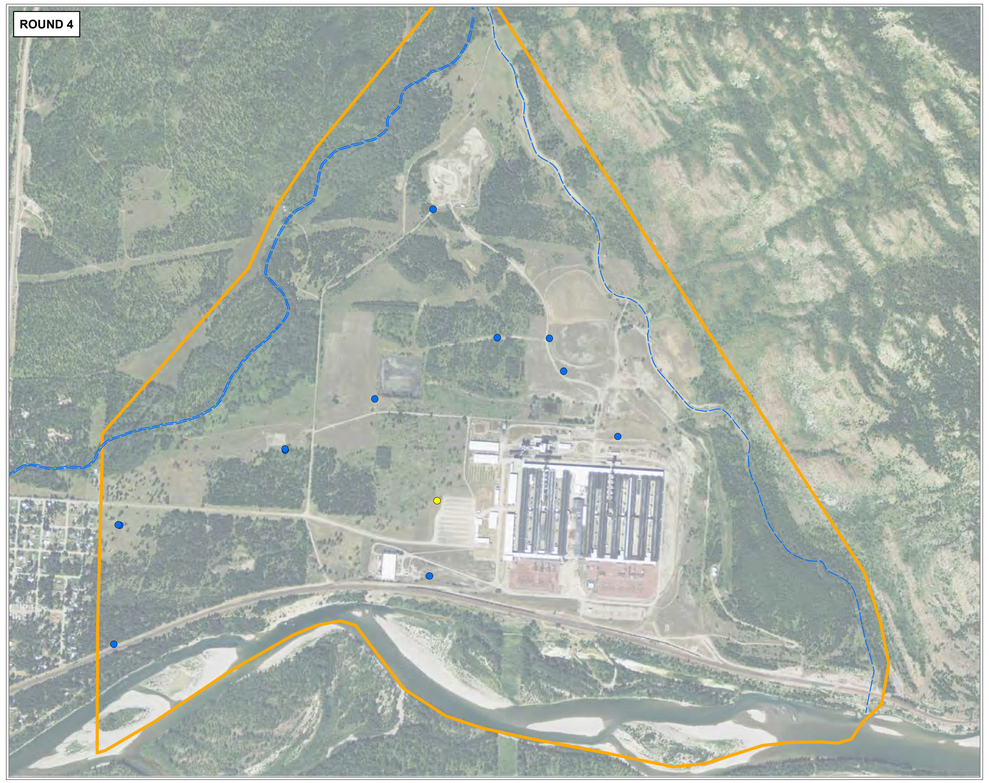

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2U)
- ND – 0.15
- 0.15 – 200
- 200 – 2,000
- >2,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CYANIDE, TOTAL	200	200	0.15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL CYANIDE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H23
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H23.2476.0001Y170.52.mxd		

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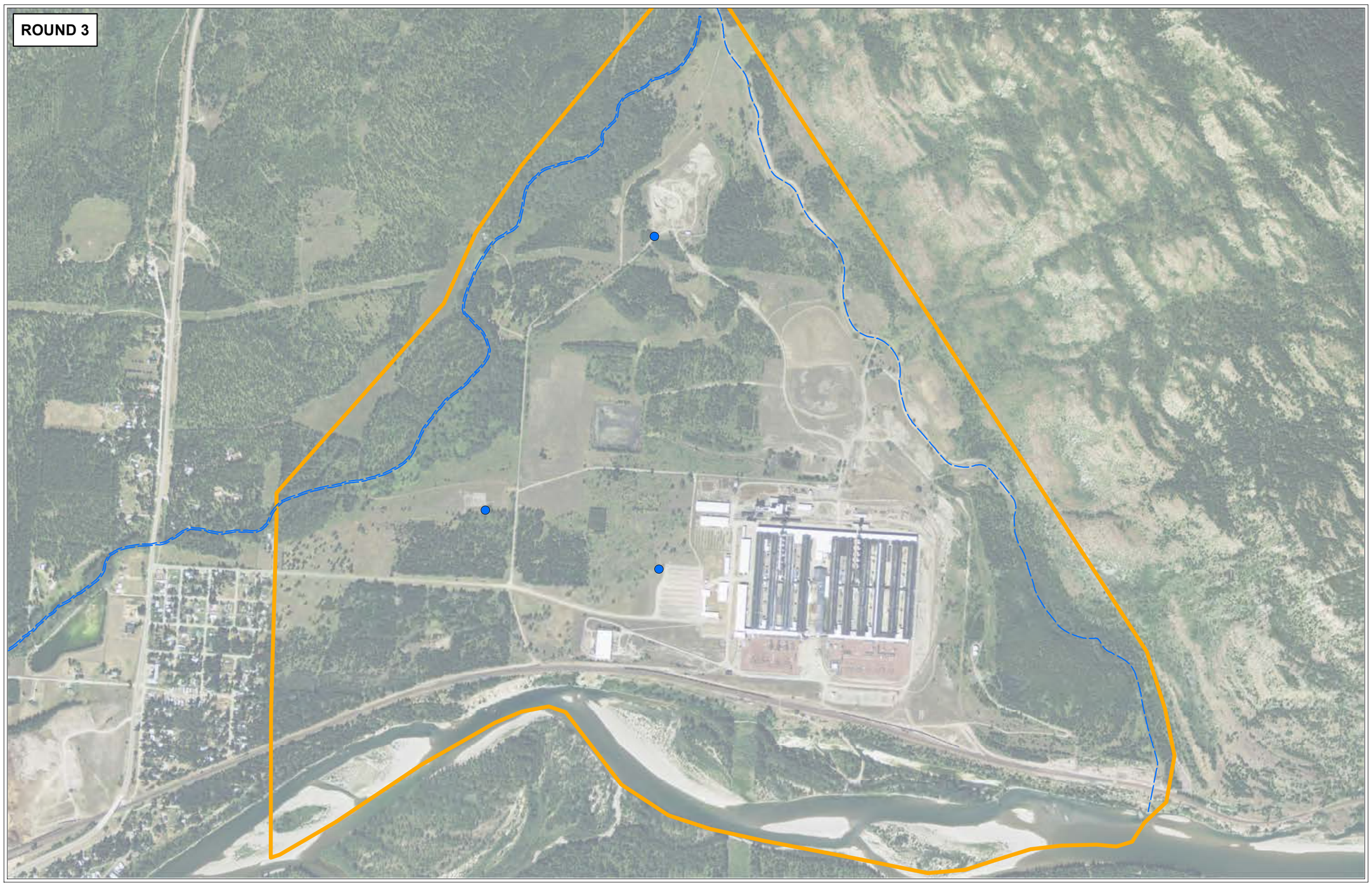

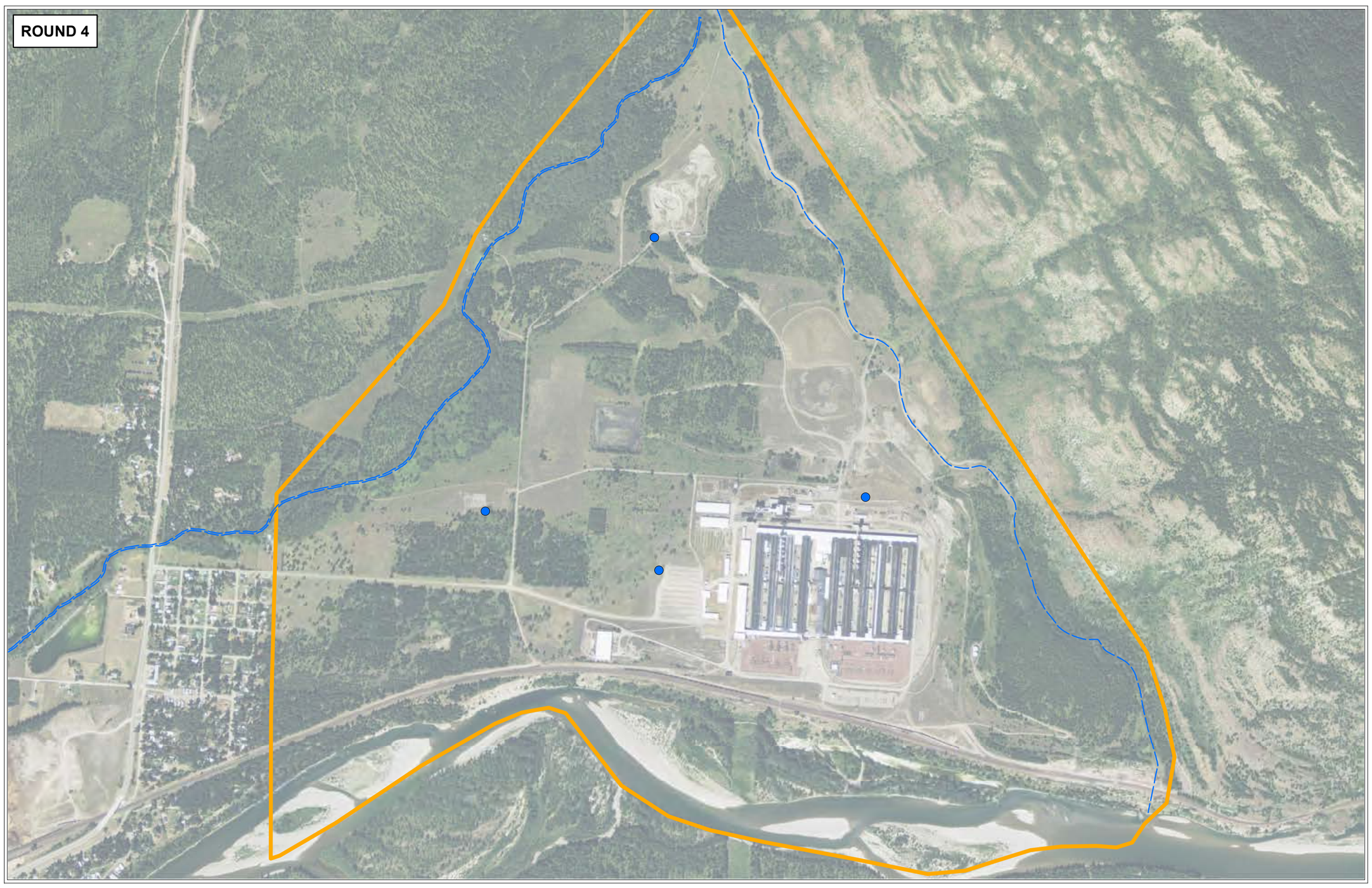

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2U)
- ND – 0.15
- 0.15 – 200
- 200 – 2,000
- >2,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CYANIDE, FREE	200	200	0.15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

N

500 0 500 1,000 Feet

Title:
CONCENTRATIONS OF TOTAL FREE CYANIDE IN ROUNDS 3 AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H24
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H24.2476.0001Y170.51.mxd		

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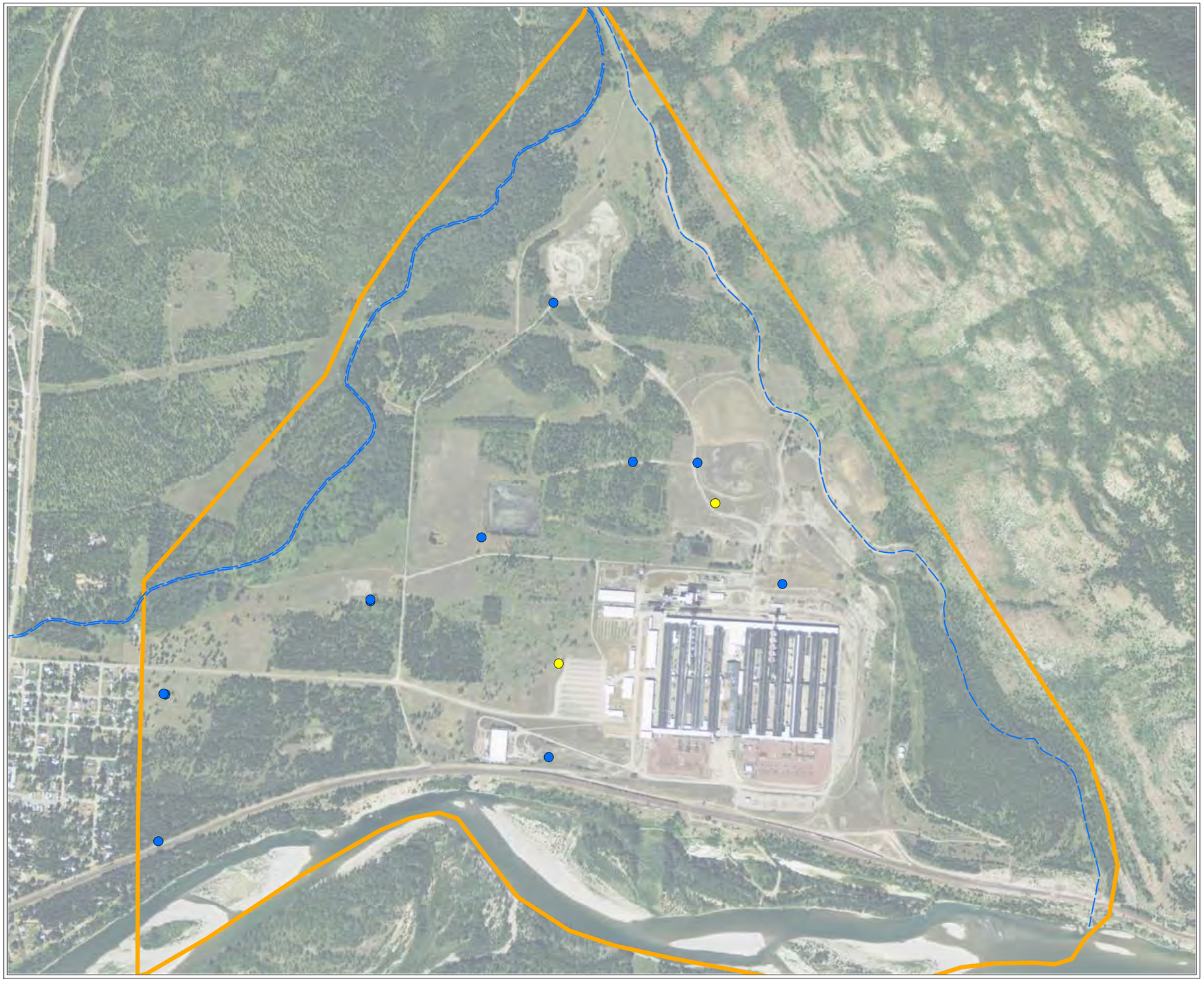

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2U)
- ND – 0.15
- 0.15 – 200
- 200 – 2,000
- >2,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CYANIDE, TOTAL	200	200	0.15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title:
CONCENTRATIONS OF DISSOLVED CYANIDE IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 20NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H25
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H25.2476.0001Y170.63.mxd		

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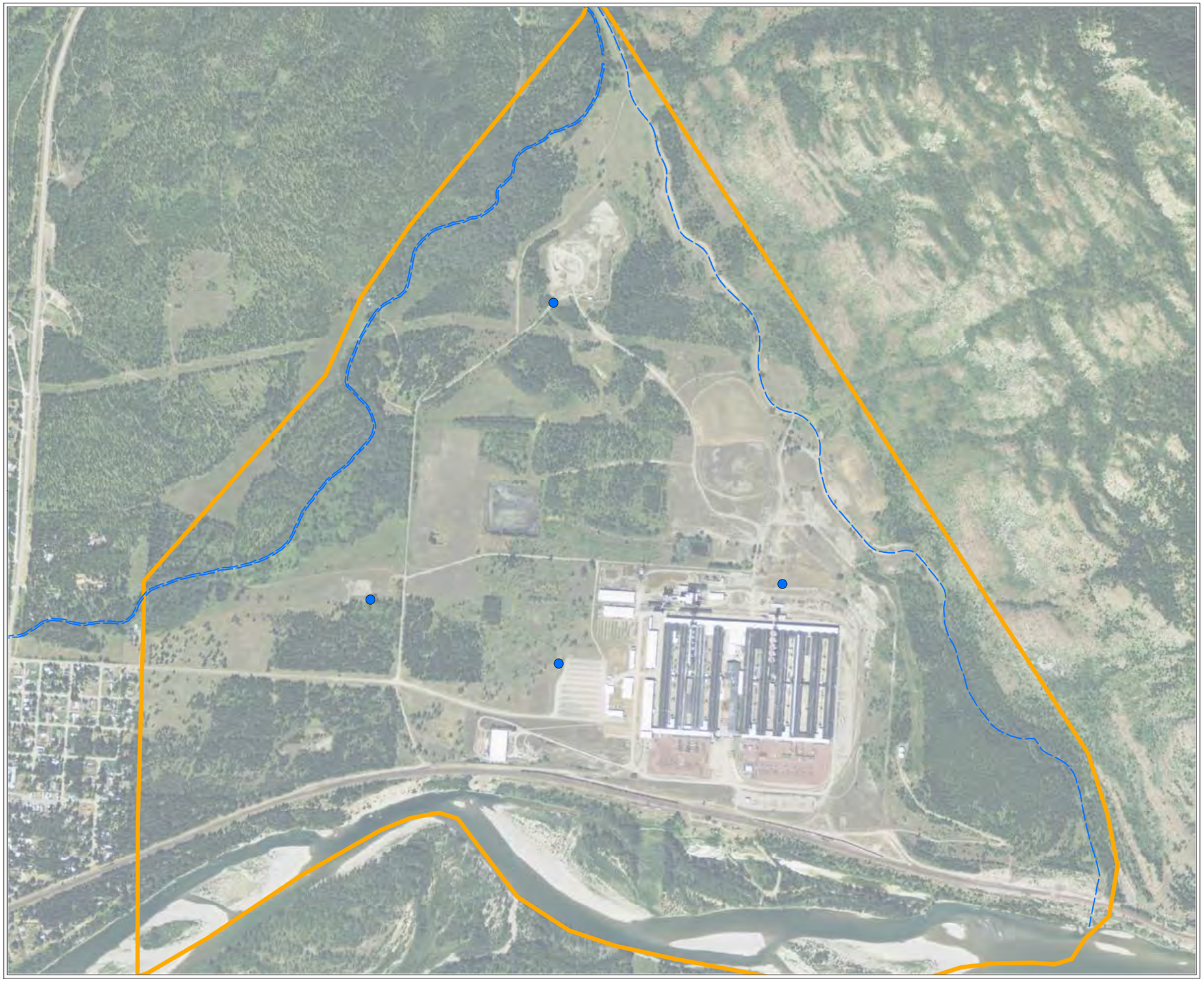

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.5U)
- ND – 0.15
- 0.15 – 200
- 200 – 2,000
- >2,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CYANIDE, FREE	200	200	0.15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title: **CONCENTRATIONS OF DISSOLVED FREE CYANIDE IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 20NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H26
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H26.2476.0001Y170.62.mxd		

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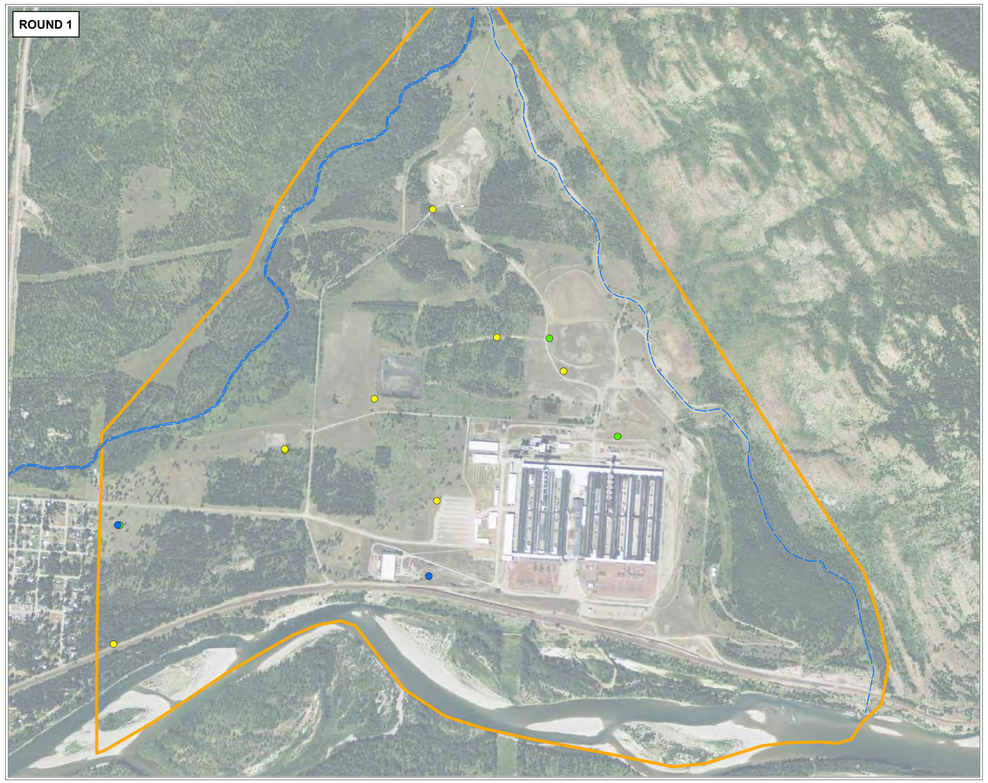

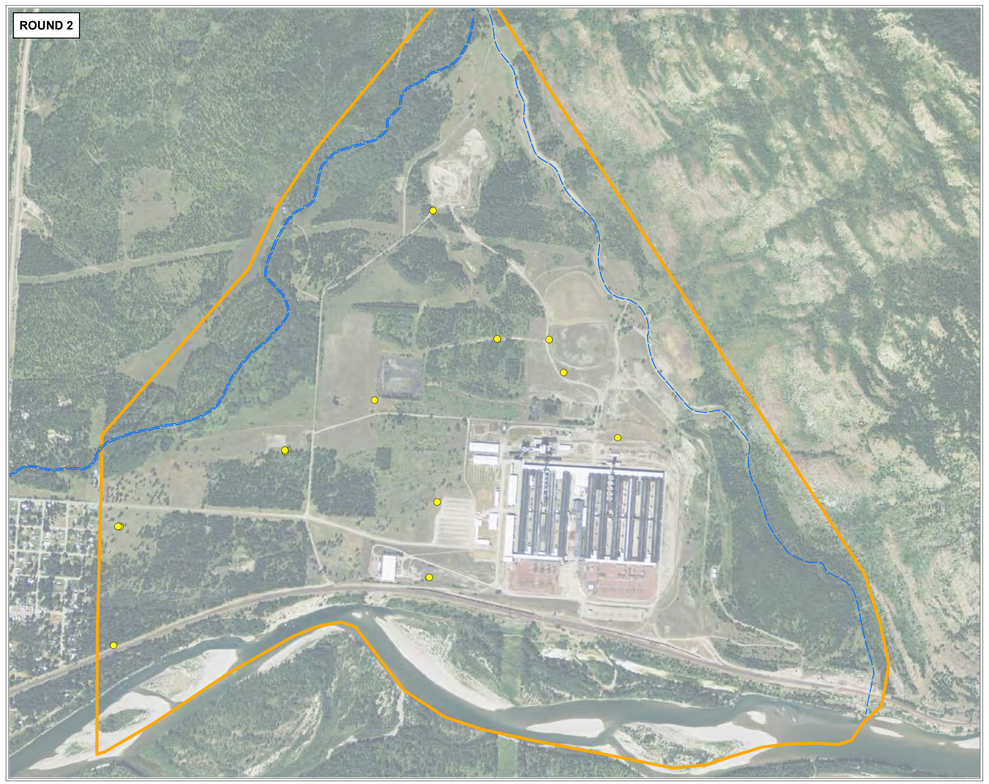

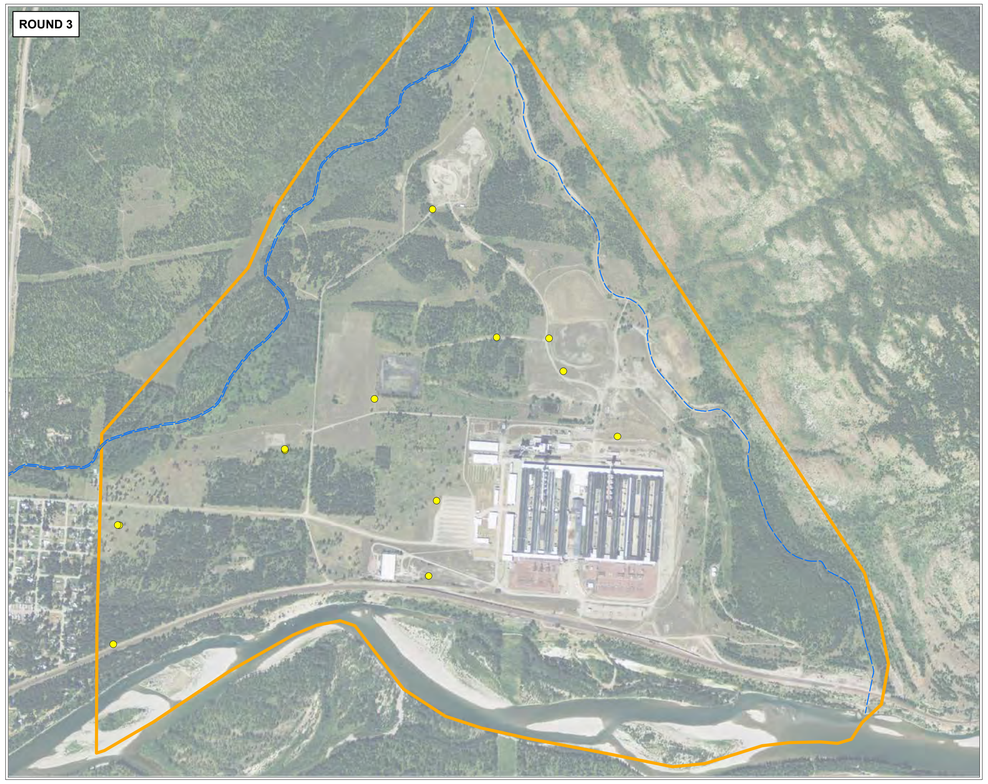

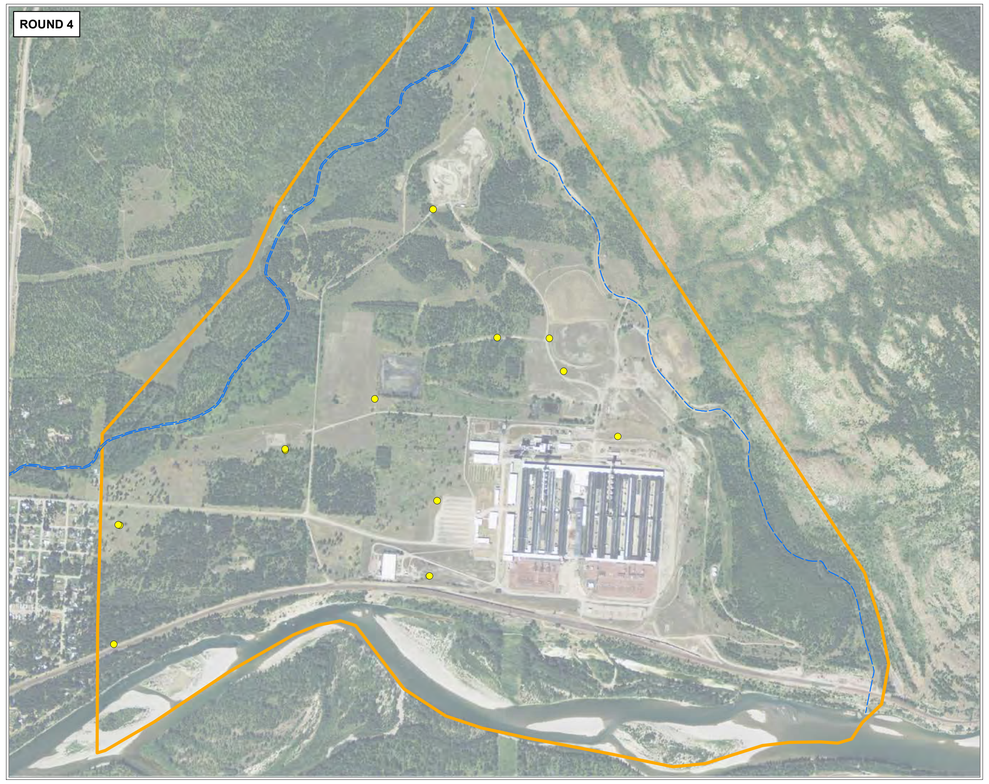

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 80
- 80 – 4,000
- 4,000 – 40,000
- >40,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
FLUORIDE	4000	4000	80

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL FLUORIDE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H27
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H27_2476.0001Y170.53.mxd		

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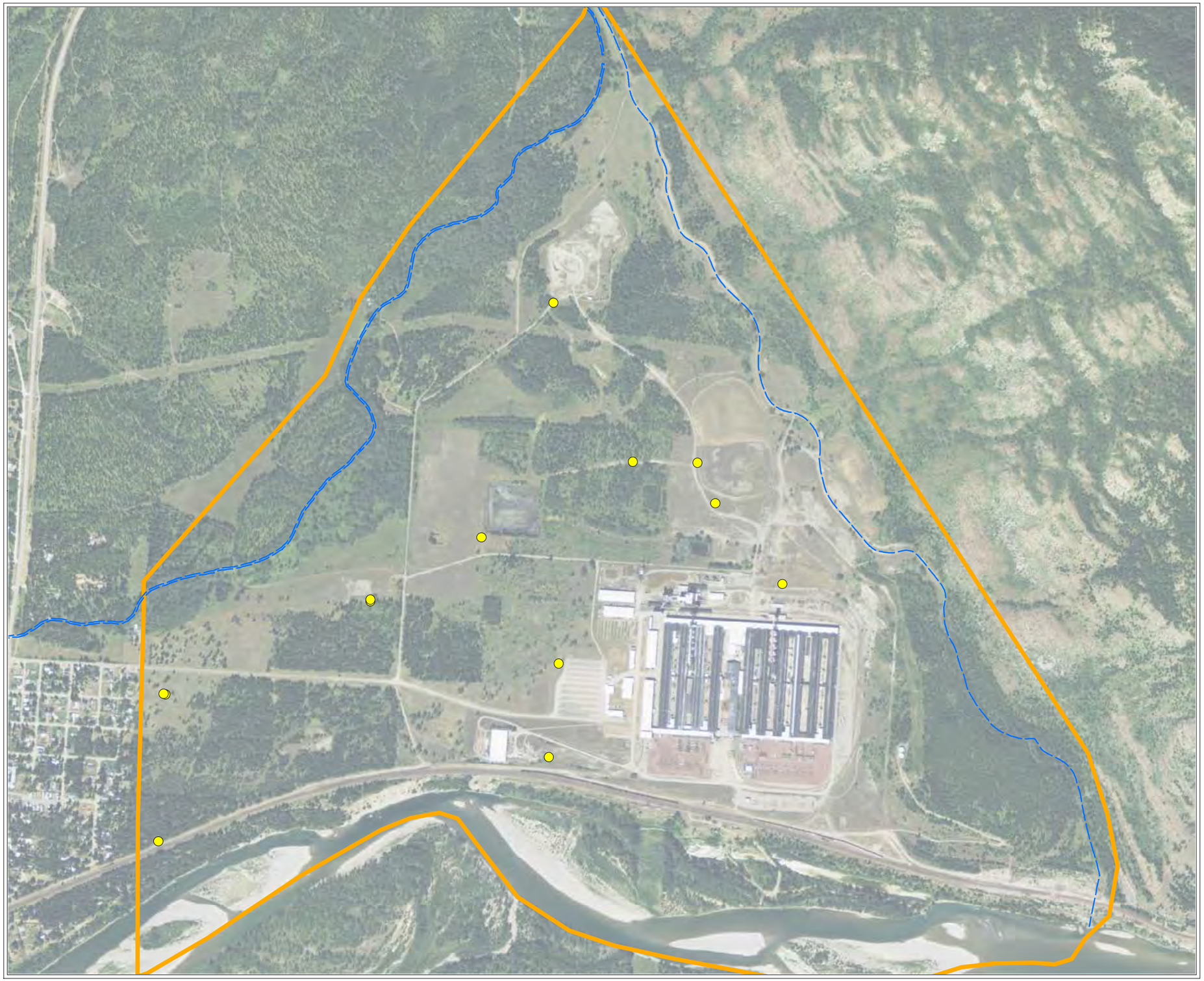

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 80
- 80 – 4,000
- 4,000 – 40,000
- >40,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
FLUORIDE	4000	4000	80

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title: **CONCENTRATIONS OF DISSOLVED FLUORIDE IN ROUNDS 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17
Prepared by: M.R.	Scale: AS SHOWN
Project Mgr: M.R.	Project: 2476.0001Y002
File: H28.2476.0001Y170.64.mxd	

APPENDIX **H28**

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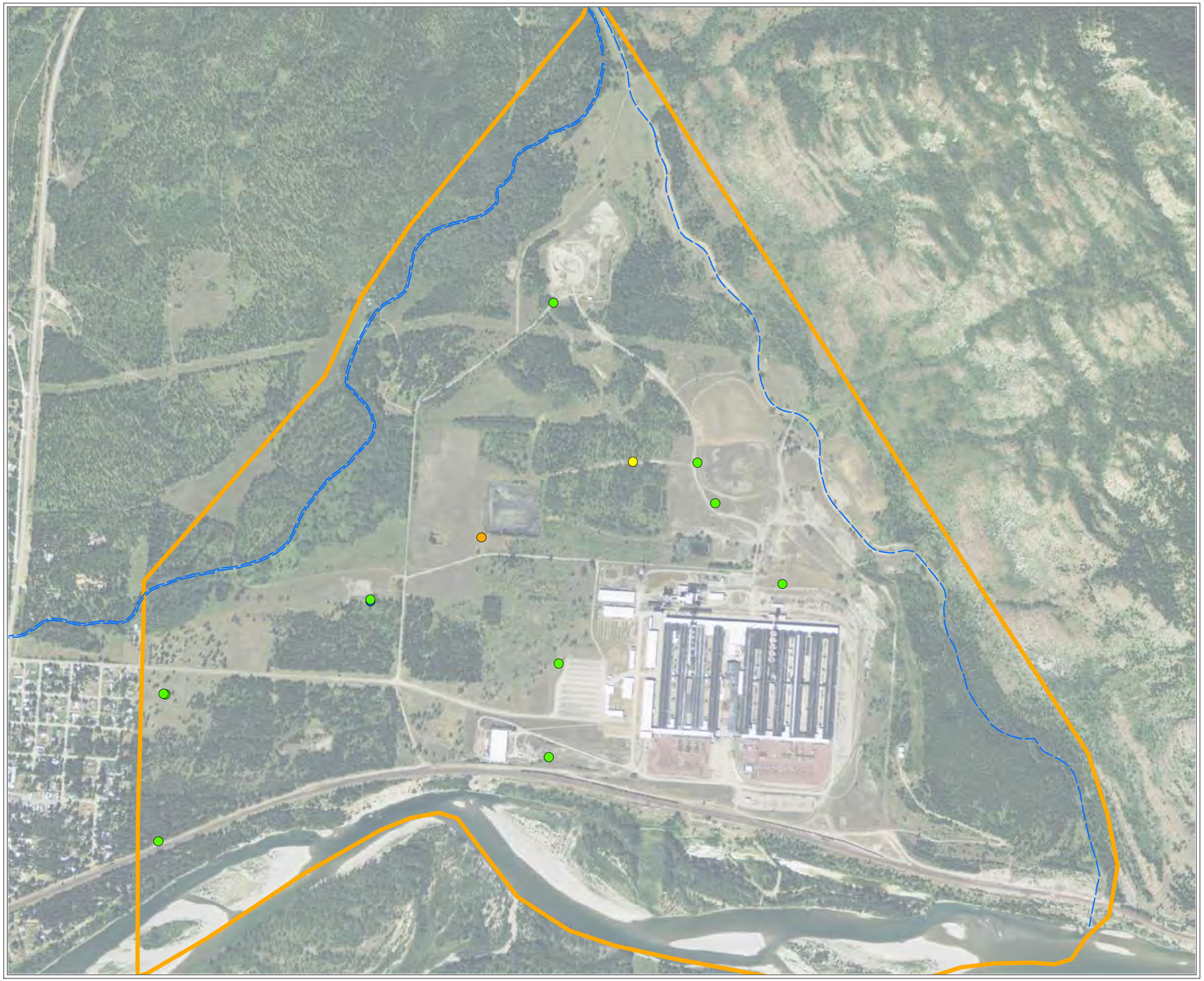

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (18.2U)
- ND – 2,000
- 2,000 – 4,000
- 4,000 – 20,000
- >20,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ALUMINUM	--	--	2000

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
18.2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL ALUMINUM IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H29
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H29.2476.0001Y170.65.mxd		

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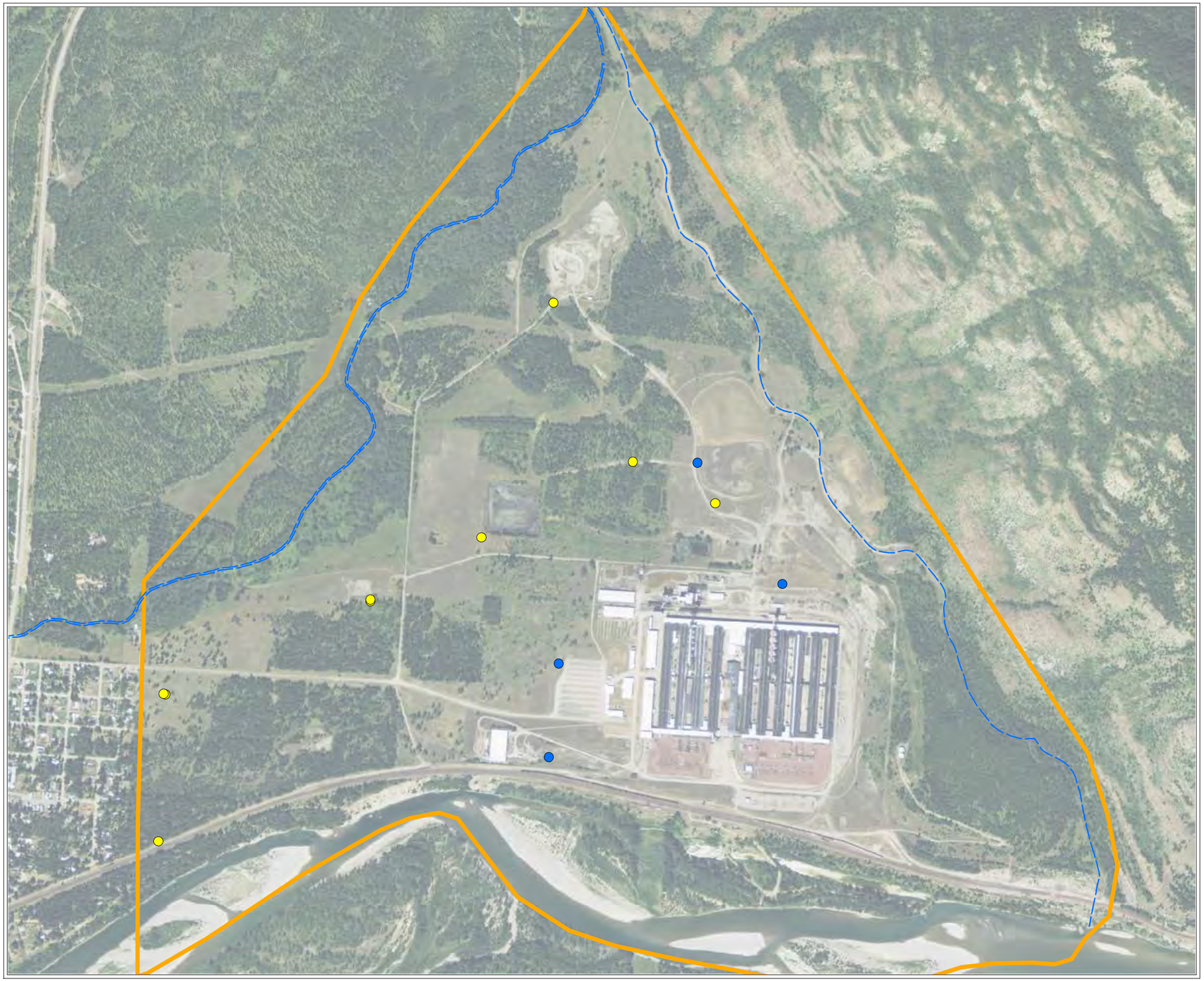

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.64U)
- ND – 0.052
- 0.052 – 10
- 10 – 100
- >100

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ARSENIC	10	10	0.052

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.64U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL ARSENIC IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H30
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H30.2476.0001Y170.66.mxd		

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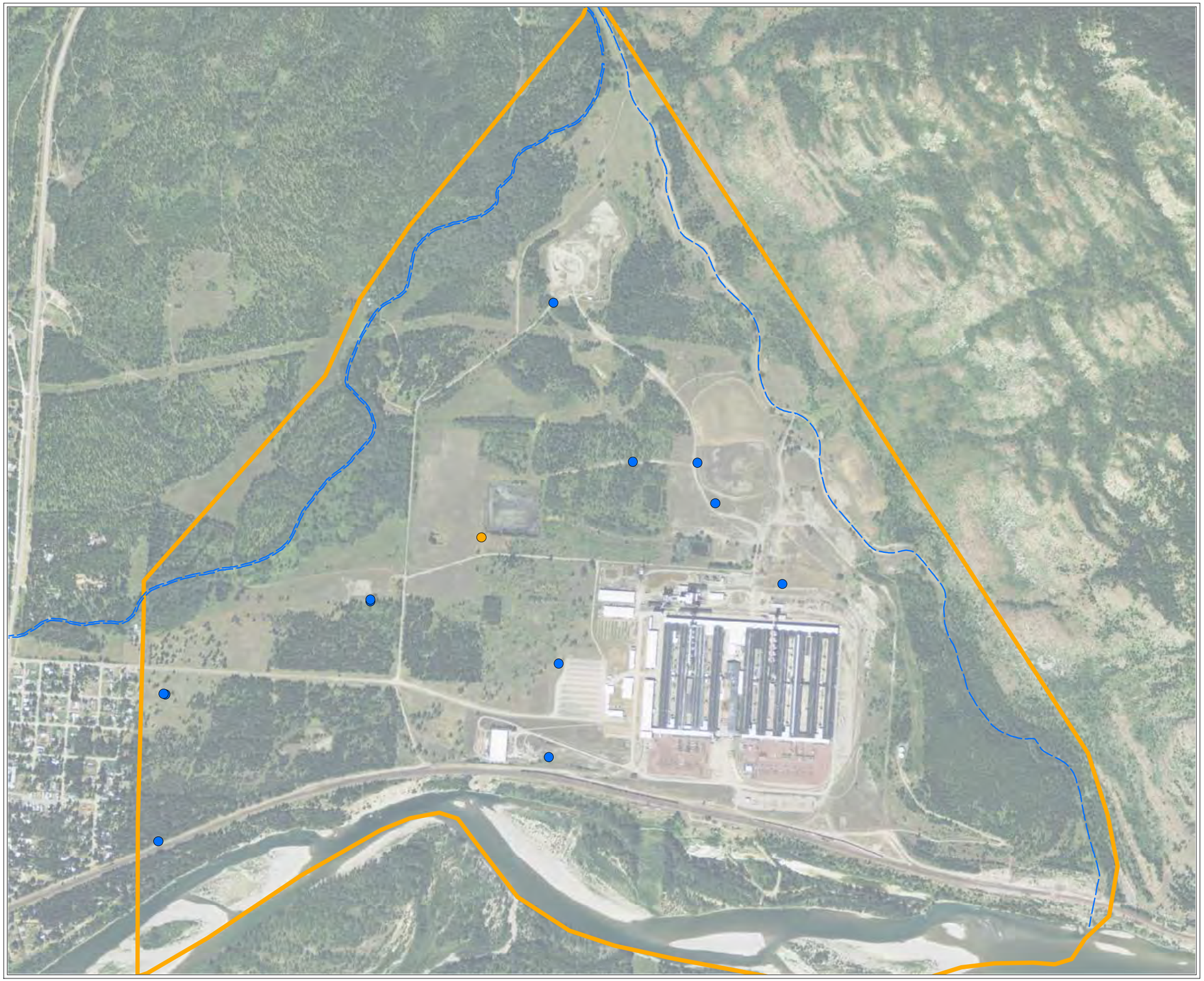

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.3U)
- ND – 0.6
- 0.6 – 2
- 2 – 4
- >4

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
COBALT	--	--	0.6

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.3U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL COBALT IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17
Prepared by: M.R.	Scale: AS SHOWN
Project Mgr: M.R.	Project: 2476.0001Y002
File: H31.2476.0001Y170.67.mxd	

APPENDIX
H31

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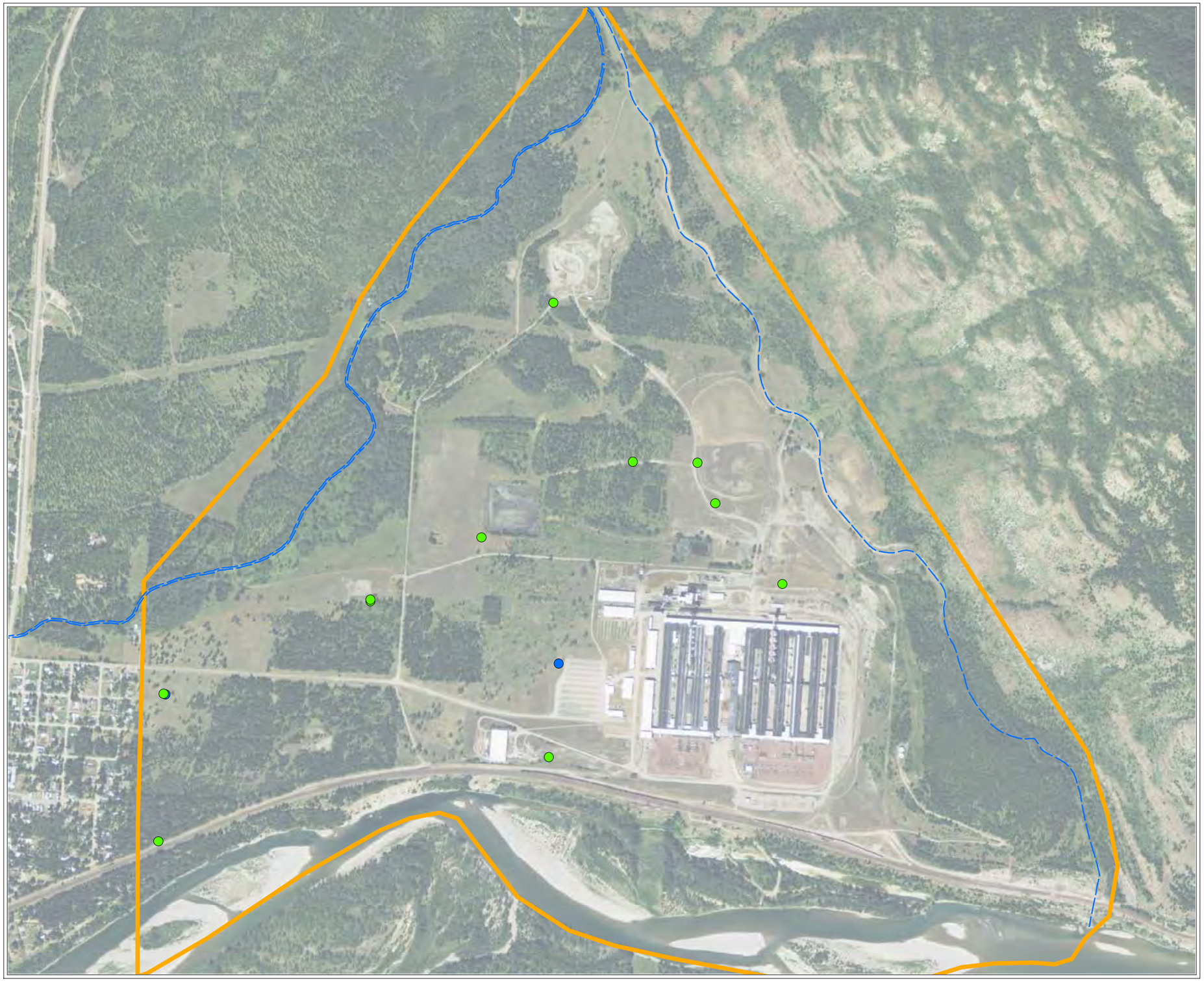

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.4U)
- ND – 80
- 80 – 1,300
- 1,300 – 13,000
- >13,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
COPPER	1300	1300	80

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL COPPER IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H32
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H32.2476.0001Y170.68.mxd		

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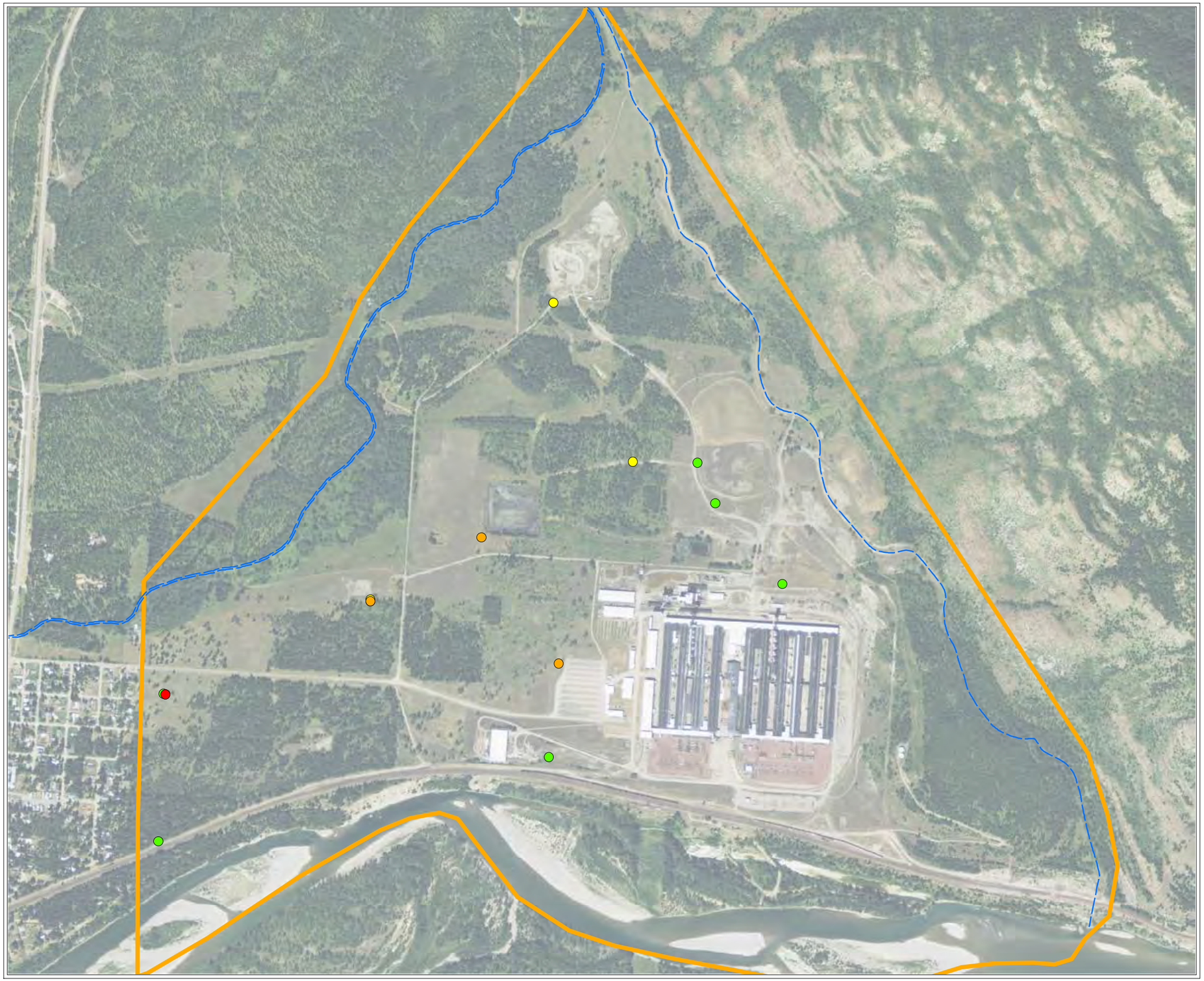

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42.4U)
- ND – 1,400
- 1,400 – 2,800
- 2,800 – 14,000
- >14,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
IRON	--	--	1400

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
42.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL IRON IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H33
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H33.2476.0001Y170.69.mxd		

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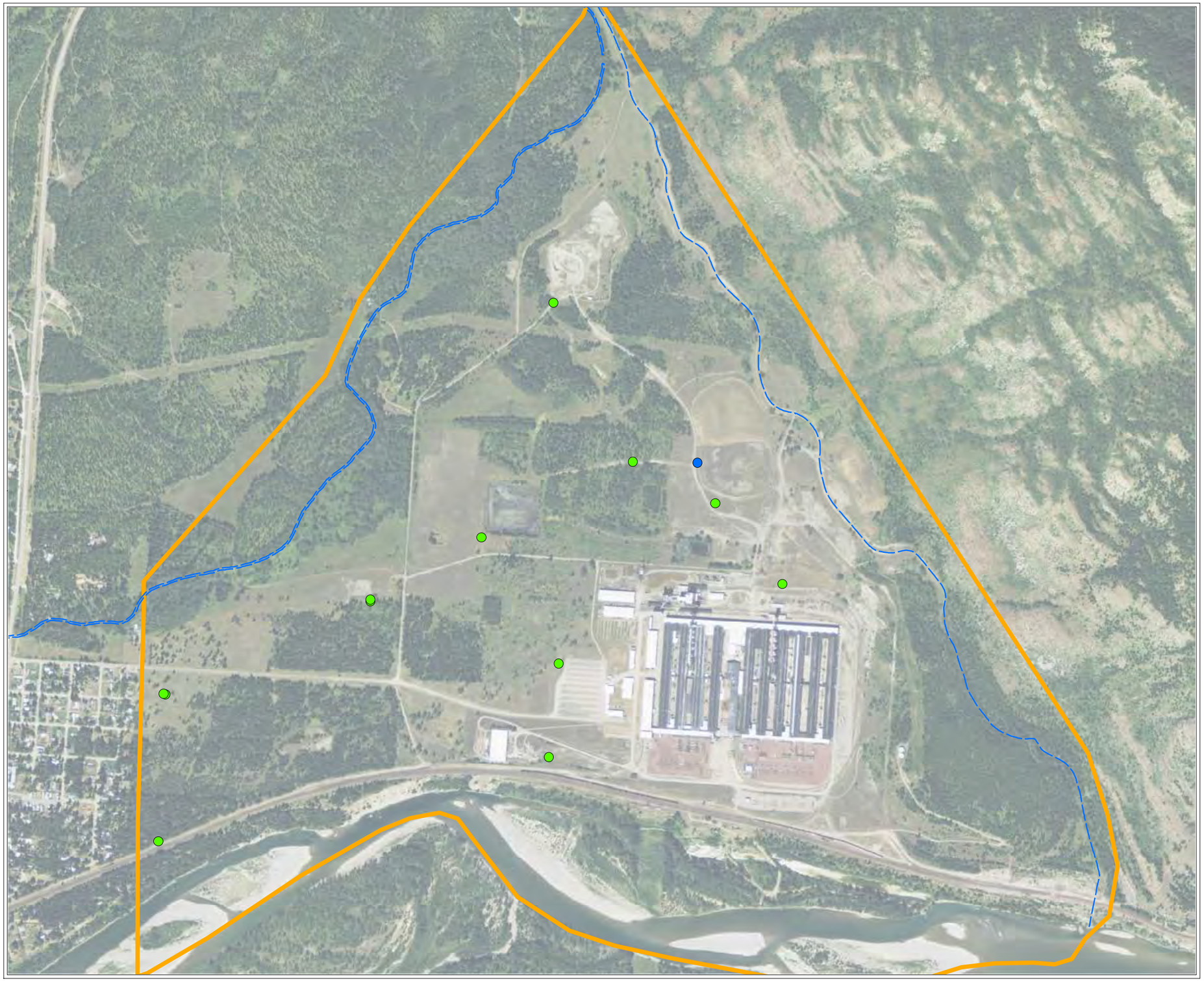

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.38U)
- ND – 15
- 15 – 30
- 30 – 150
- >150

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
LEAD	15	15	15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.38U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL LEAD IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H34
Project Mgr: M.R.	Project: 2476.0001Y002	
File: H34.2476.0001Y170.70.mxd		

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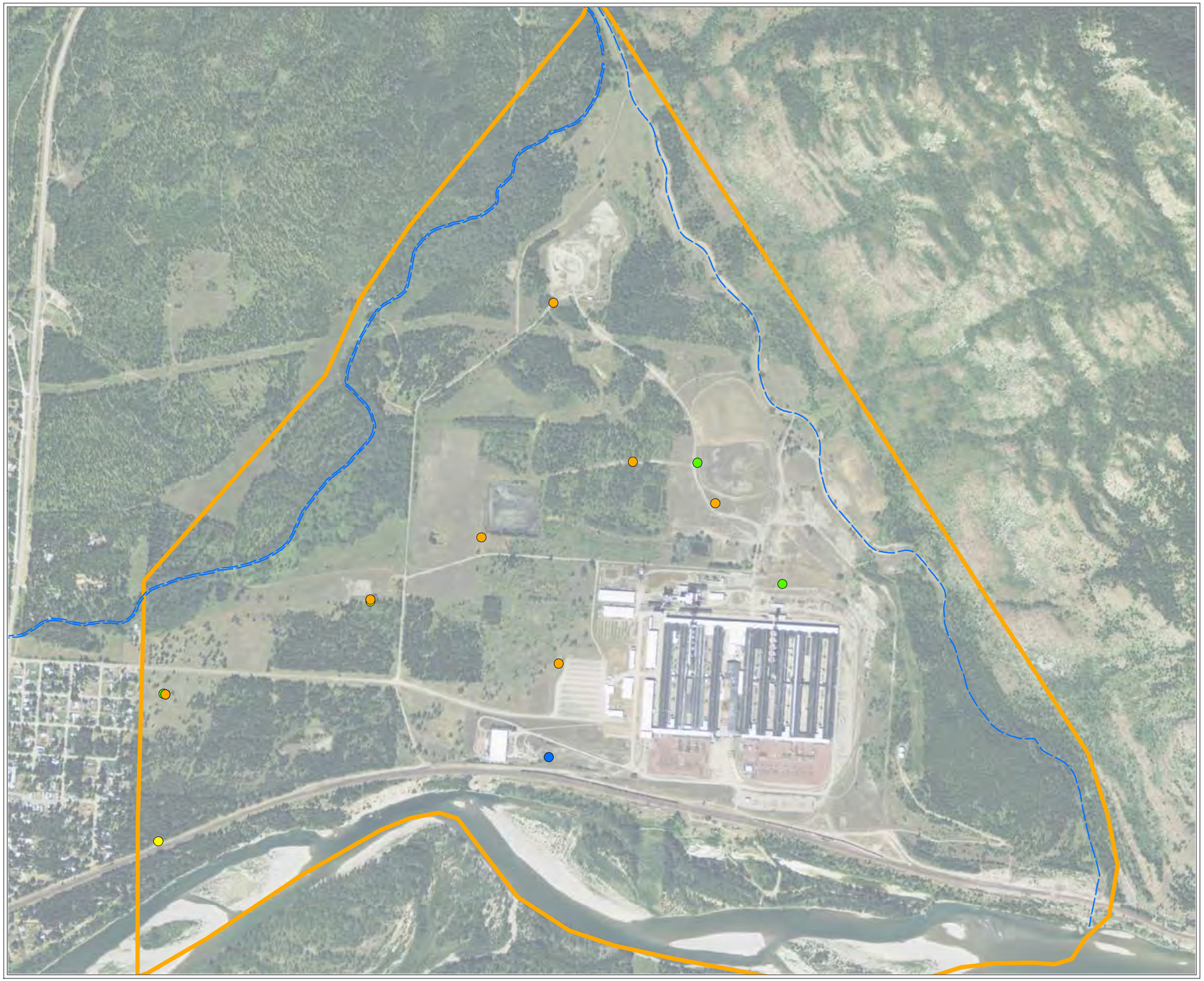

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2.5U)
- ND – 43
- 43 – 86
- 86 – 430
- >430

CHEMICAL NAME	DEQ–7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
MANGANESE	--	--	43

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title: **CONCENTRATIONS OF TOTAL MANGANESE IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H35
Project Mgr: M.R.	Project: 2476.0001Y002	
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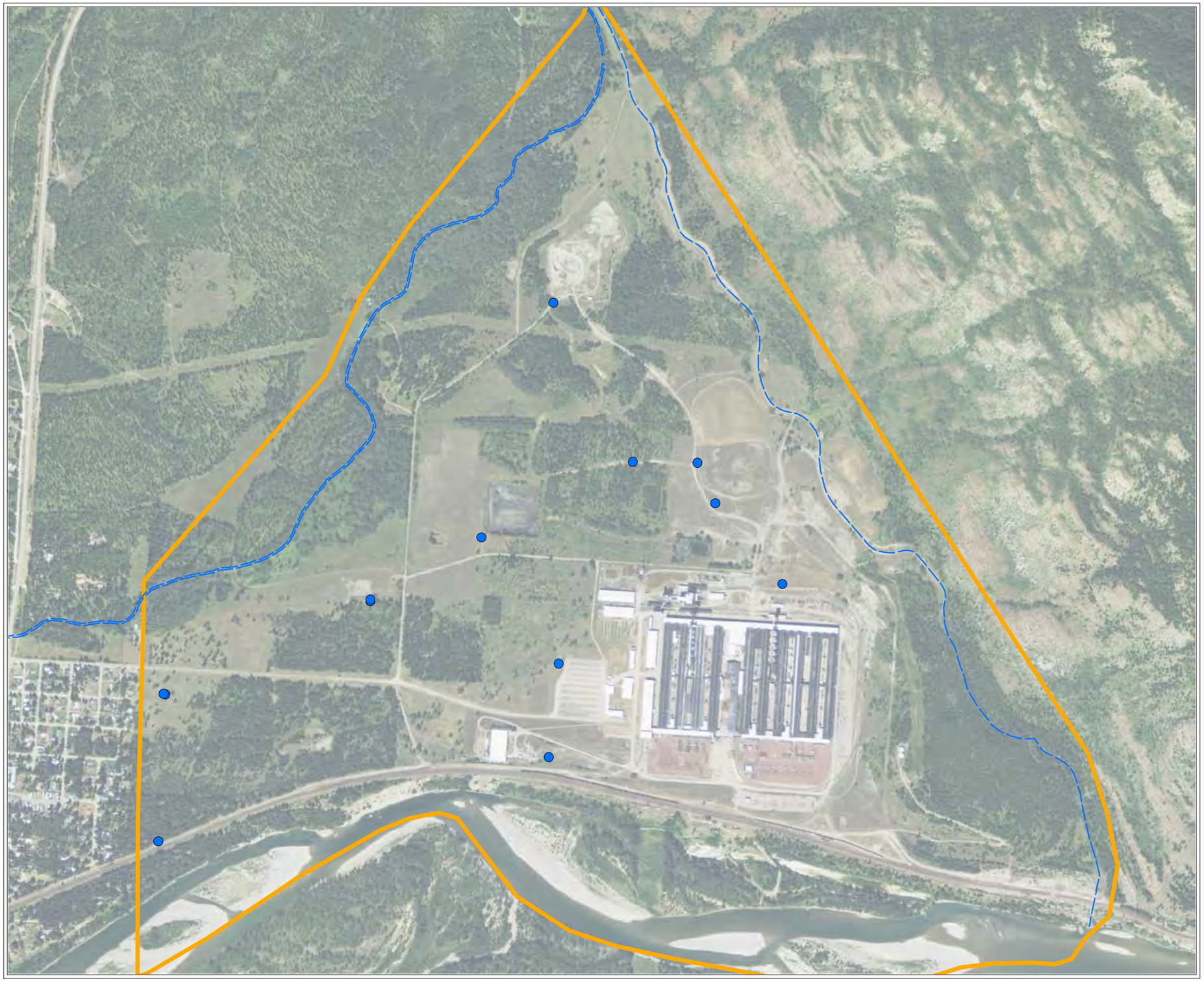

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.26U)
- ND – 1
- 1 – 2
- 1 – 20
- >20

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
THALLIUM	2	2	0.02

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.26U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF TOTAL THALLIUM IN ROUND 4 GROUNDWATER FROM MONITORING WELLS SCREEND BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H36
Project Mgr: M.R.	Project: 2476.0001Y002	
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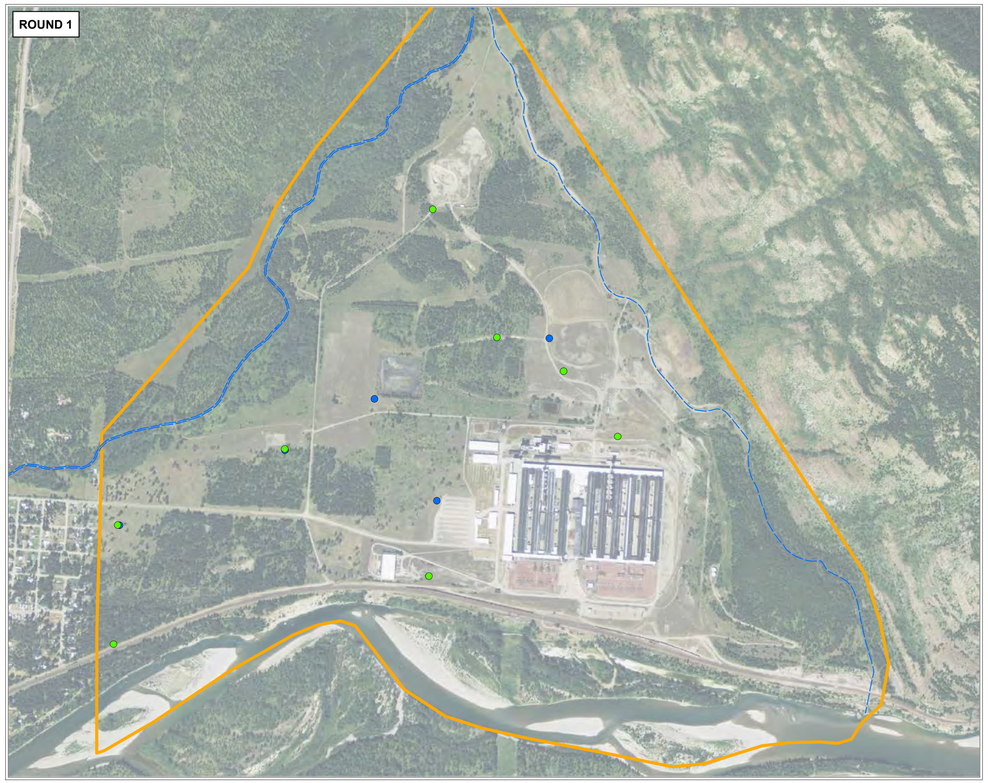

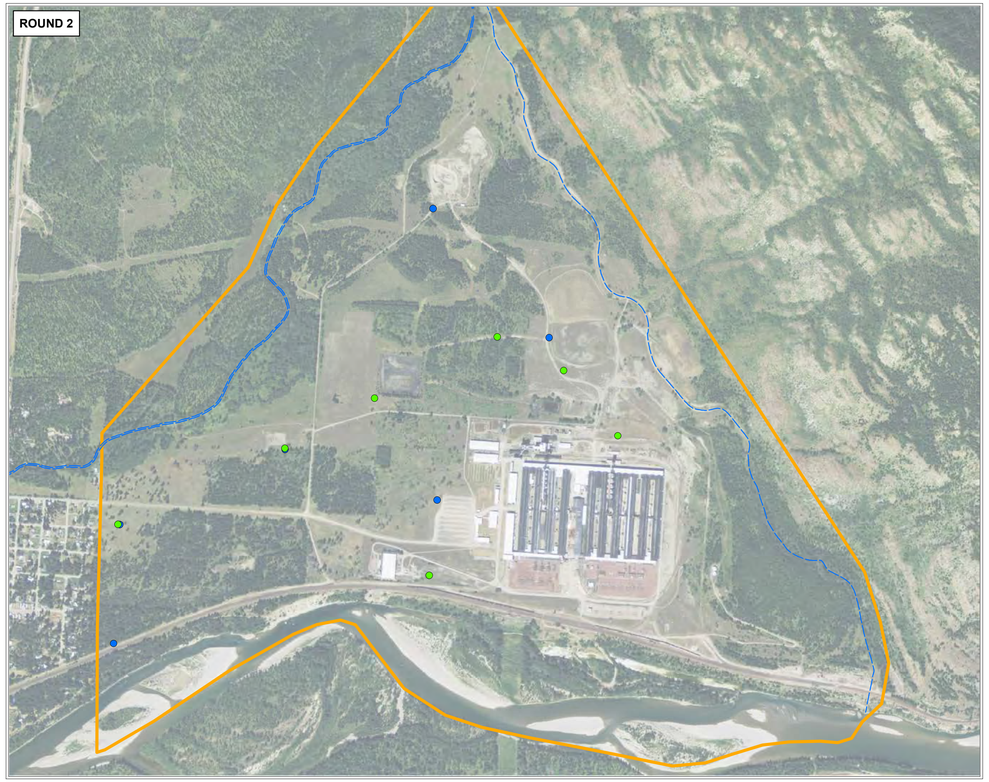

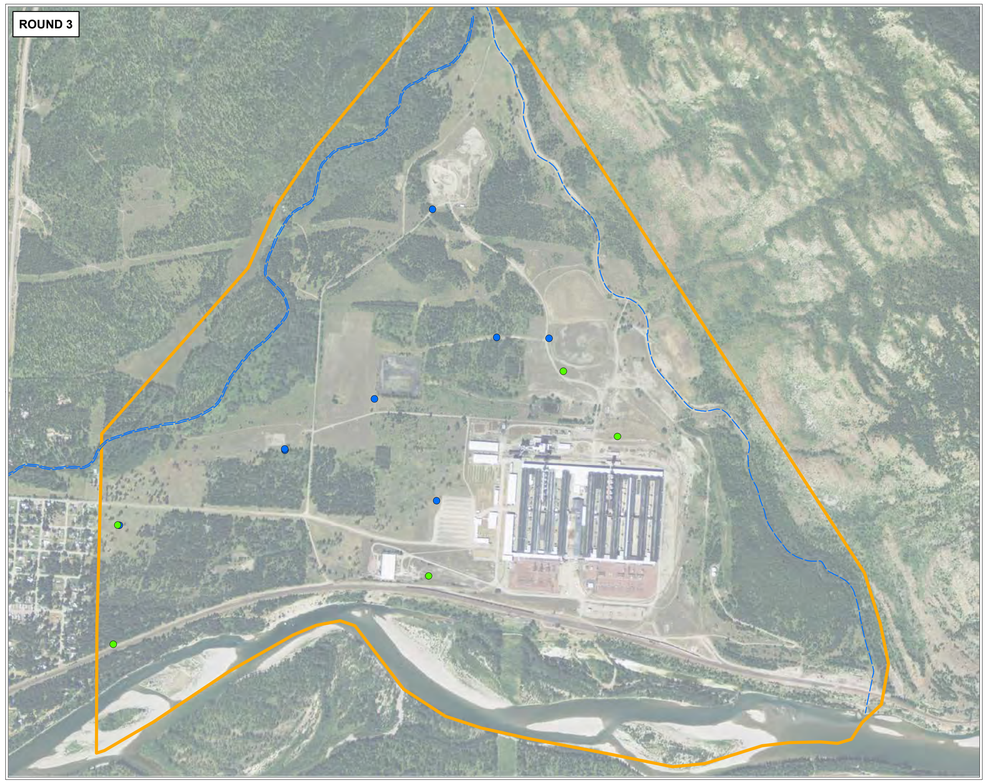

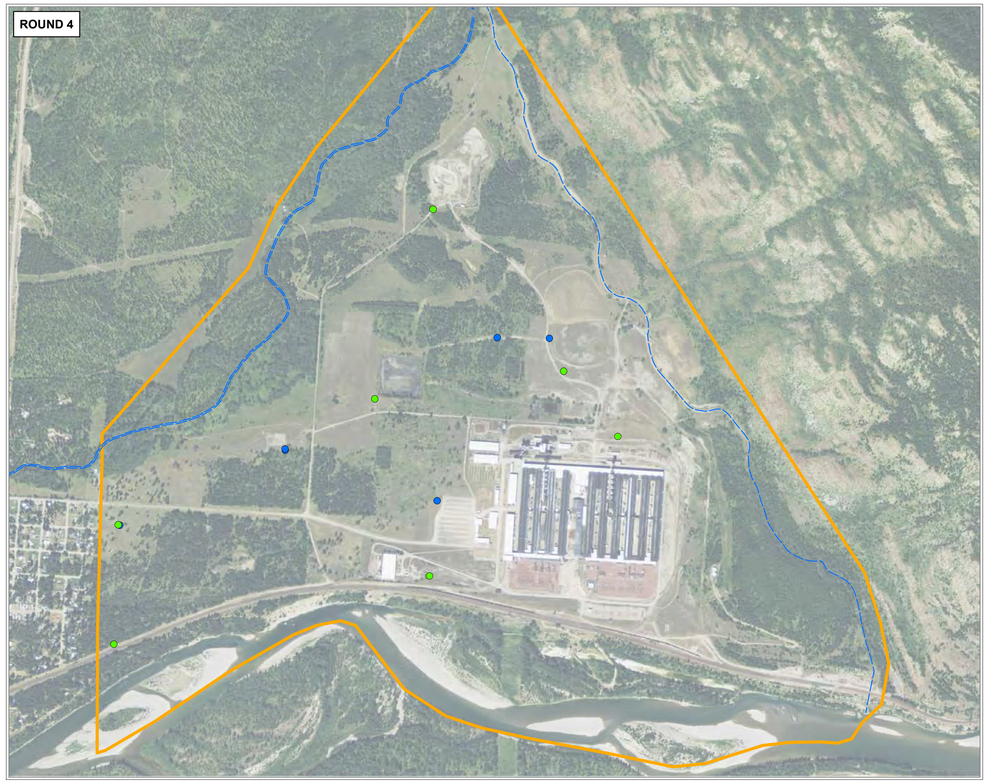

N

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (18.2U)
- ND – 2,000
- 2,000 – 4,000
- 4,000 – 20,000
- >20,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ALUMINUM	--	--	2000

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
18.2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED ALUMINUM IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H37
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H37.2476.0001Y170.54.mxd		

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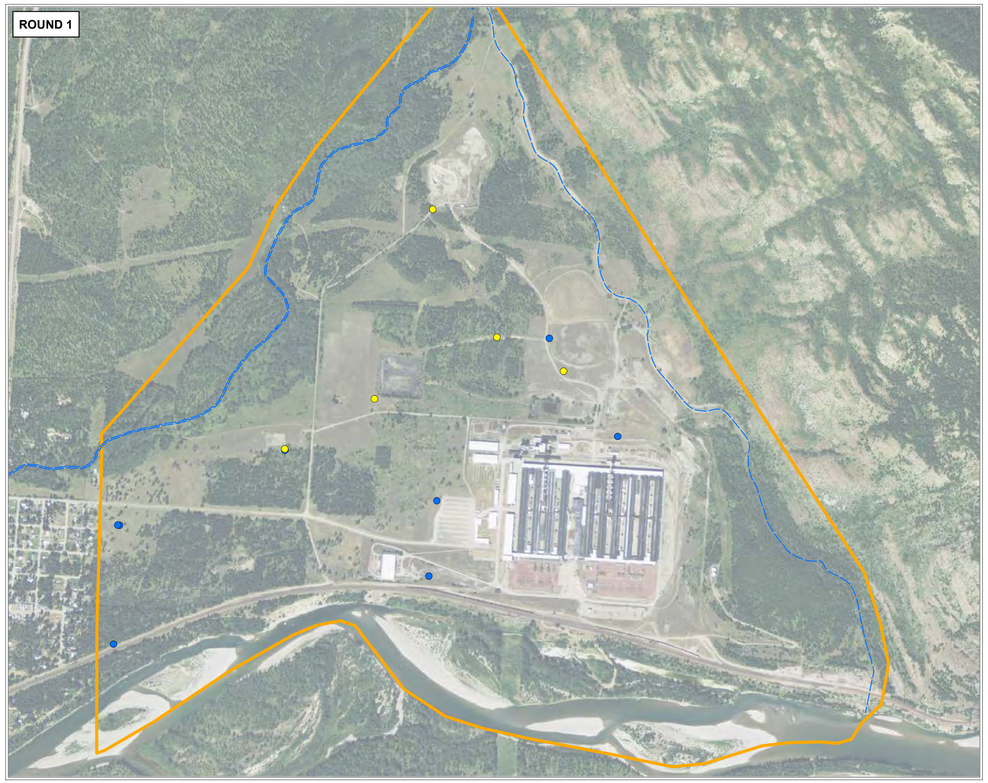

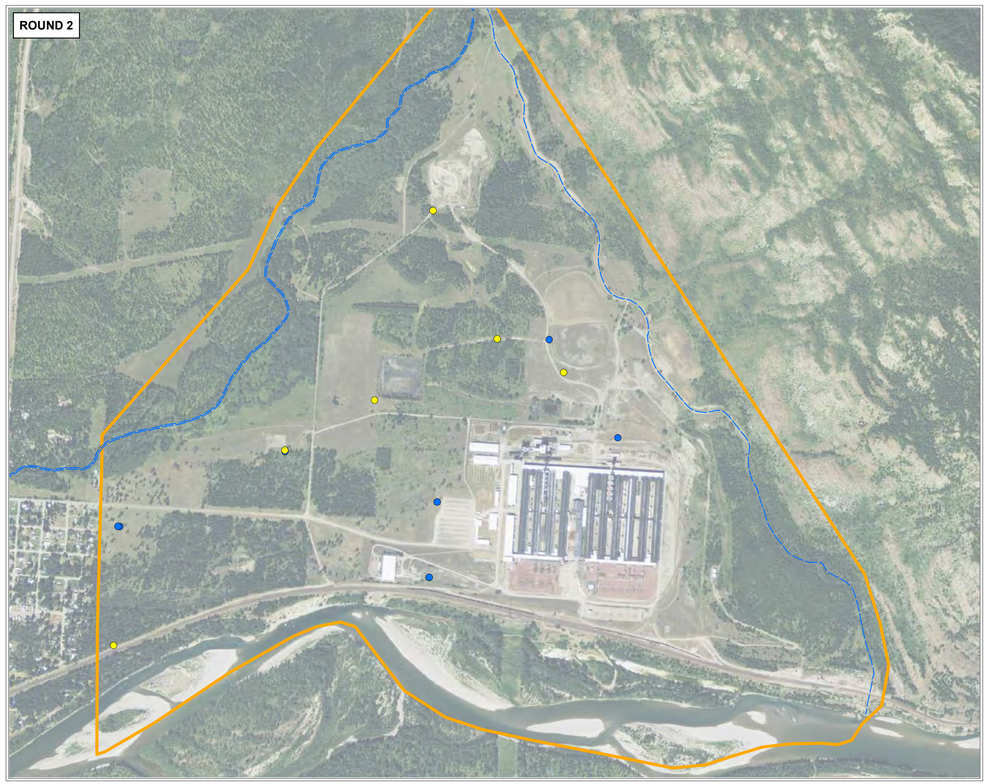

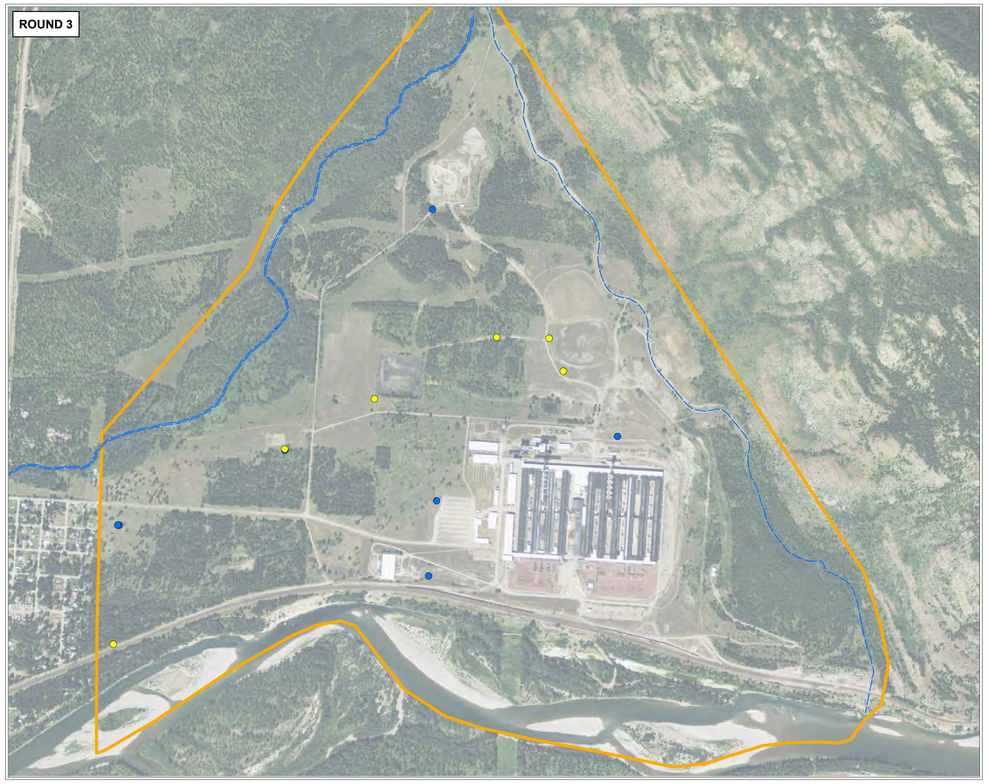

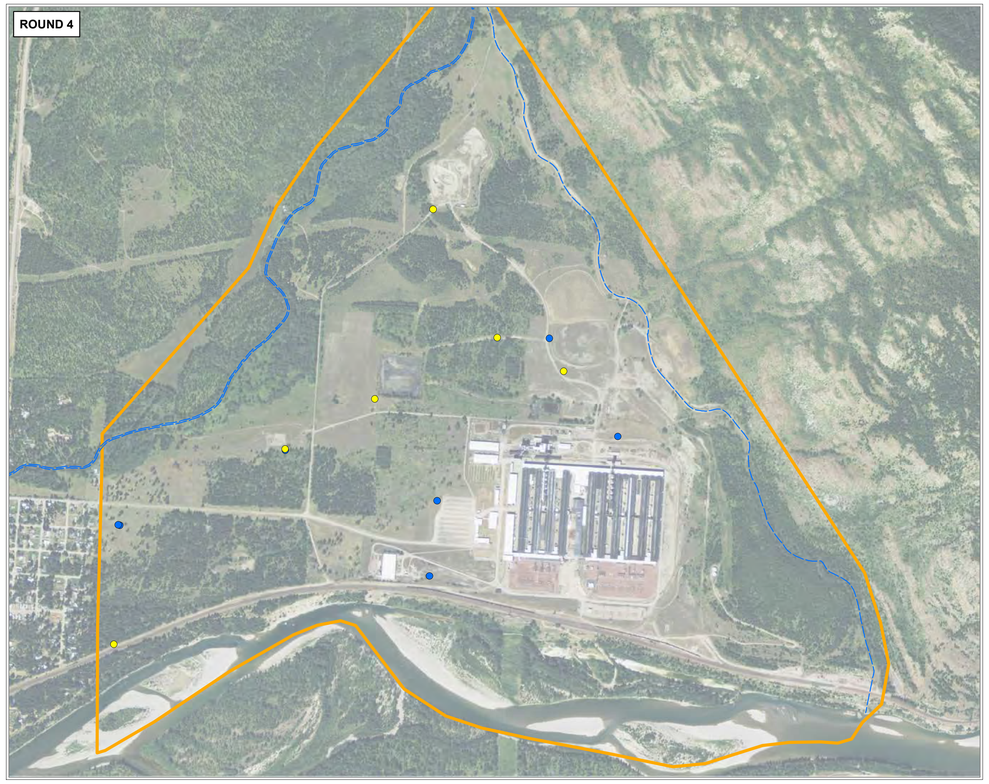

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.64U)
- ND – 0.052
- 0.052 – 10
- 10 – 100
- >100

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ARSENIC	10	10	0.052

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.64U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED ARSENIC IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H38
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H38.2476.0001Y170.55.mxd		

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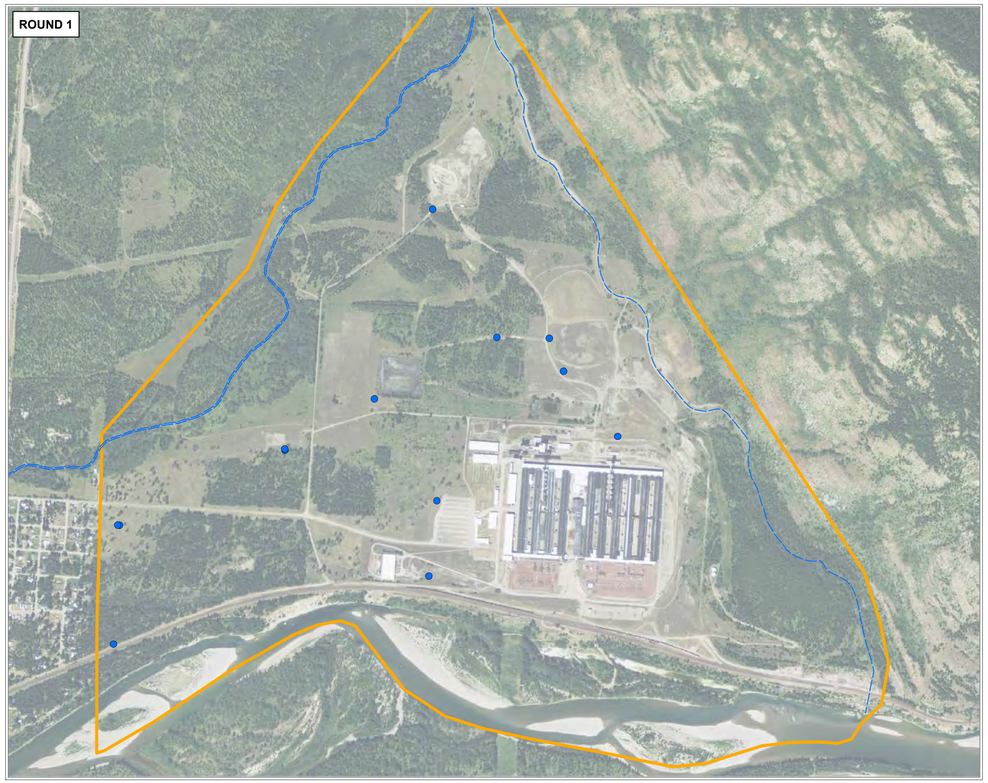

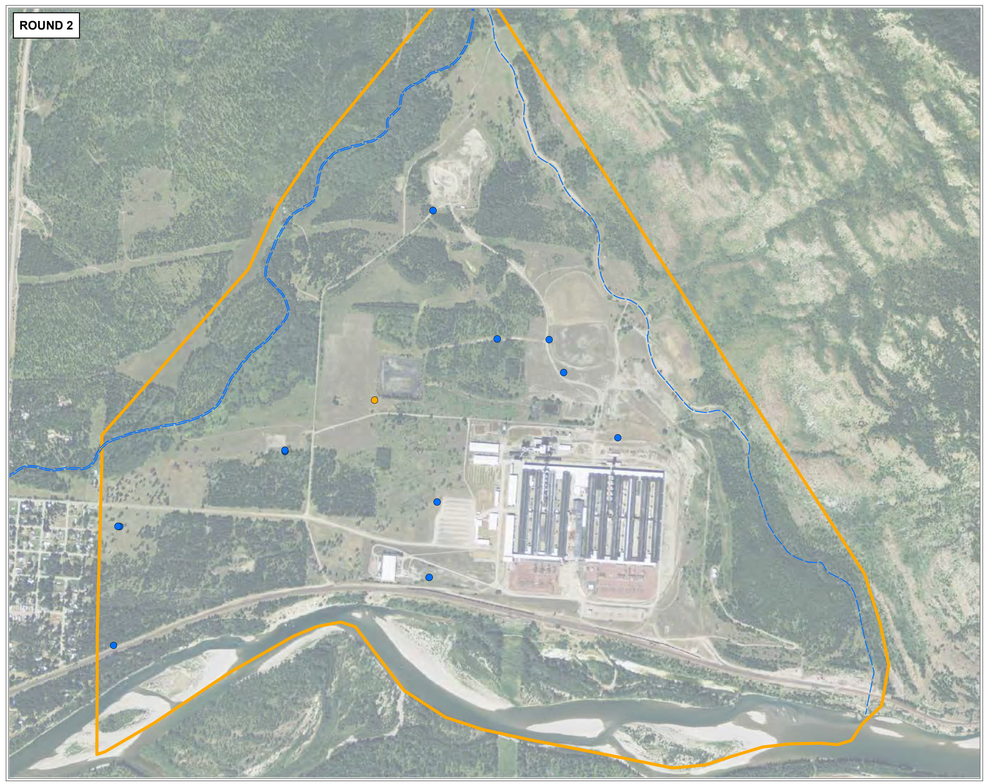

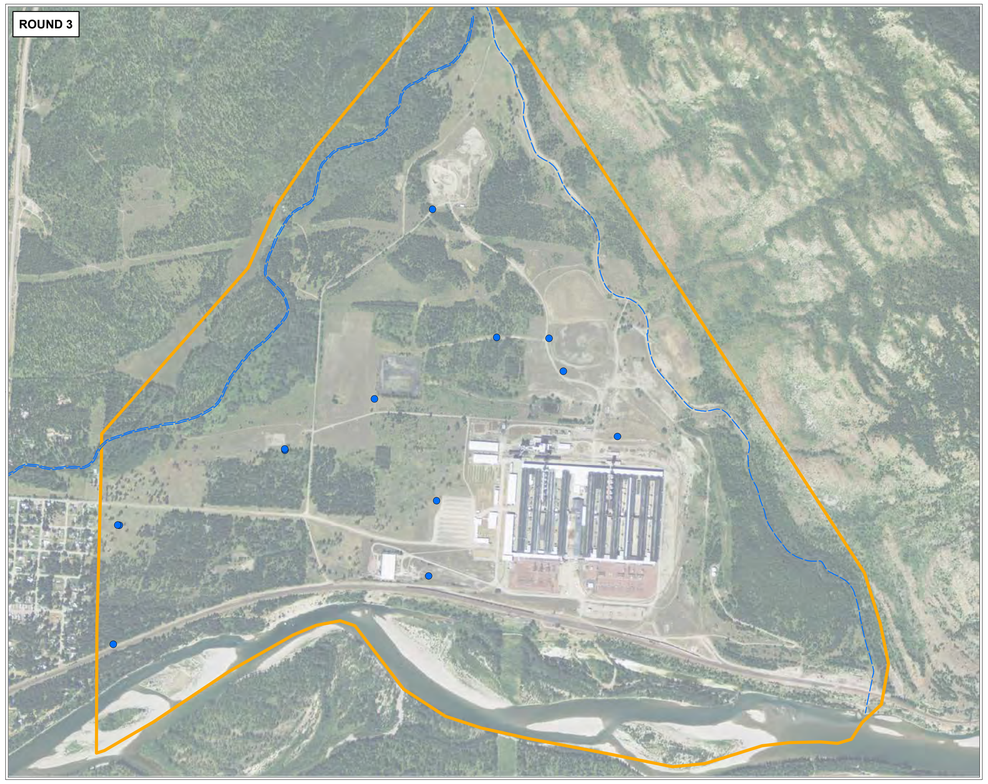

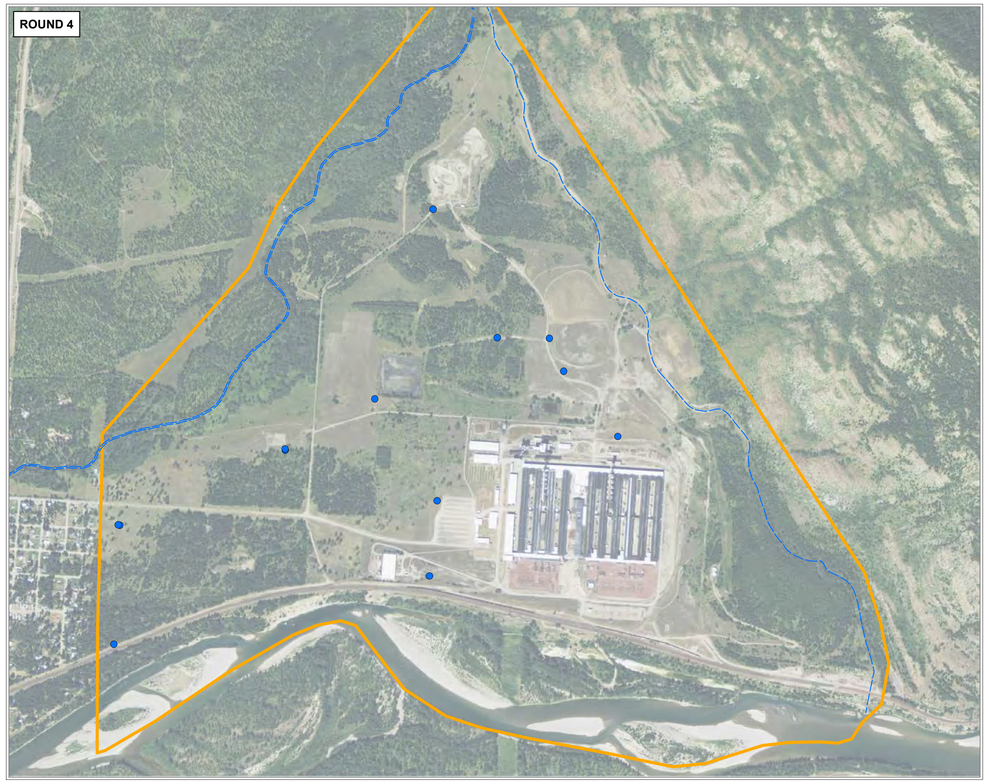

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.3U)
- ND – 0.6
- 0.6 – 2
- 2 – 4
- >4

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
COBALT	--	--	0.6

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.3U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED COBALT IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H39
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H39.2476.0001Y170.56.mxd		

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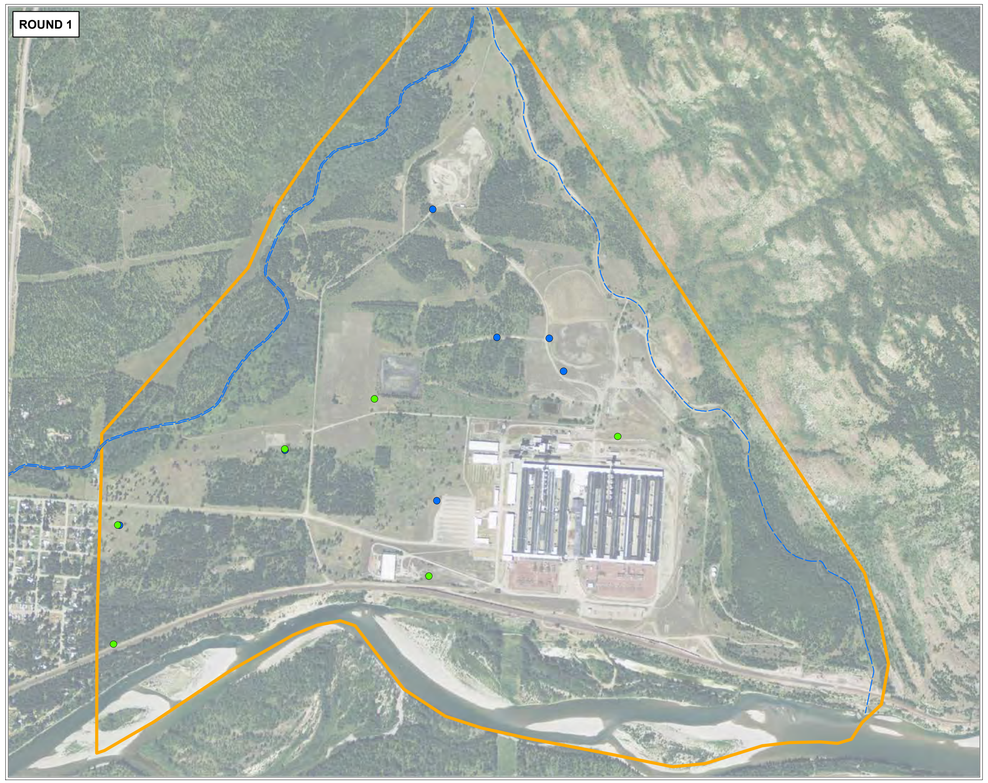

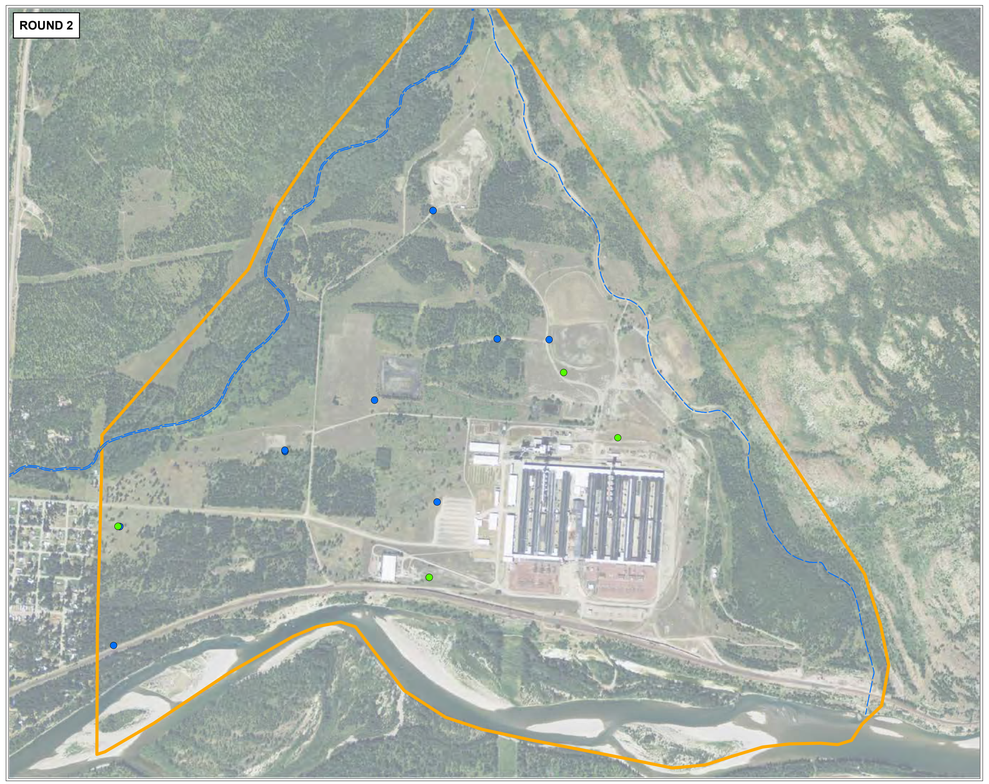

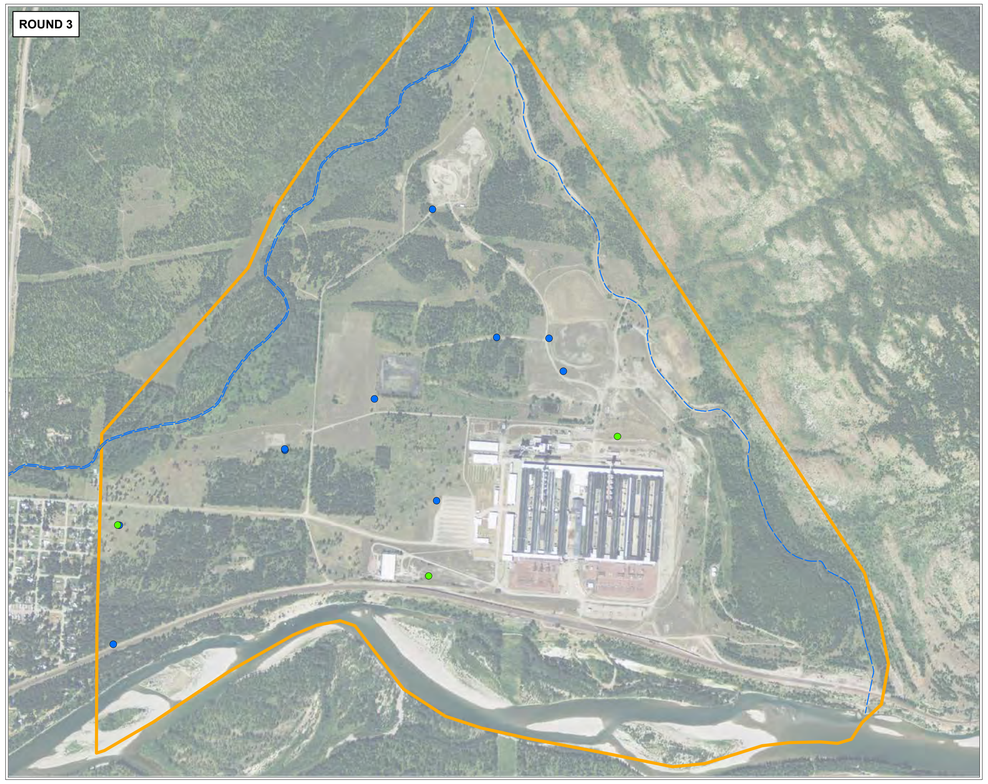

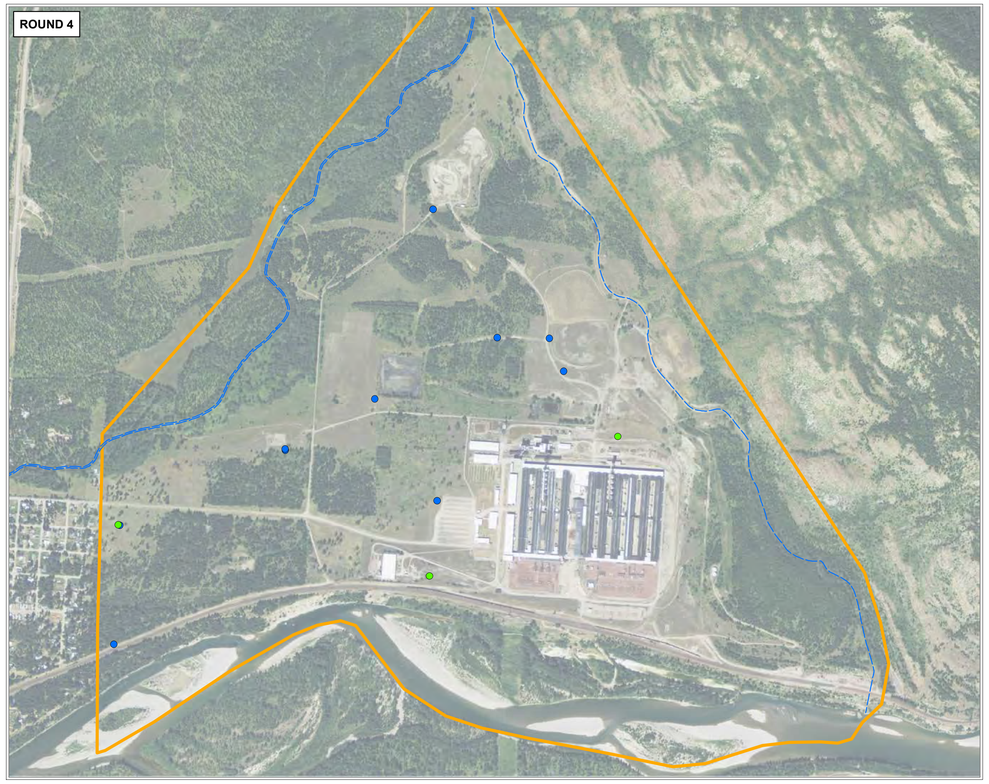

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.4U)
- ND – 80
- 80 – 1,300
- 1,300 – 13,000
- >13,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
COPPER	1300	1300	80

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF DISSOLVED COPPER IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H40
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H40.2476.0001Y170.57.mxd		

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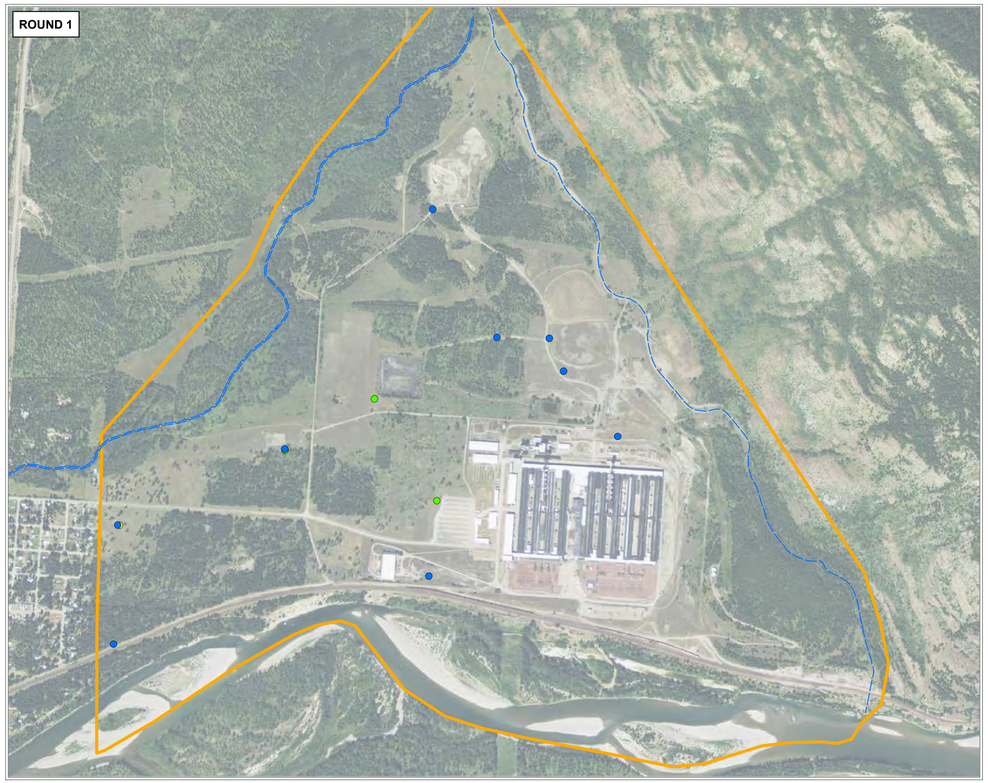

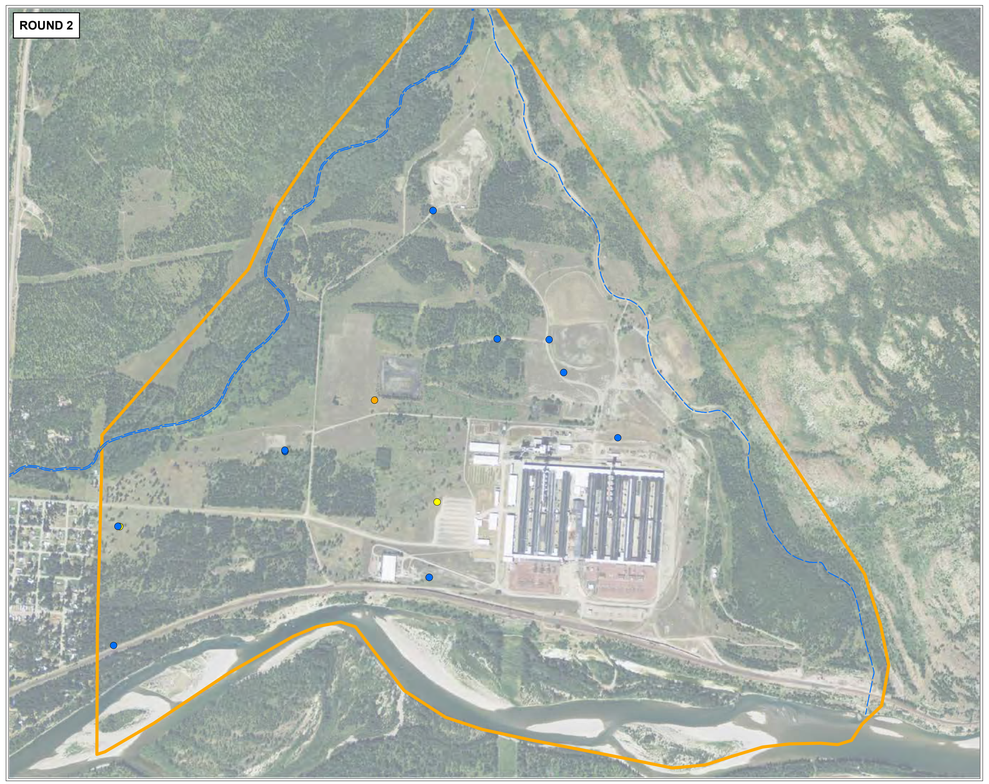

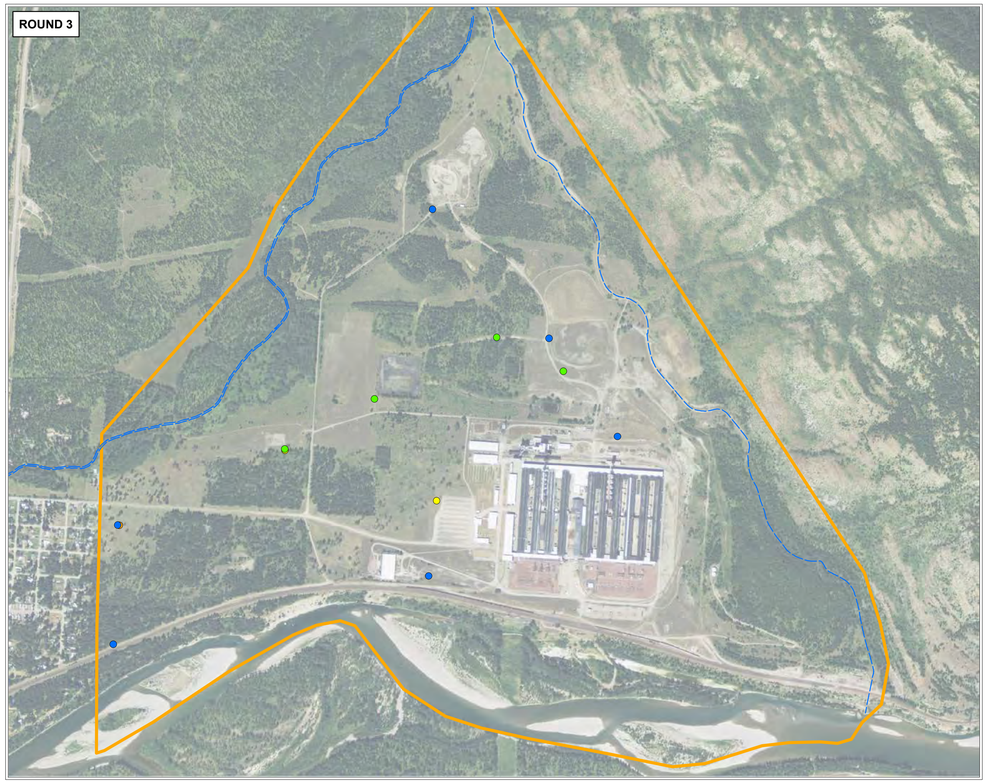

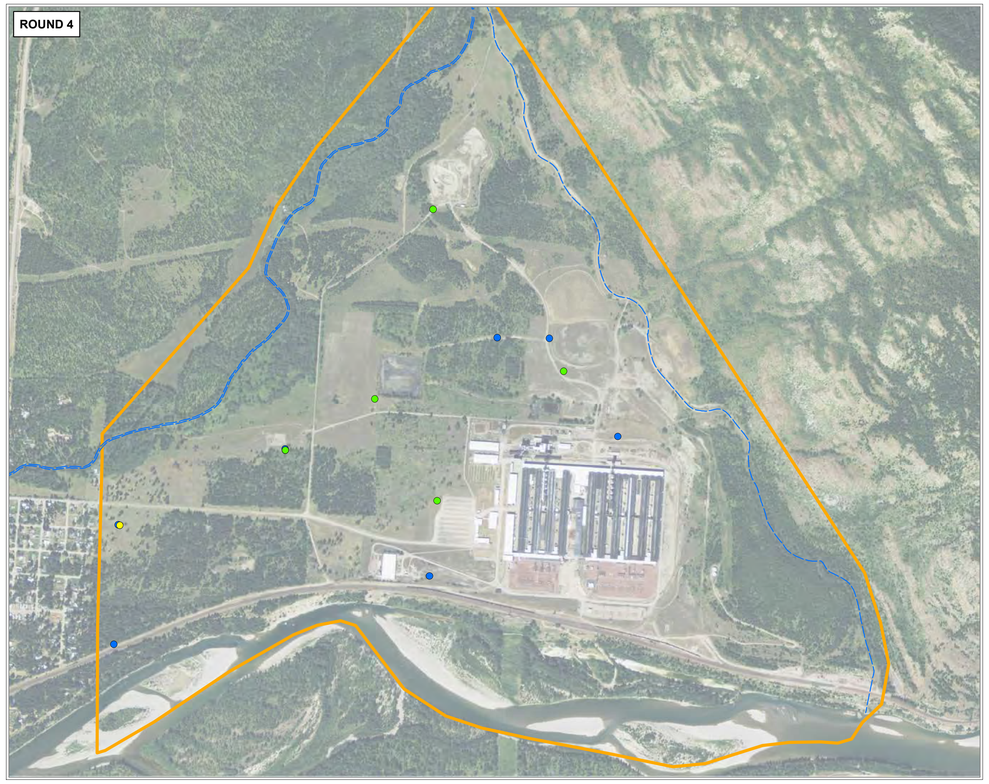

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42.4U)
- ND – 1,400
- 1,400 – 2,800
- 2,800 – 14,000
- >14,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
IRON	--	--	1400

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
42.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF DISSOLVED IRON IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H41
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H41,2476.0001Y170.58.mxd		

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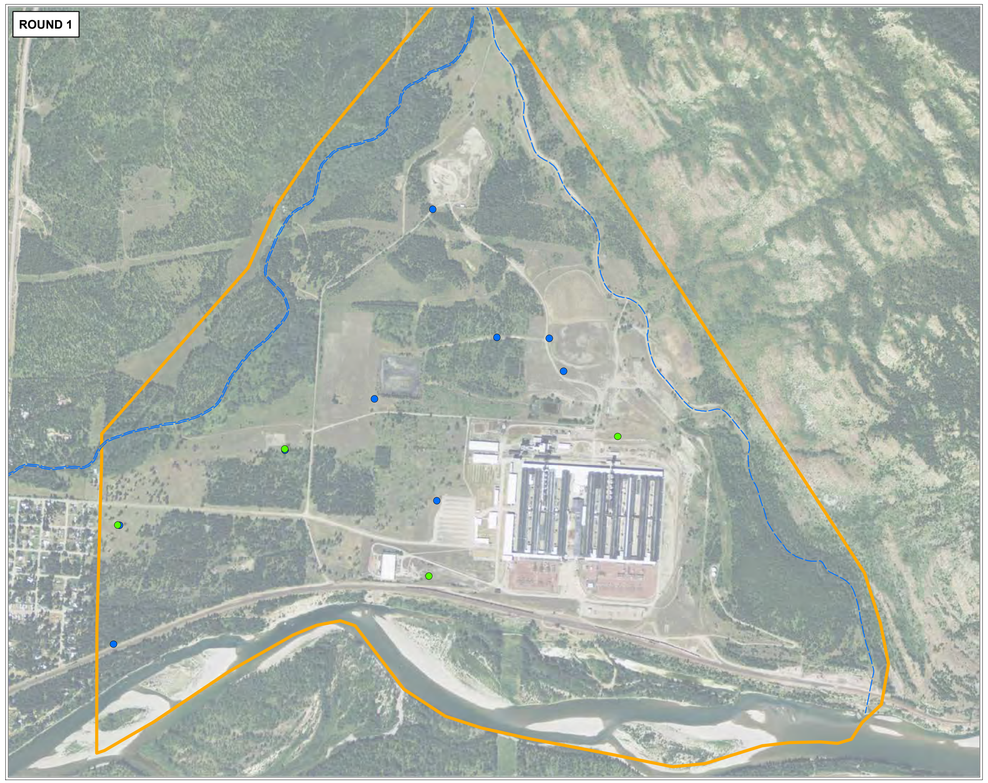

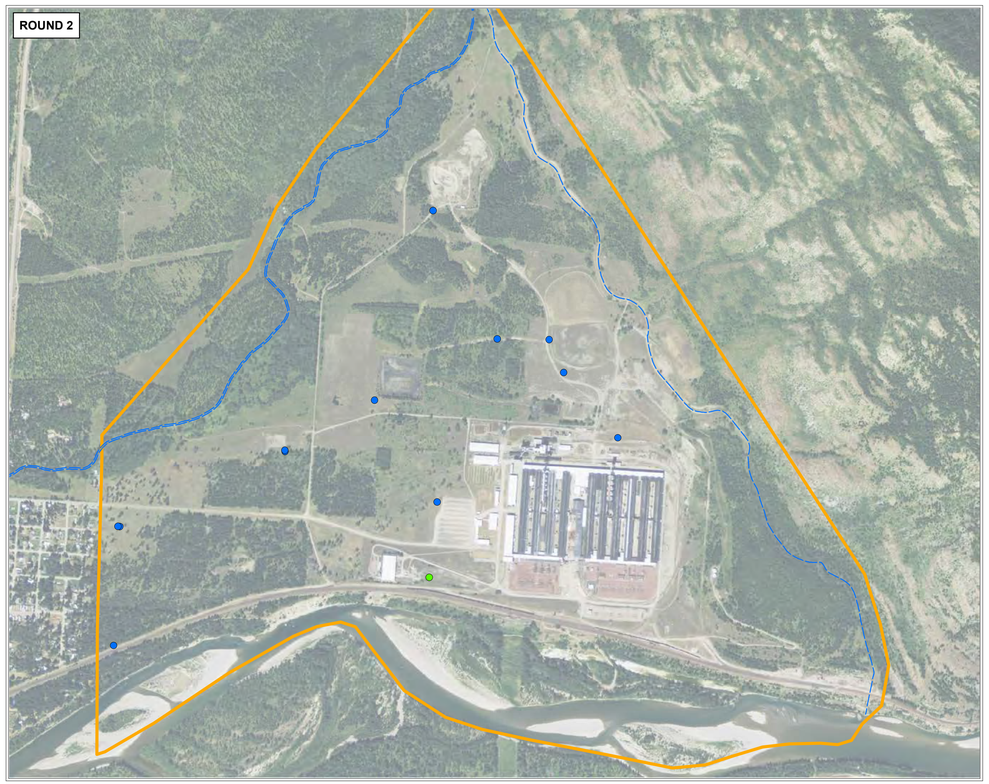

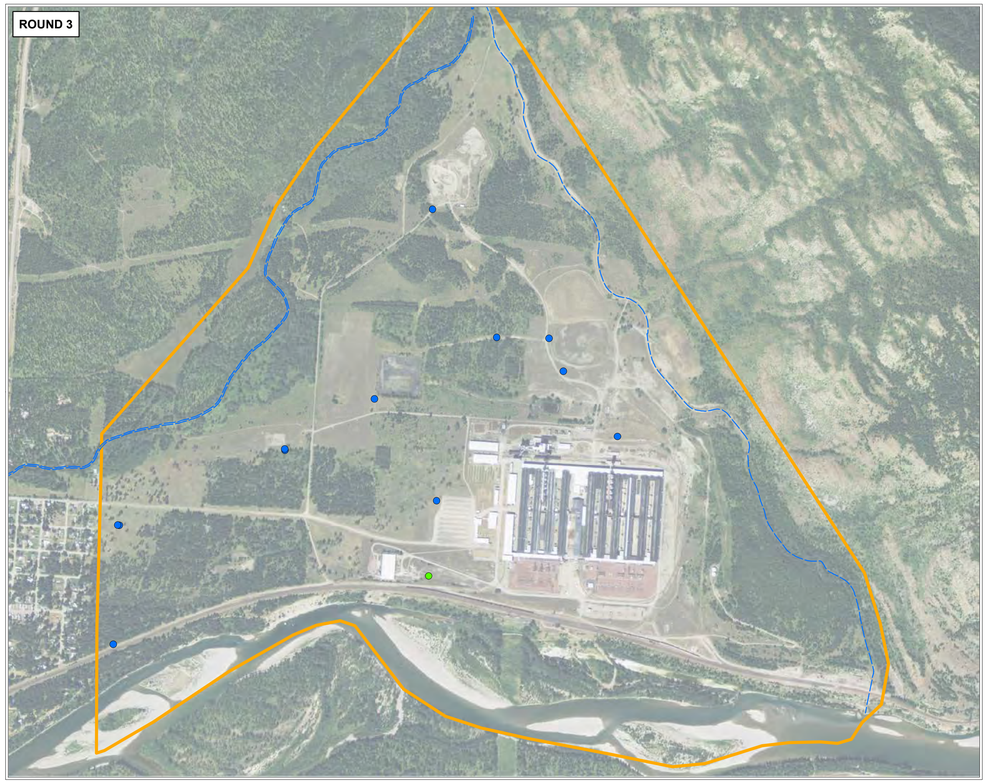

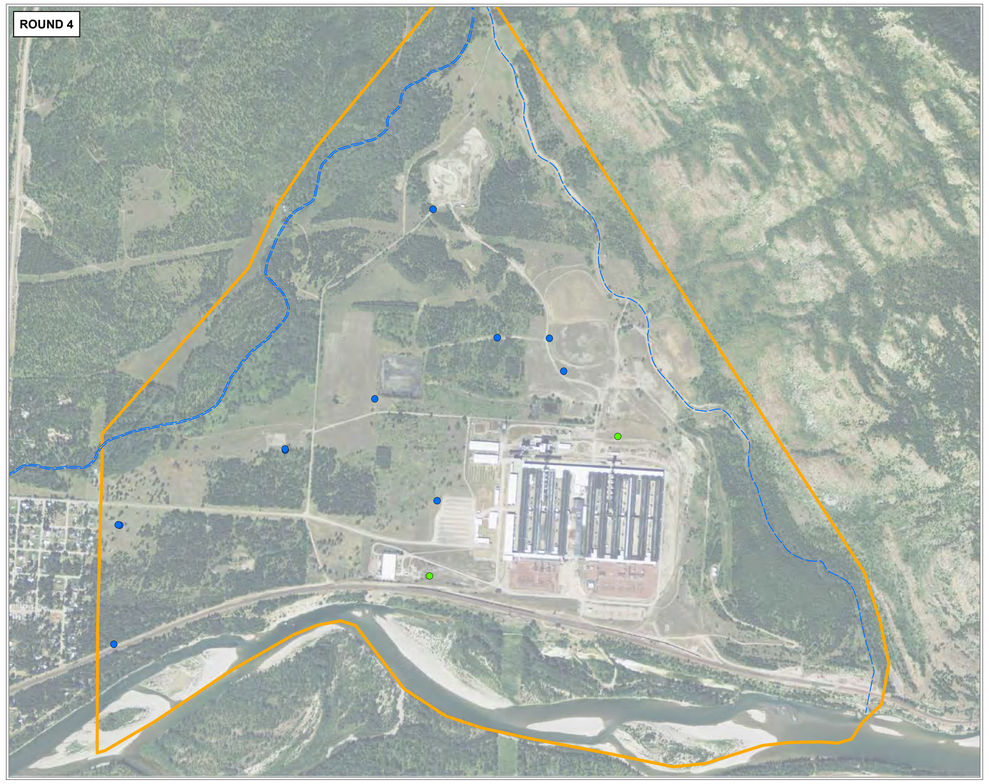

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.38U)
- ND – 15
- 15 – 30
- 30 – 150
- >150

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
LEAD	15	15	15

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.38U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF DISSOLVED LEAD IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H42
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H42.2476.0001Y170.59.mxd		

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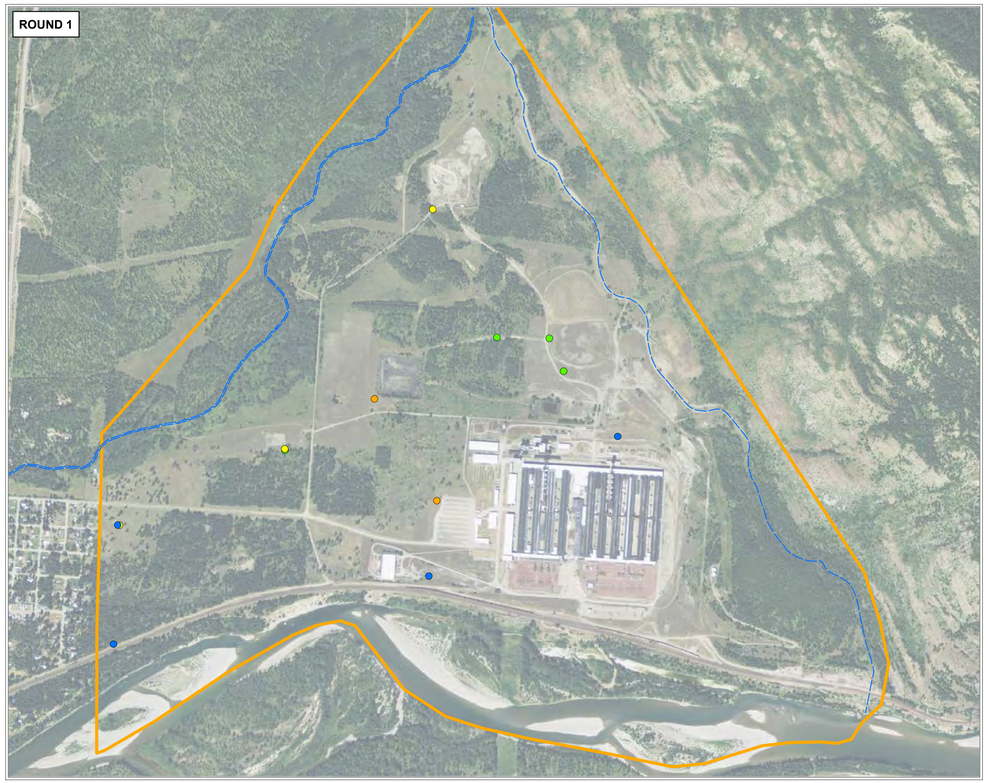

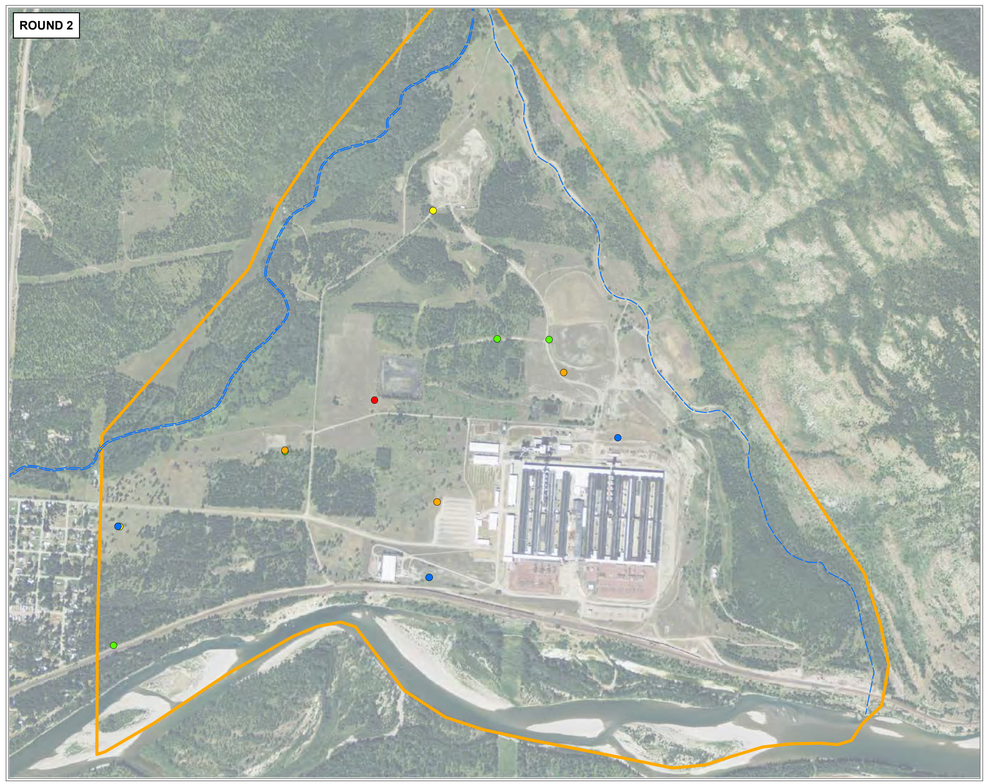

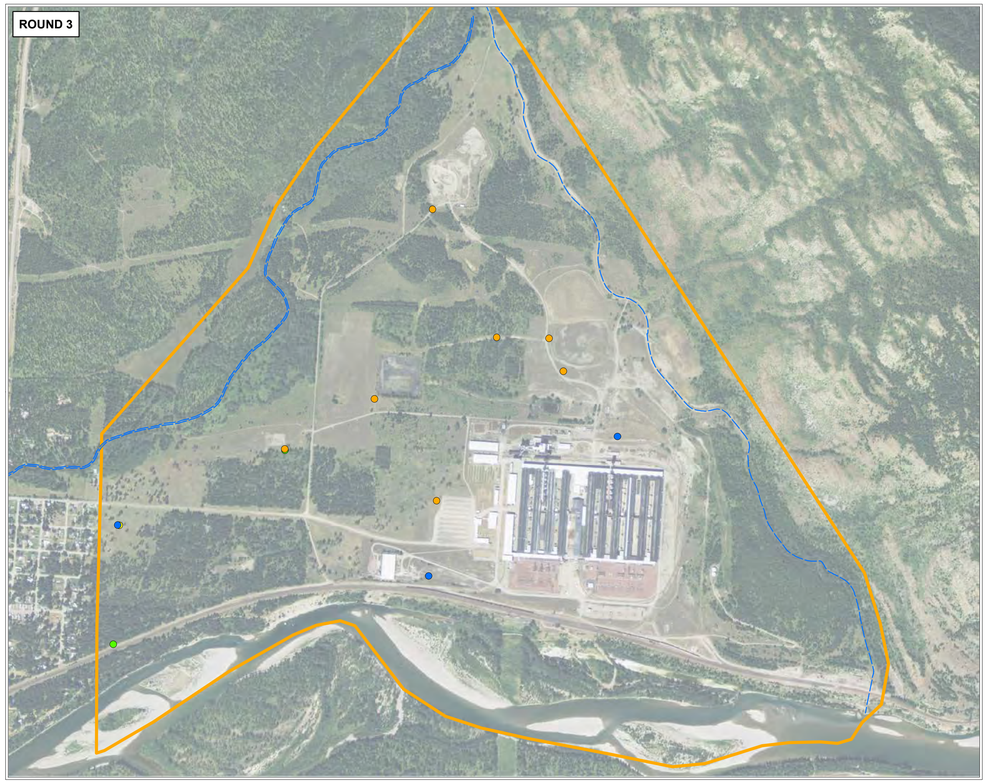

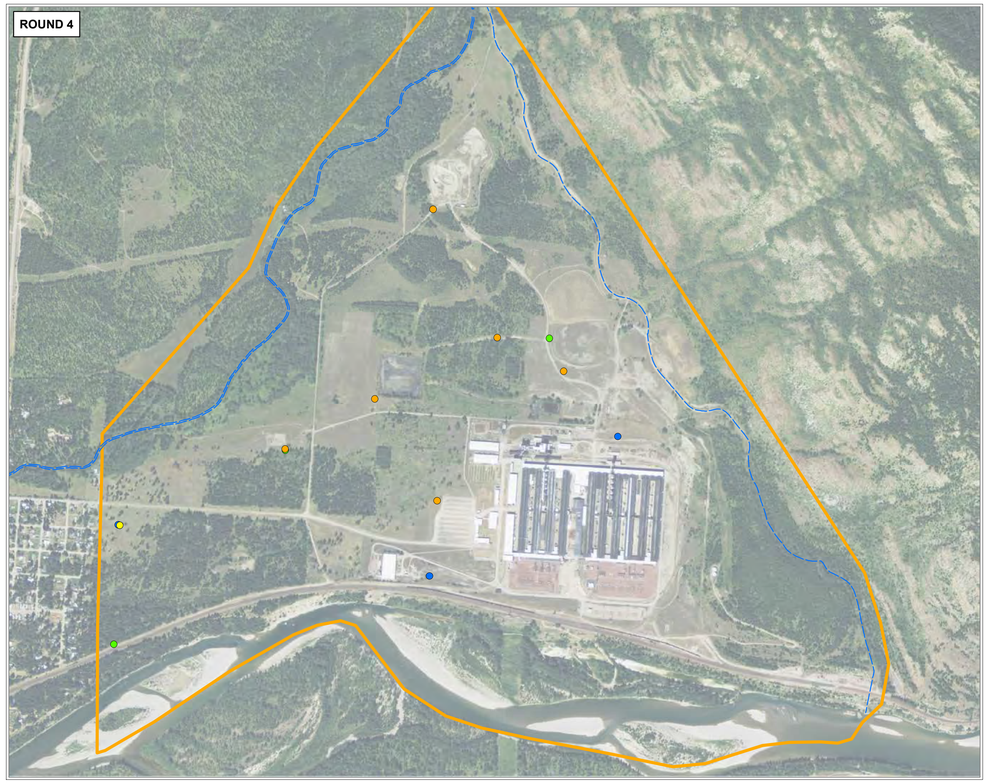

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2.5U)
- ND – 43
- 43 – 86
- 86 – 430
- >430

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
MANGANESE	--	--	43

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
2.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title: **CONCENTRATIONS OF DISSOLVED MANGANESE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H43
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H43.2476.0001Y170.60.mxd		

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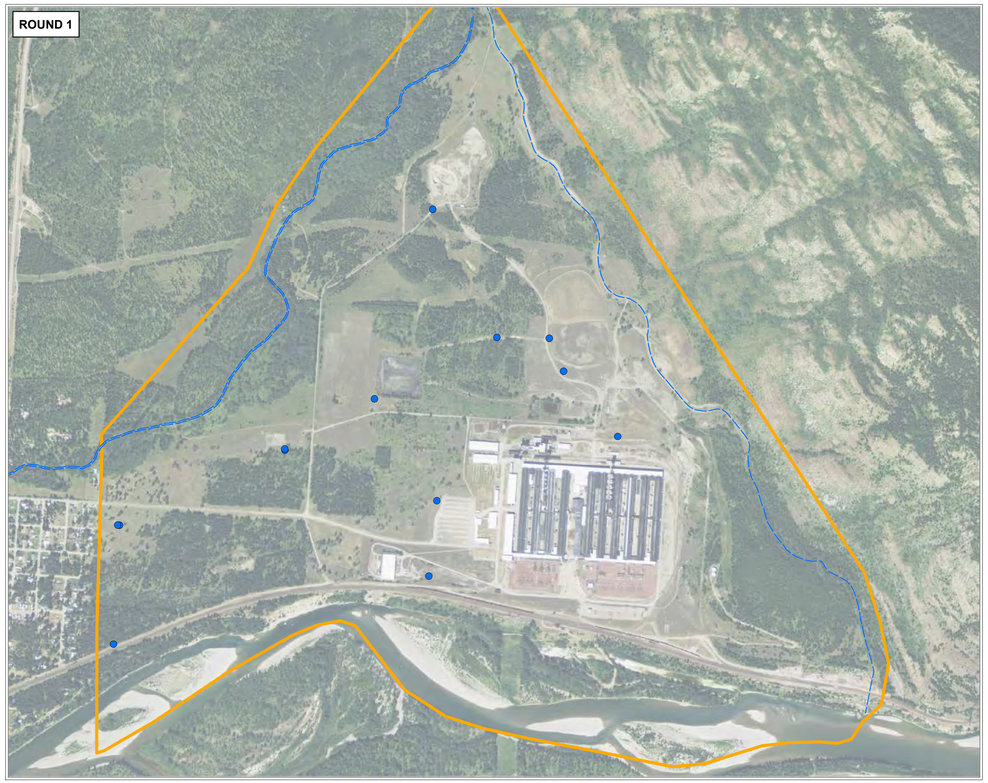

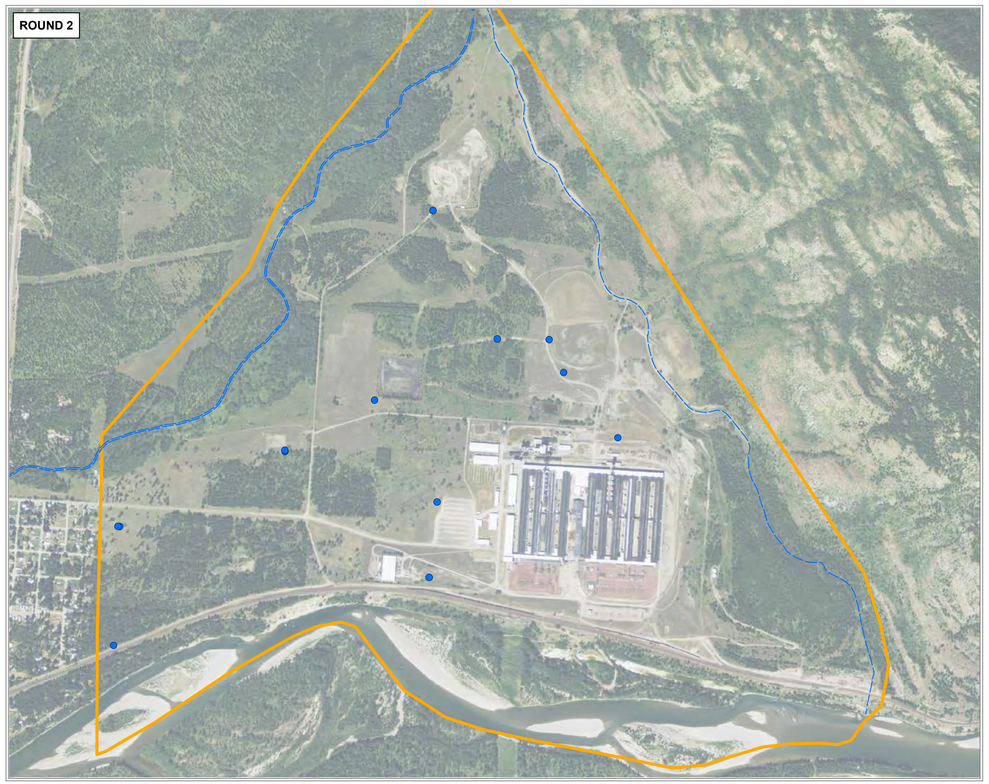

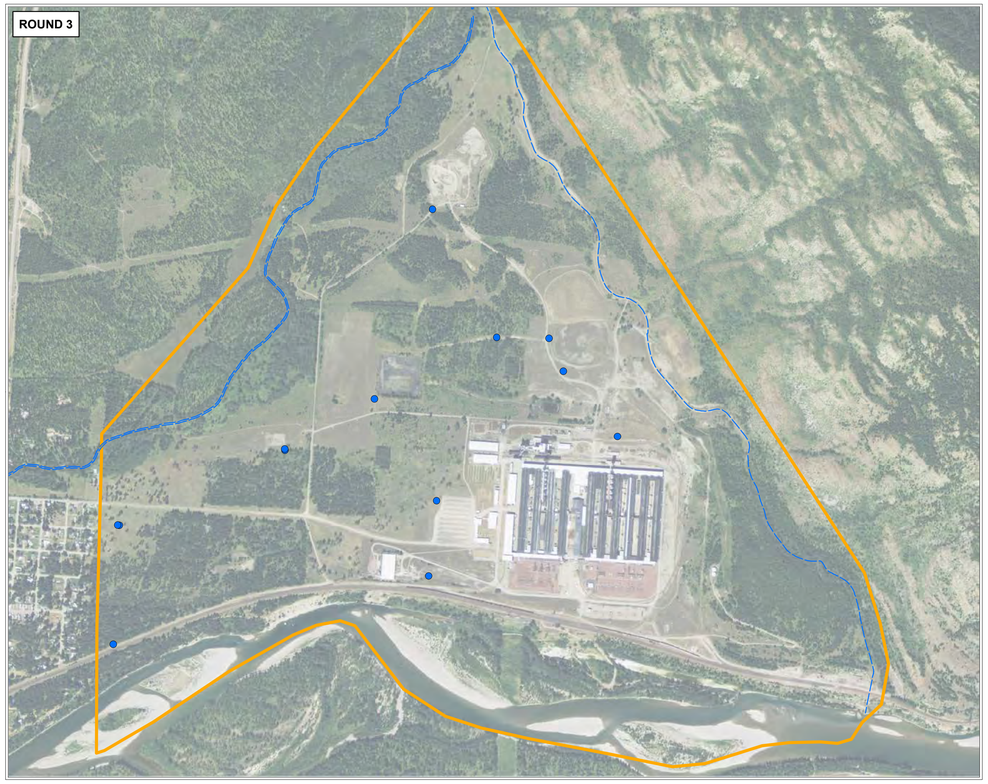

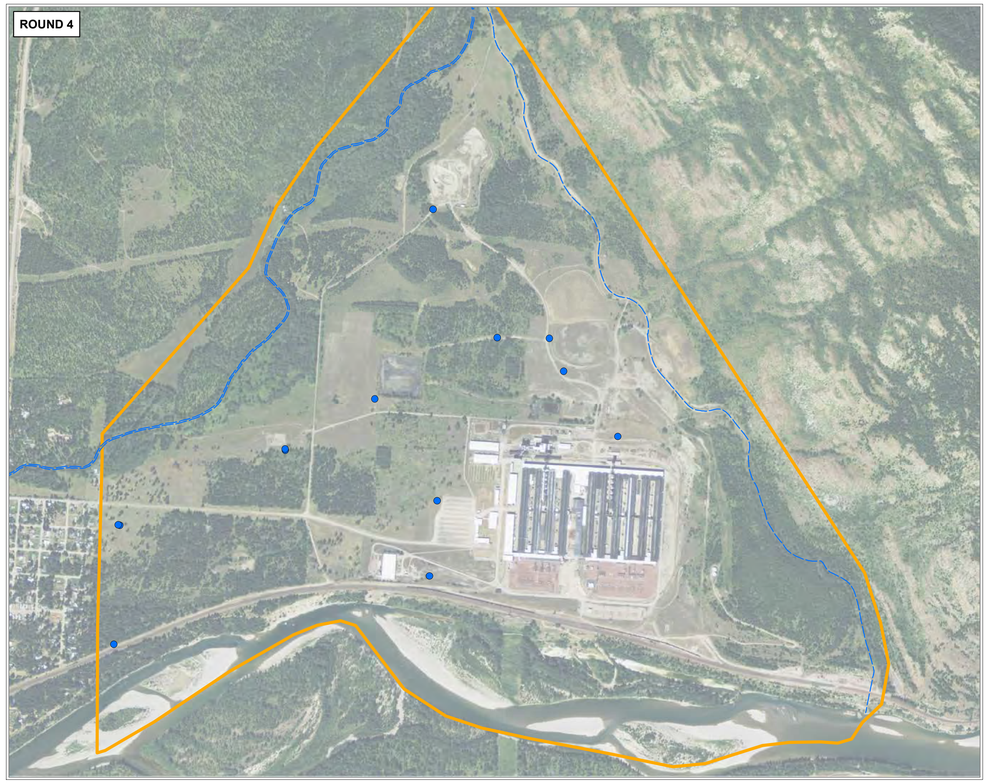

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.26U)
- ND – 1
- 1 – 2
- 2 –20
- >20

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
THALLIUM	2	2	0.02

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
0.26U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF DISSOLVED THALLIUM IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H44
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H44.2476.0001Y170.61.mxd		

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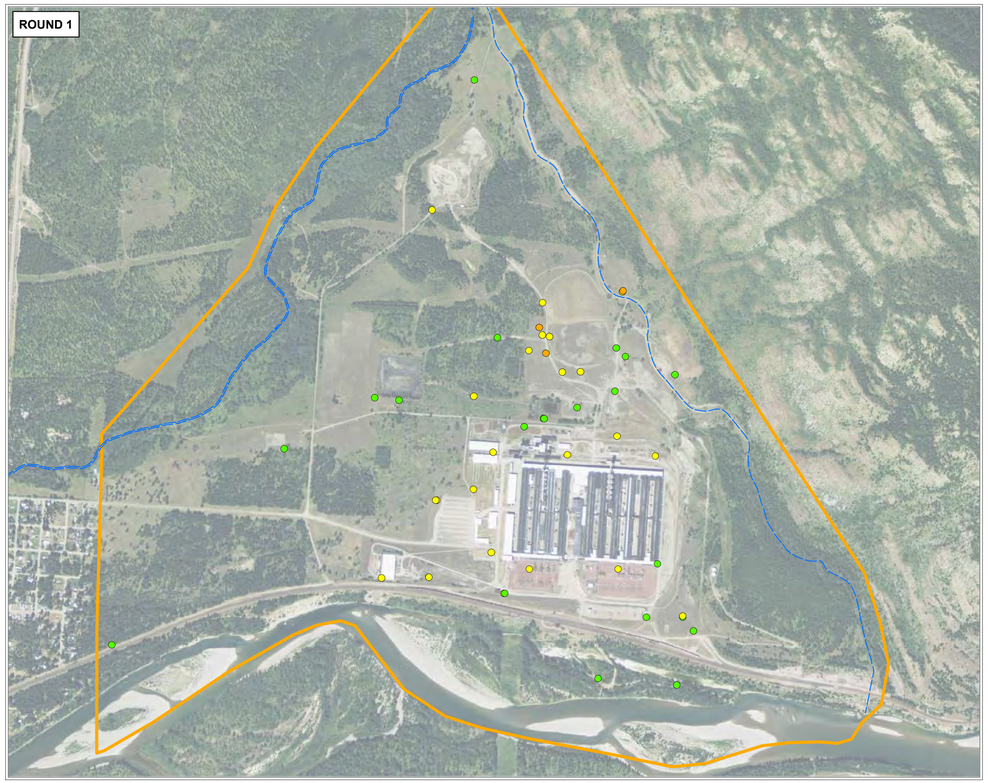

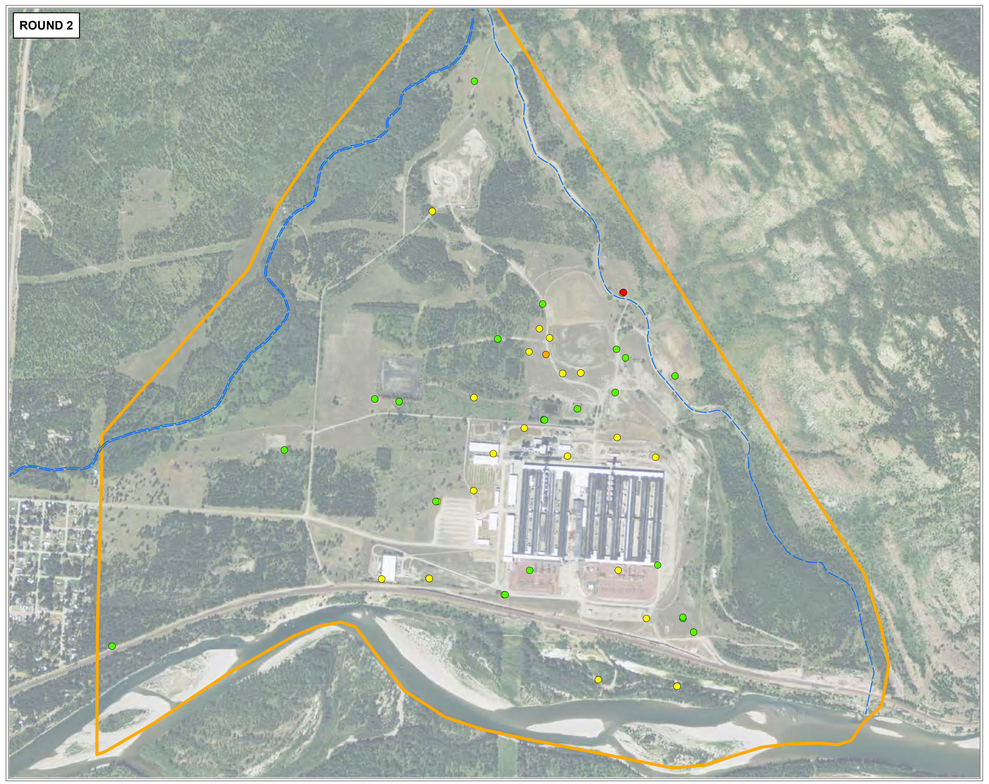

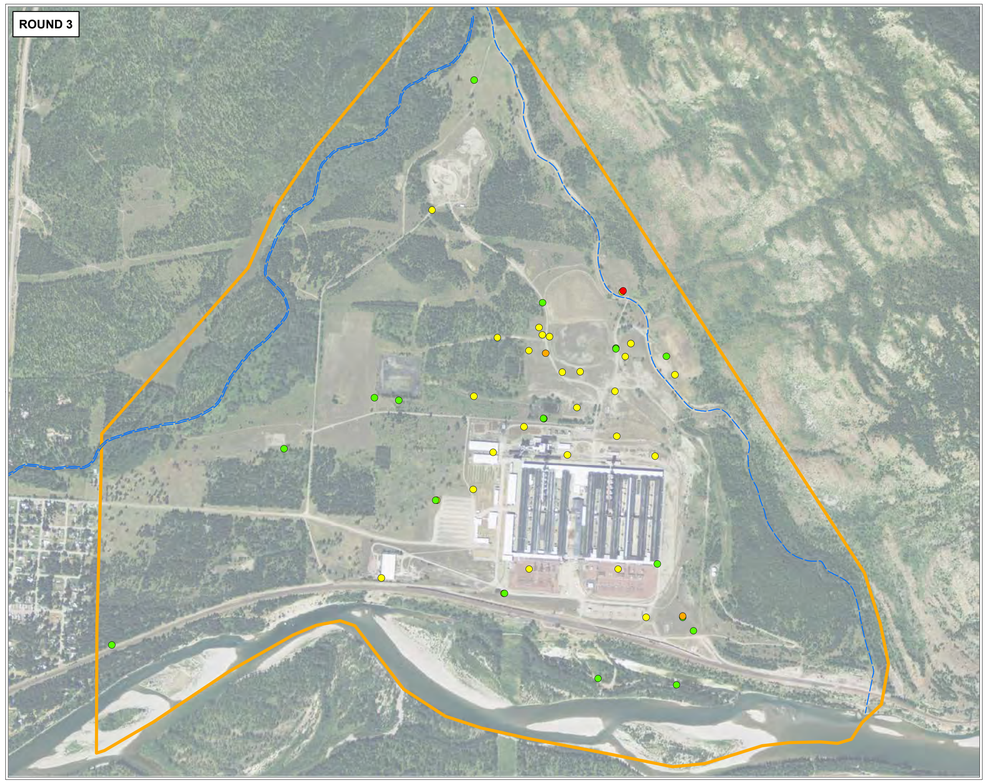

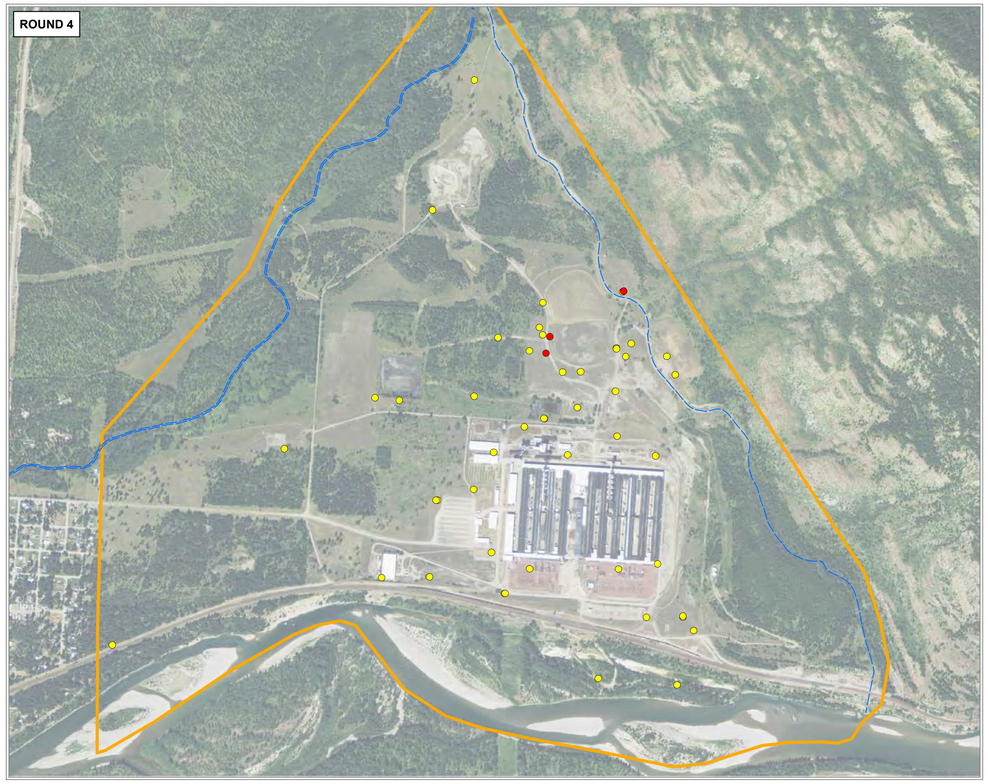

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 250,000
- 250,000 – 750,000
- 750,000– 1,250,000
- >1,250,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ALKALINITY	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF ALKALINITY IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H45
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H45.2476.0001Y170.86.mxd		

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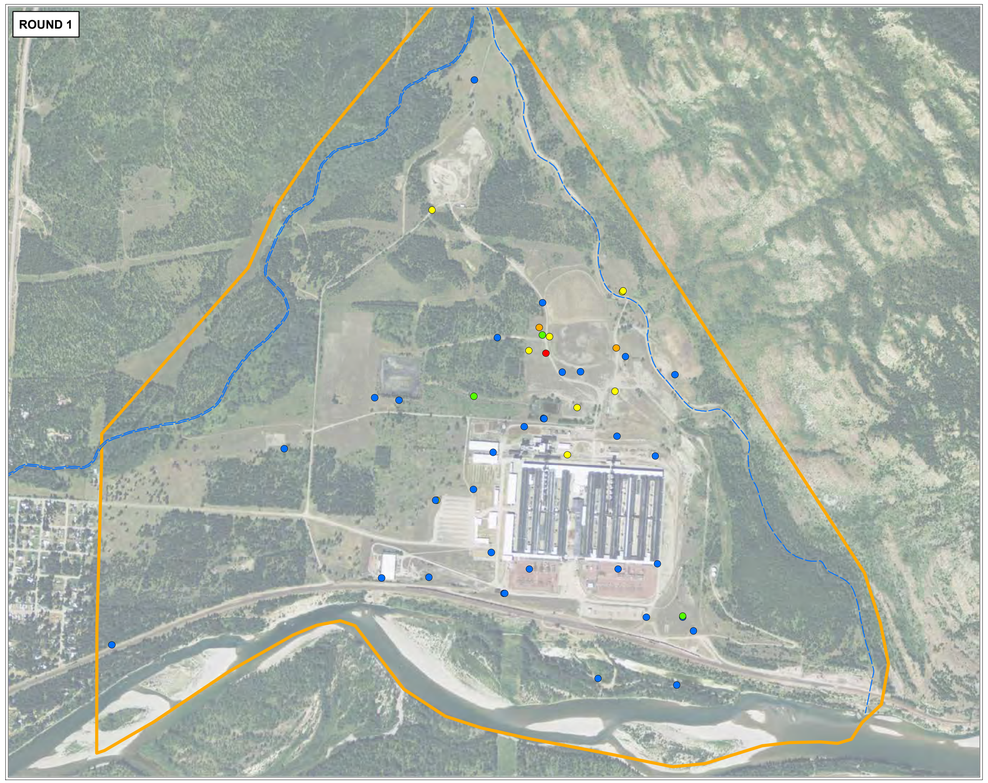

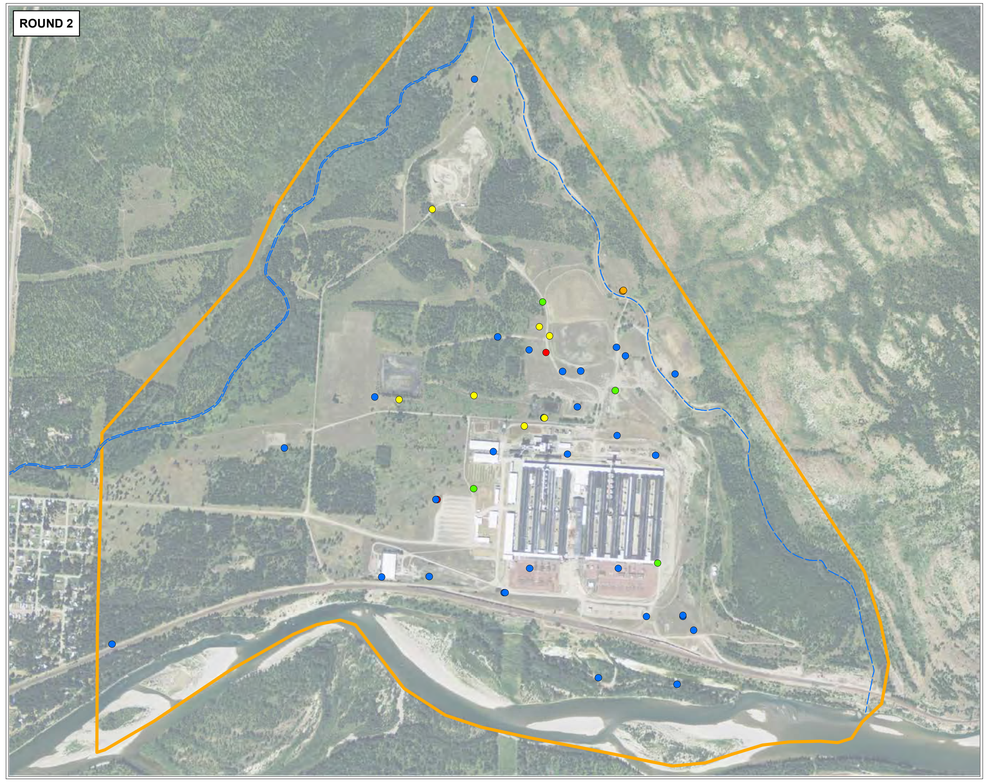

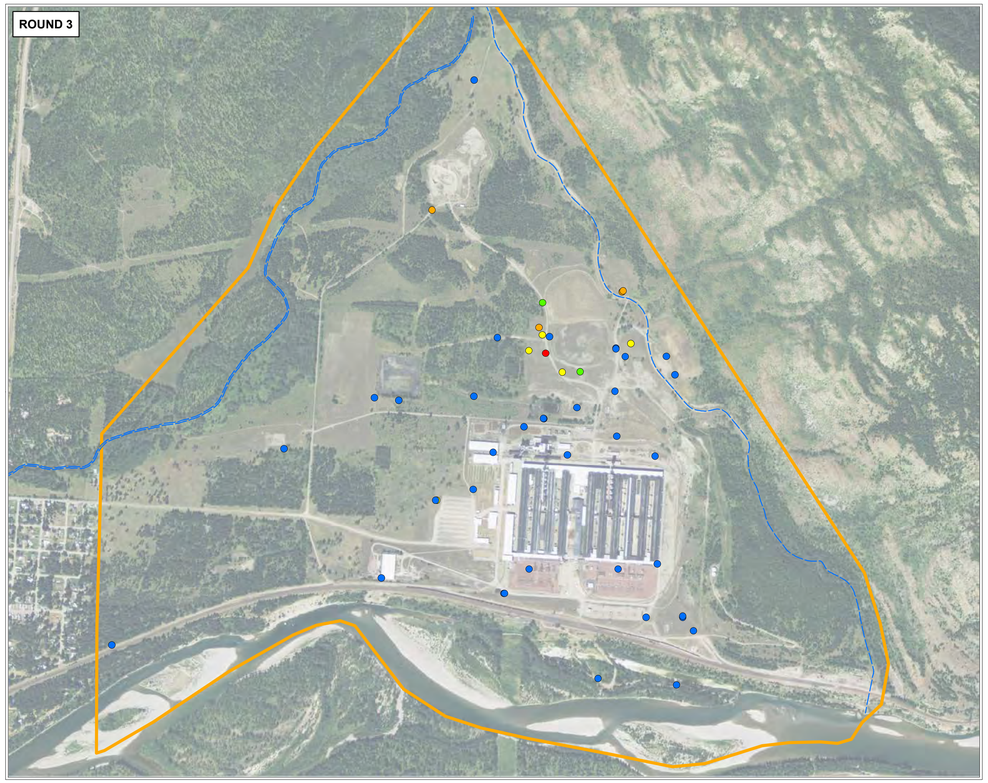

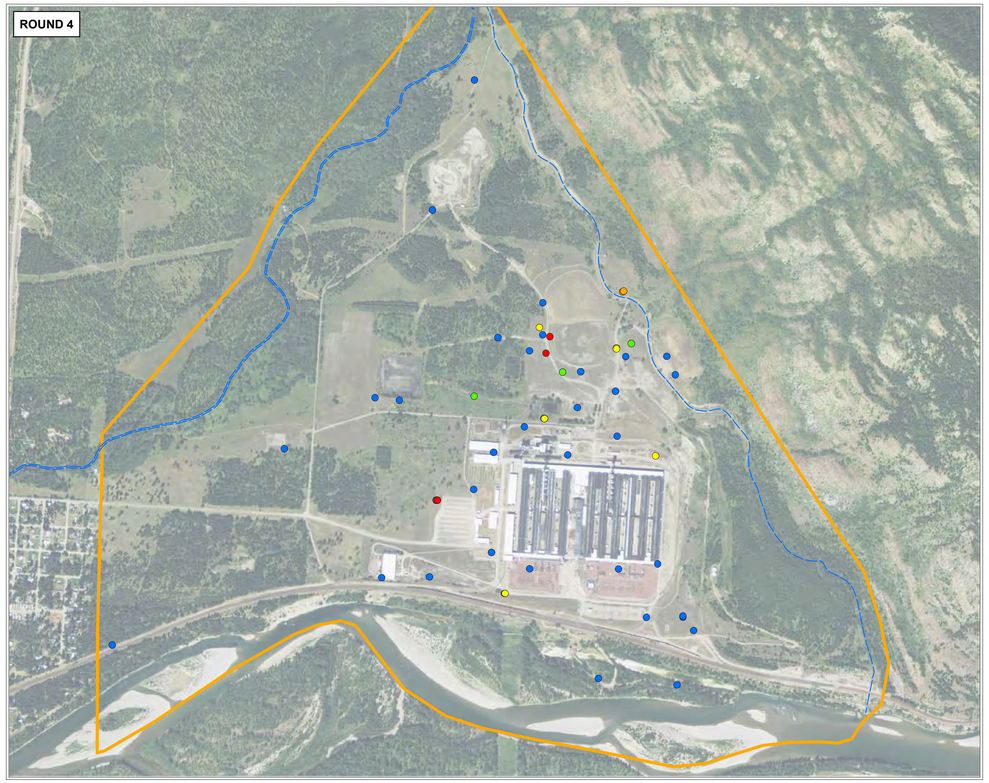

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (72U)
- ND – 100
- 100 – 500
- 500 – 5,000
- >5,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
AMMONIA	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
72U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF AMMONIA IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H46
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H46.2476.0001Y170.45.mxd		

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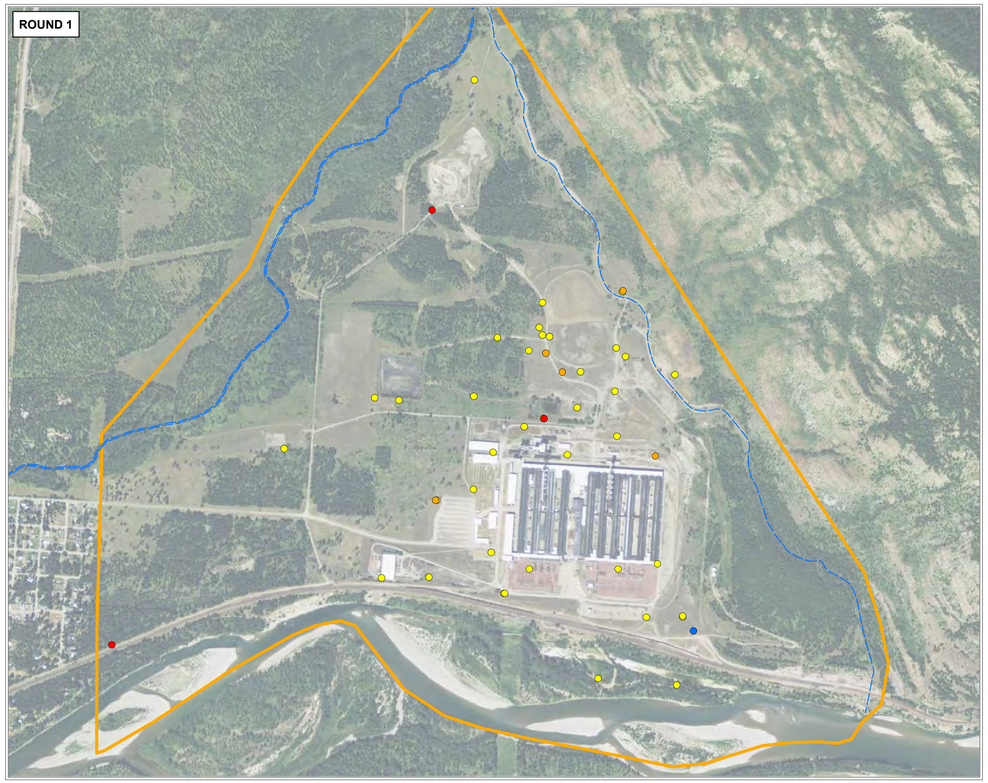

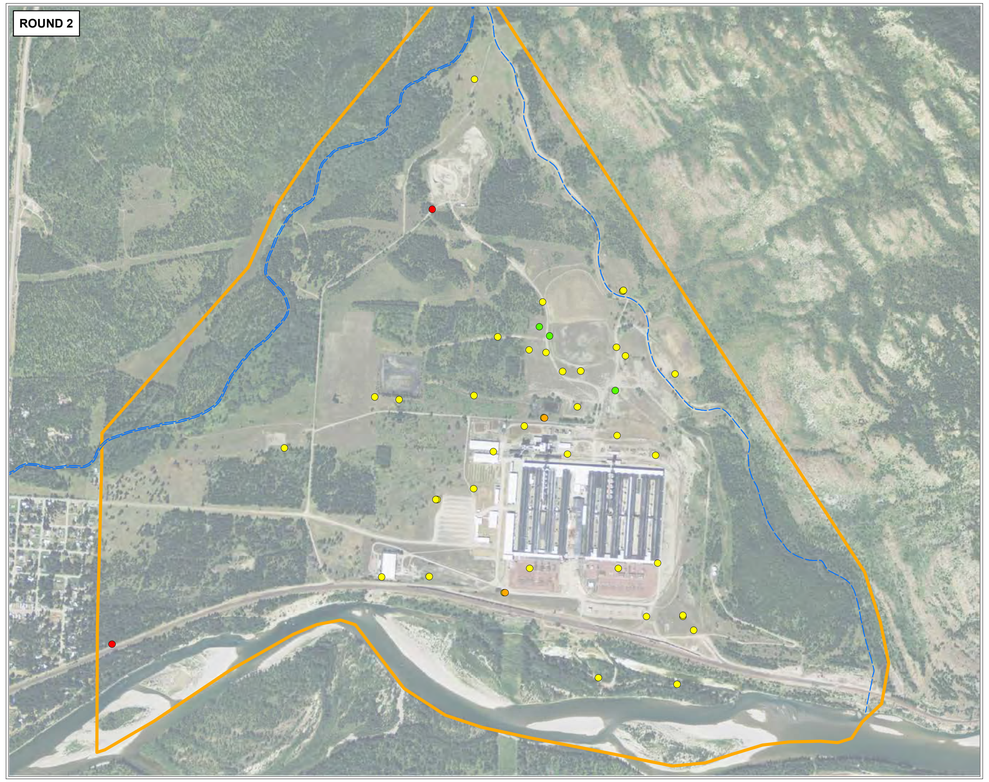

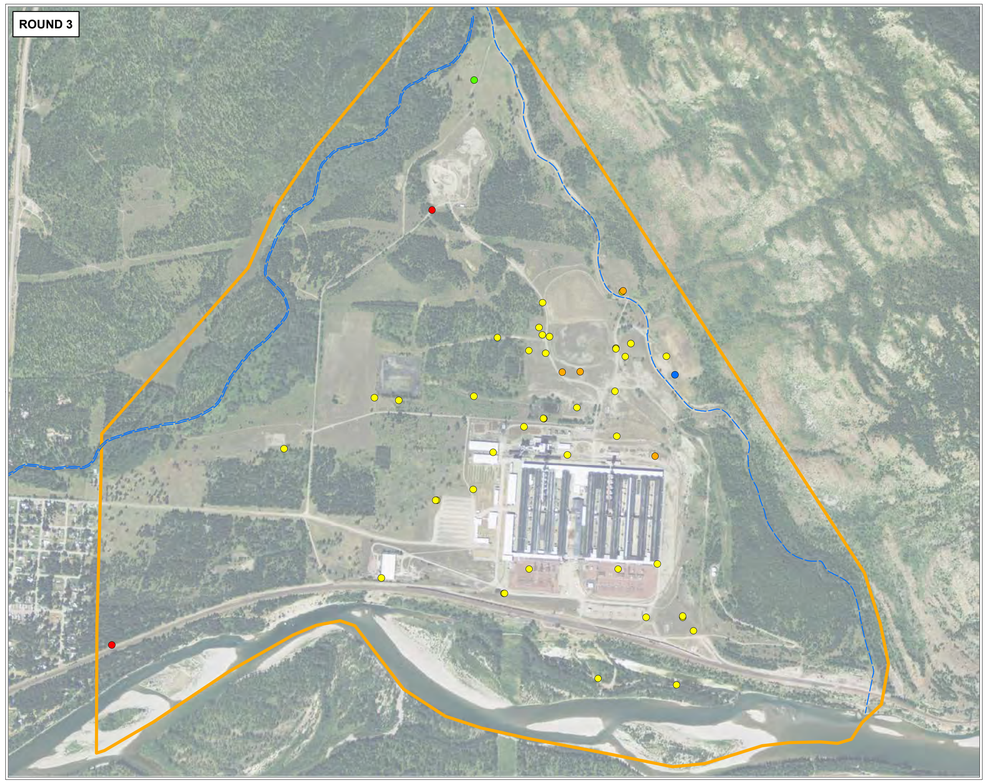

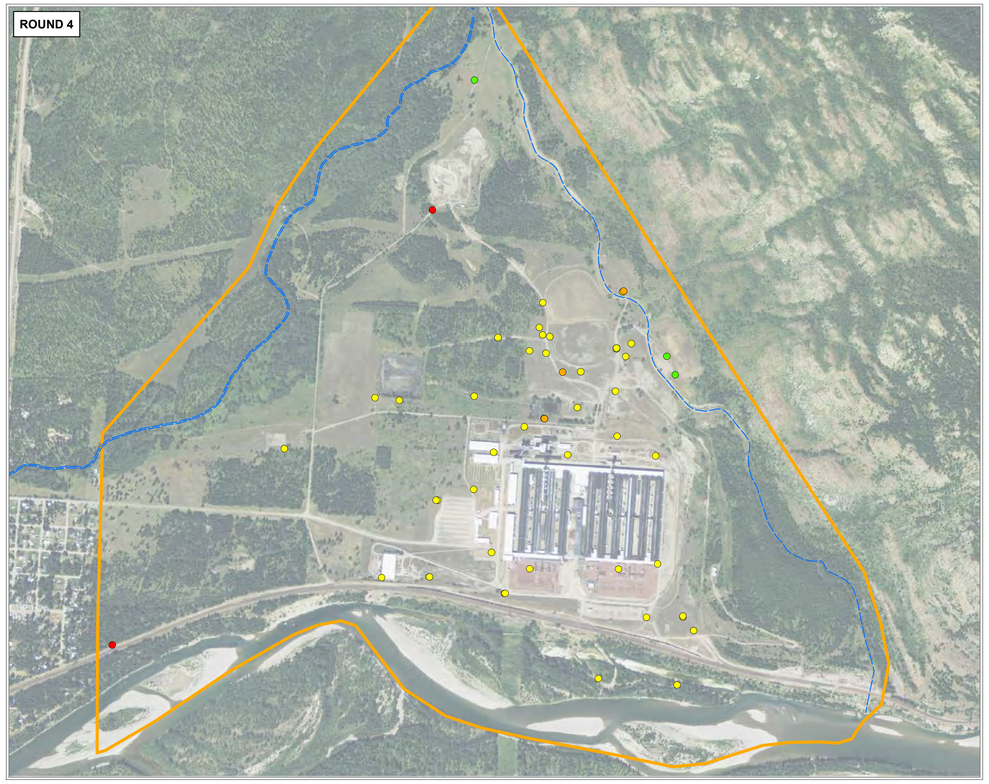

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 500
- 500 – 5,000
- 5,000 – 10,000
- >10,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CHLORIDE	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF CHLORIDE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H47
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H47_2476.0001Y170.46.mxd		

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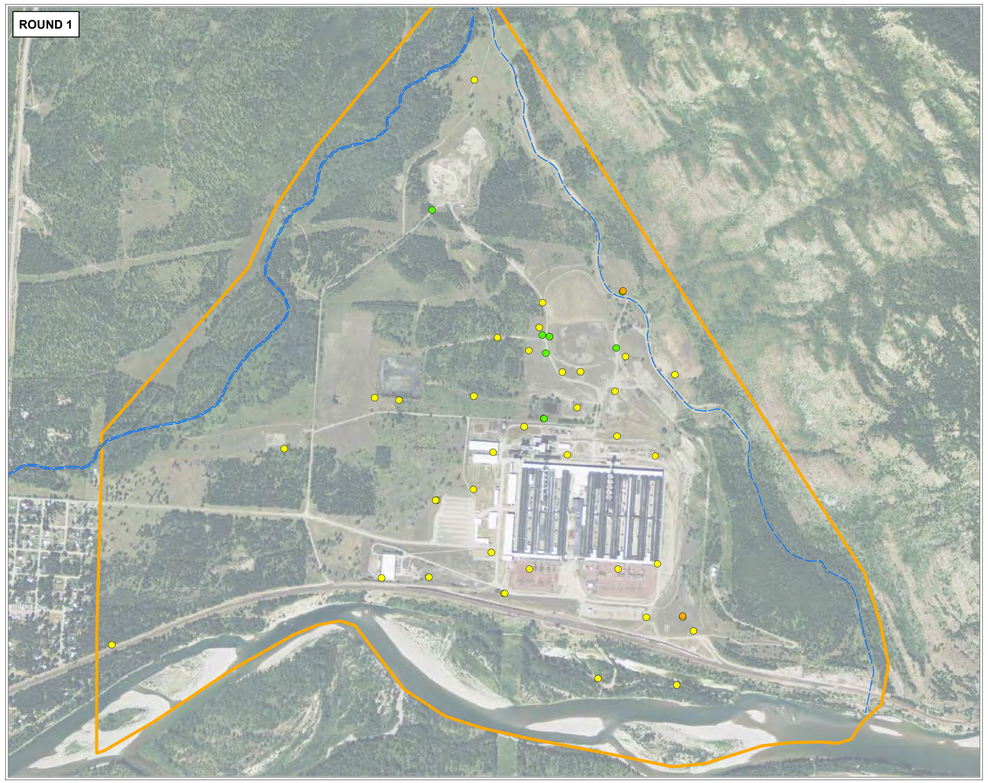

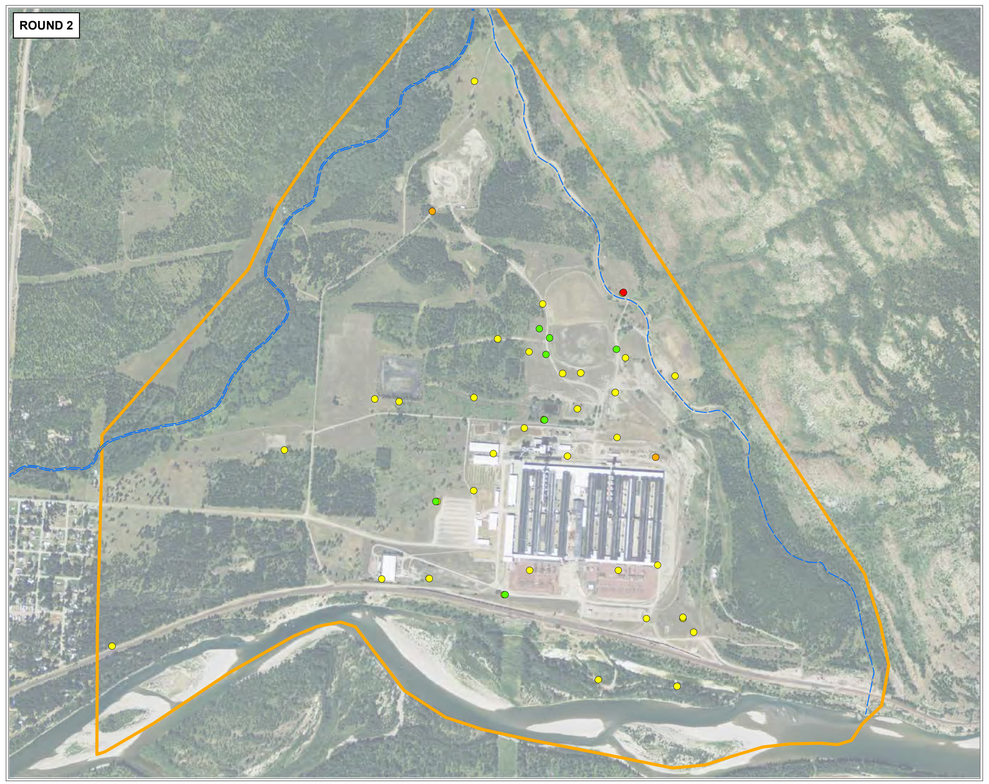

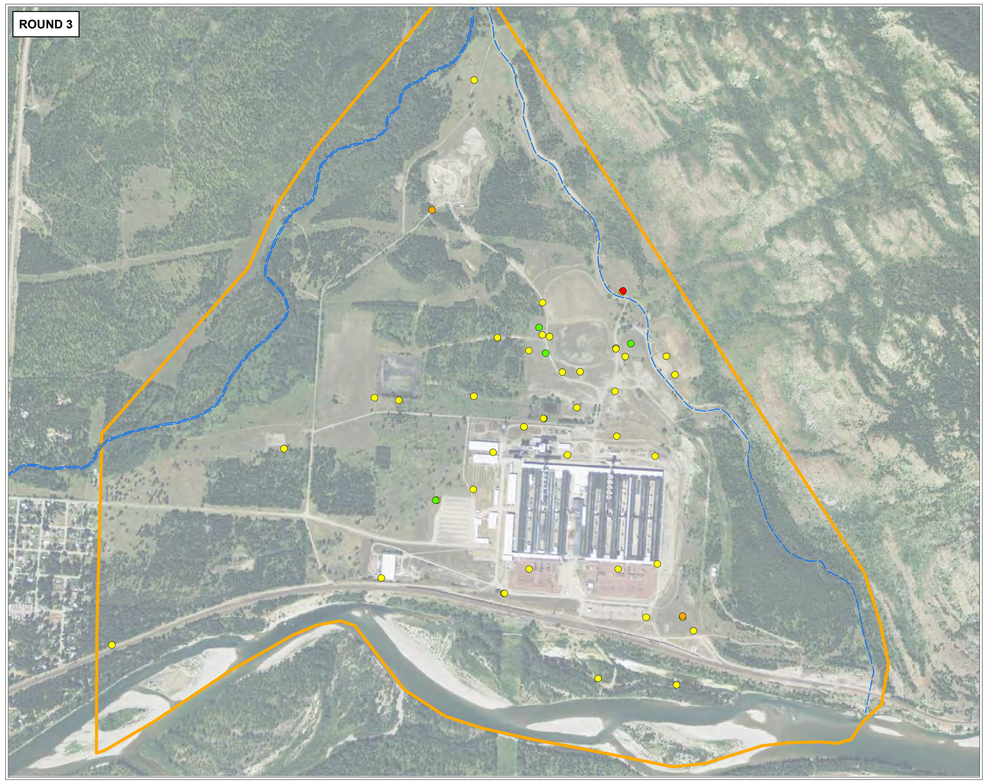

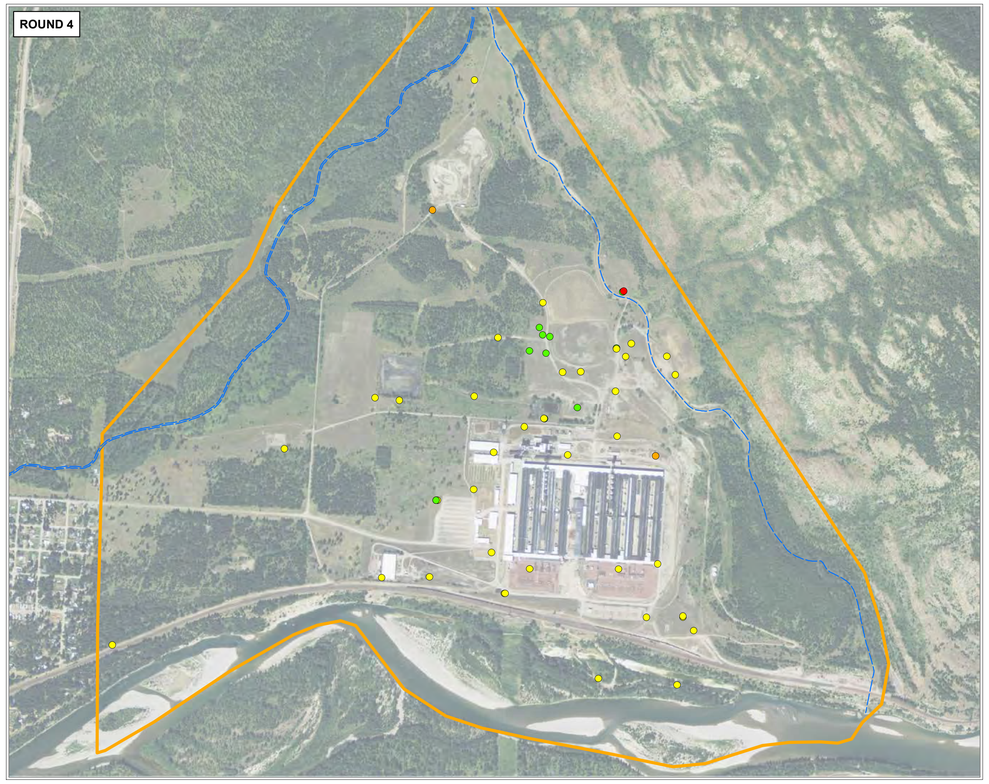

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 150,000
- 150,000 – 500,000
- 500,000 – 1,000,000
- >1,000,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
HARDNESS AS CALCIUM CARBONATE	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF HARDNESS AS CALCIUM CARBONATE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H48
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H48.2476.0001Y170.47.mxd		

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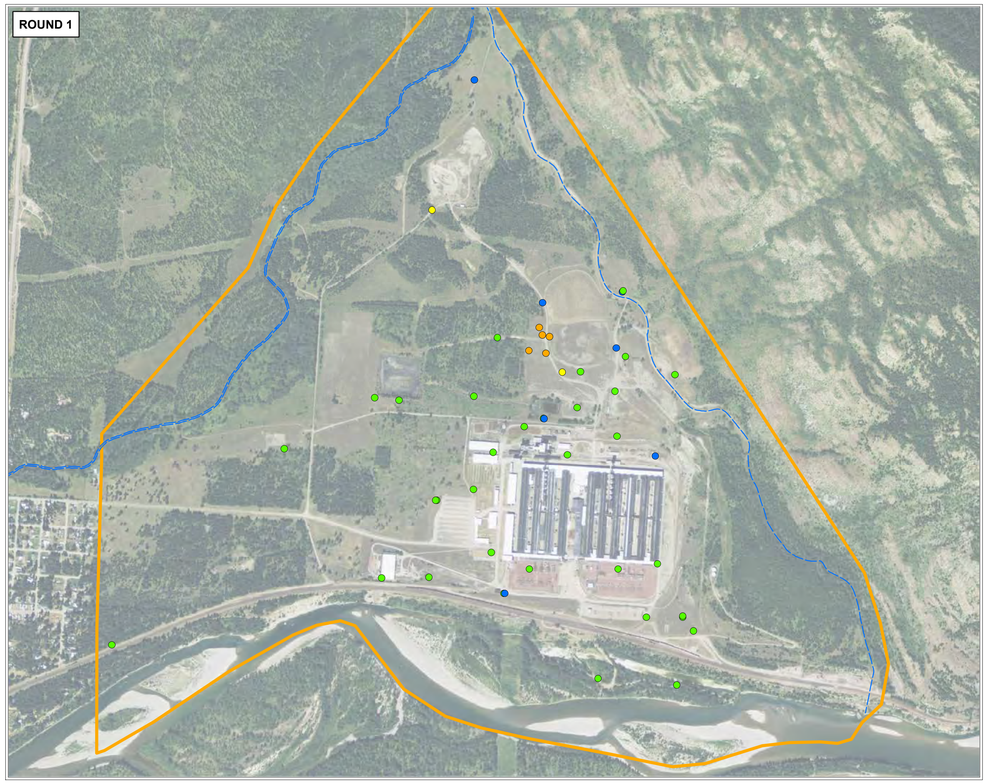

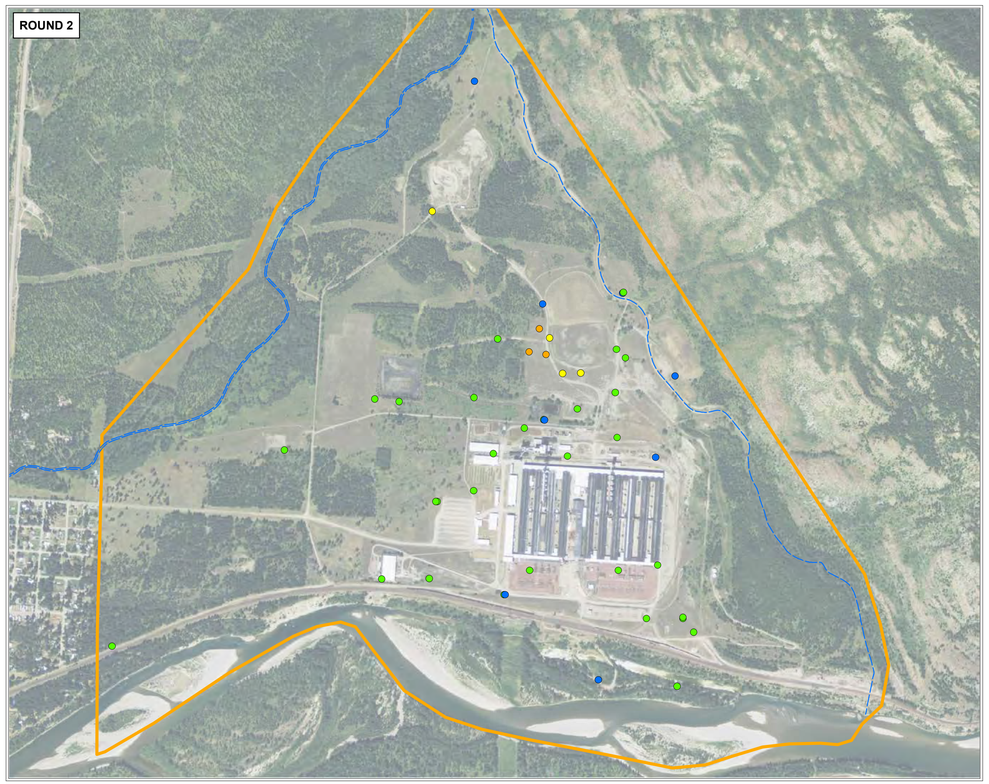

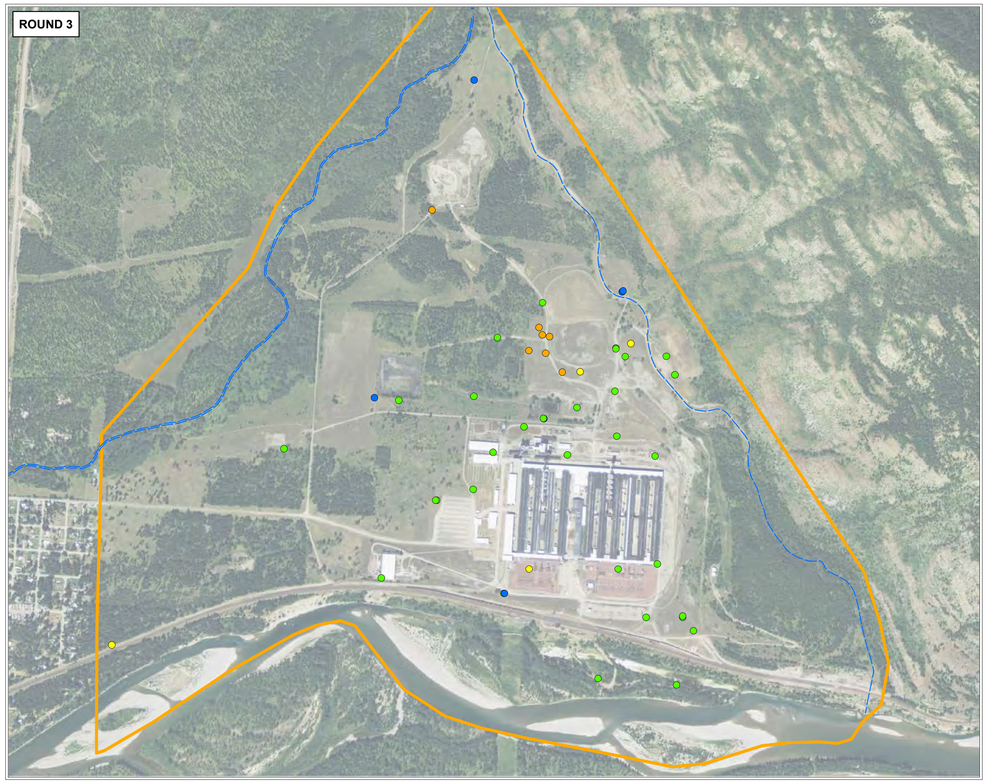

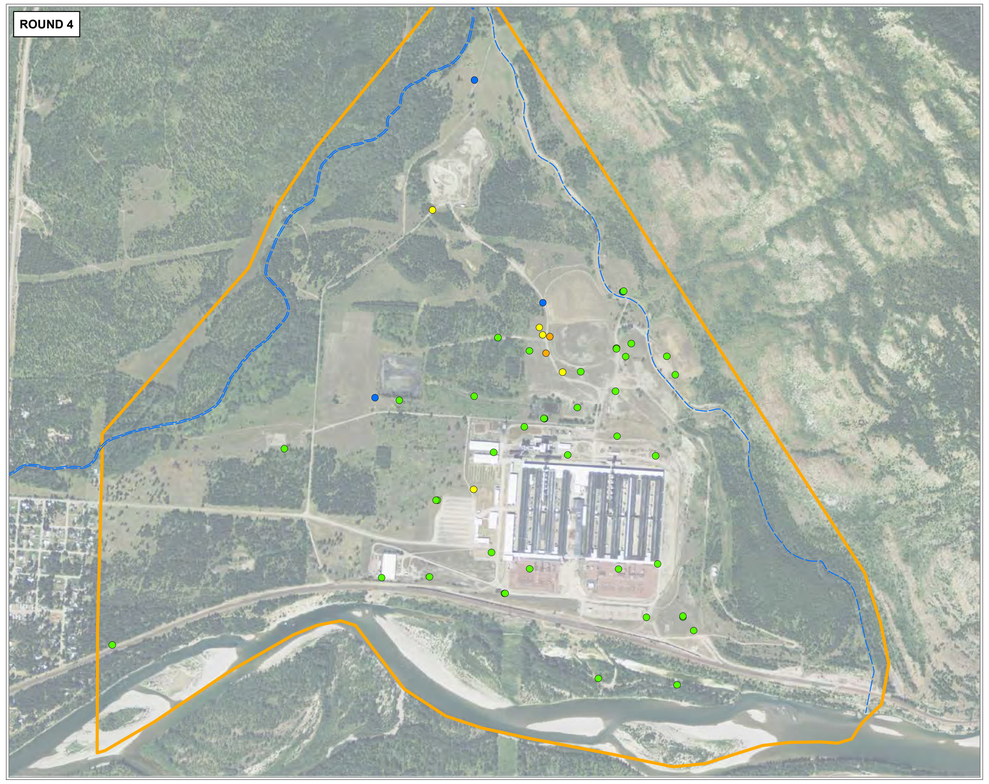

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (100U)
- ND – 5,000
- 5,000 – 10,000
- 10,000 – 100,000
- >100,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
NITRATE + NITRITE	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
100U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF NITRATE + NITRITE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H49
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H49.2476.0001Y170.48.mxd		

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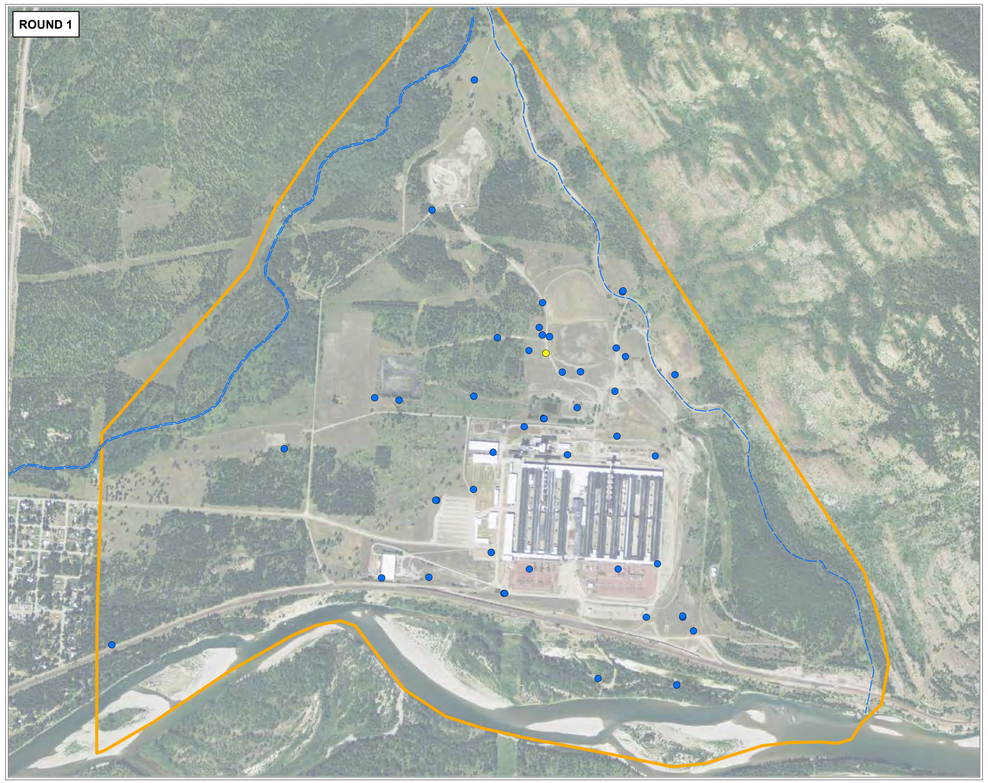

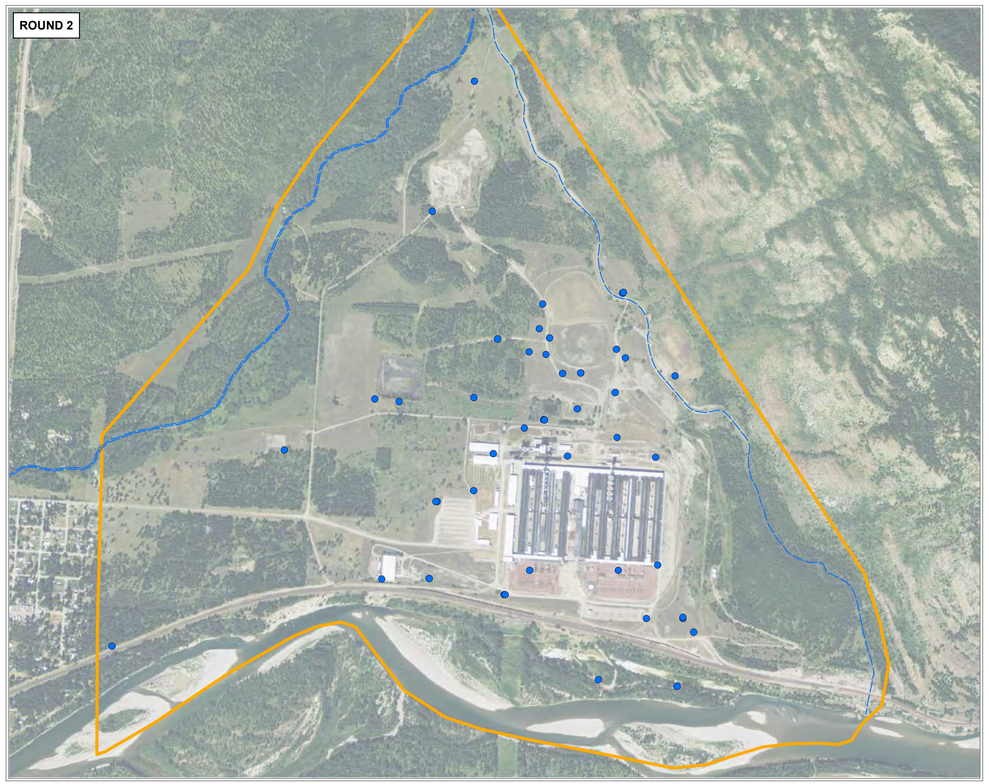

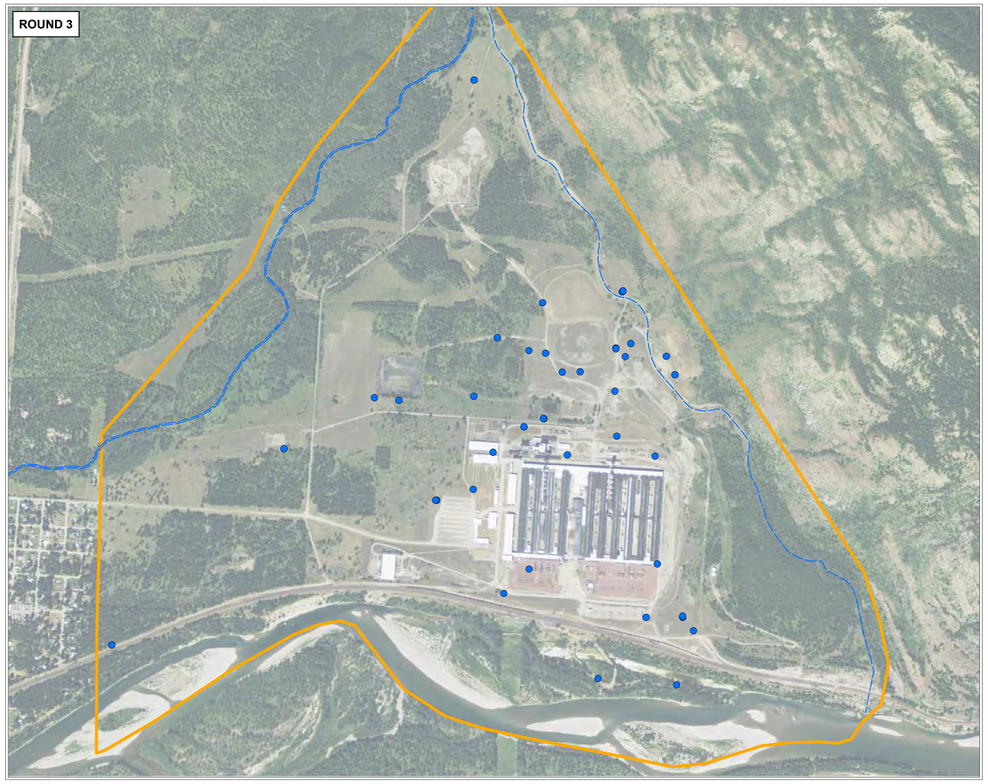

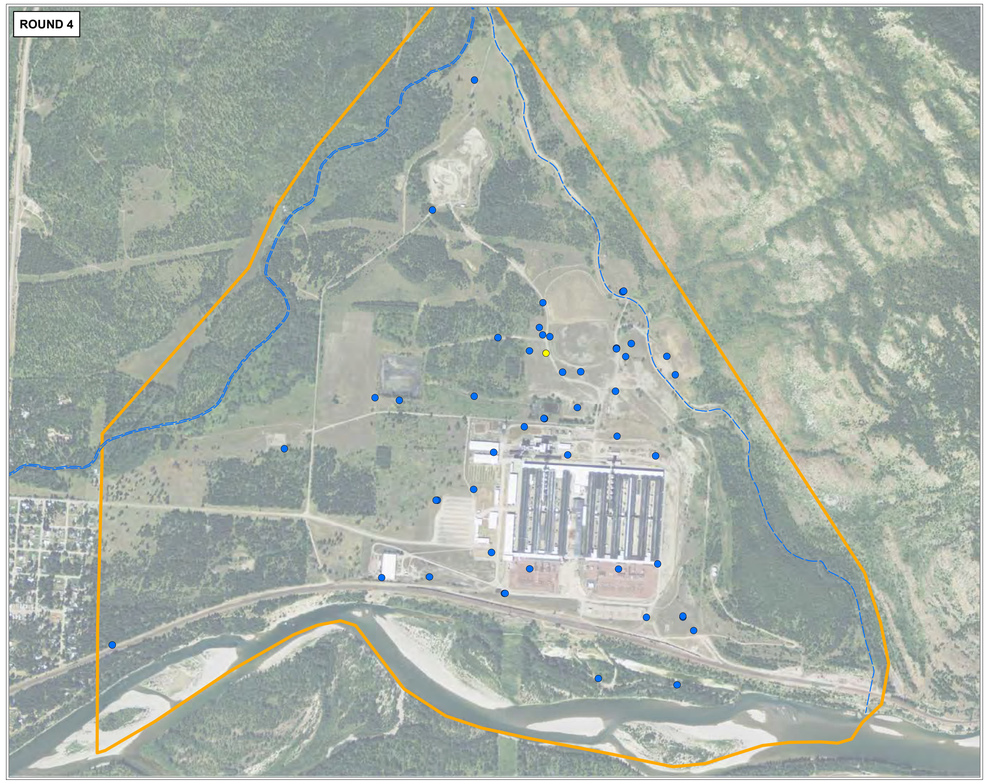

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42U)
- ND – 100
- 100 – 500
- 500 – 5,000
- >5,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ORTHOPHOSPATE AS P	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
42U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF ORTHOPHOSPHATE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H50
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H50.2476.0001Y170.49.mxd		

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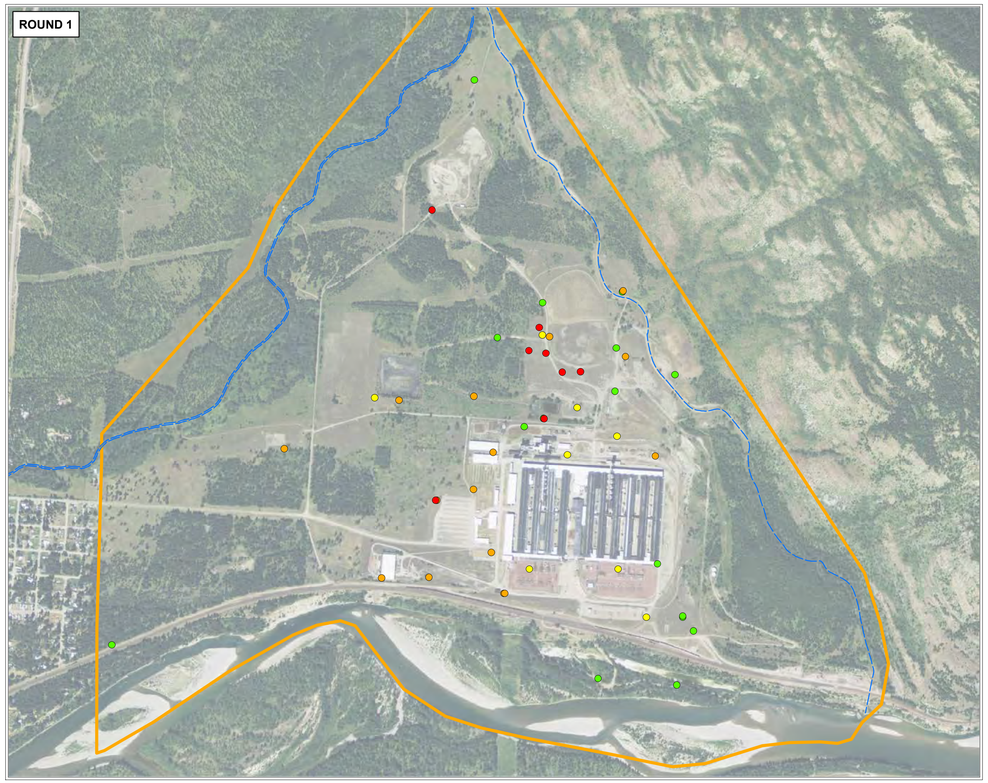

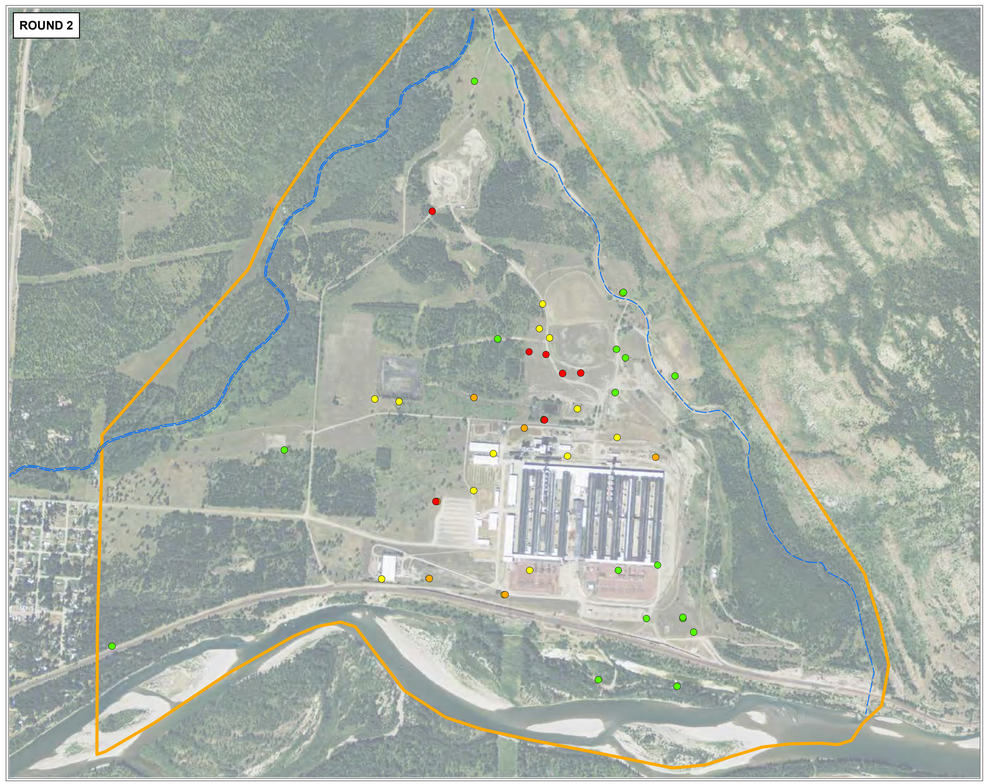

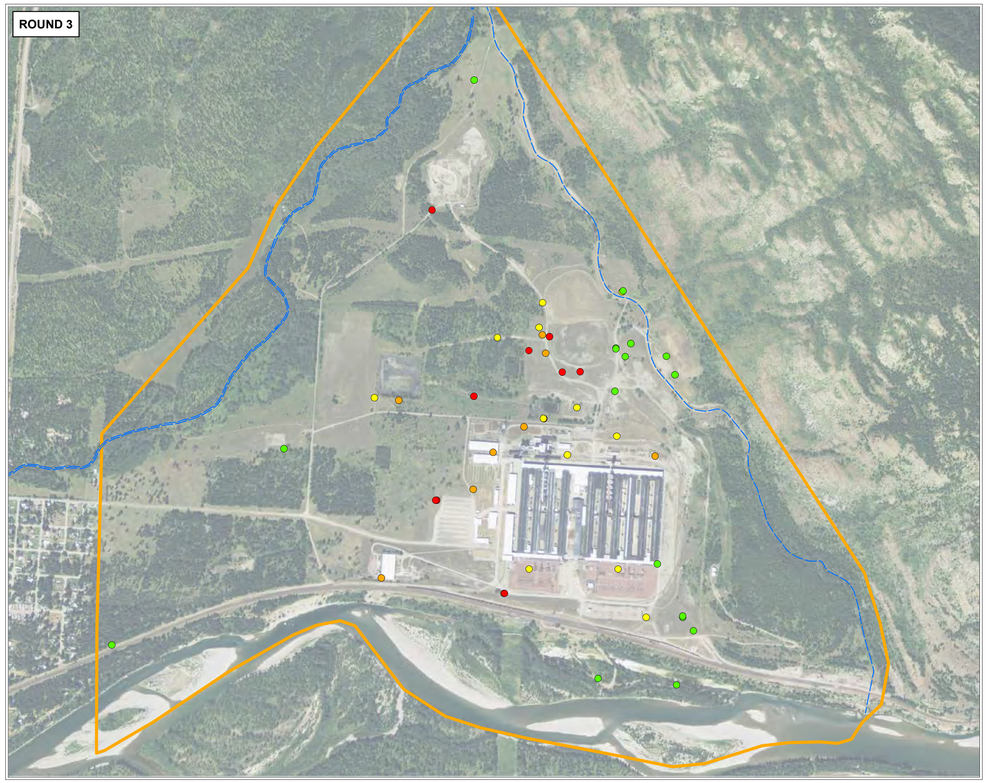

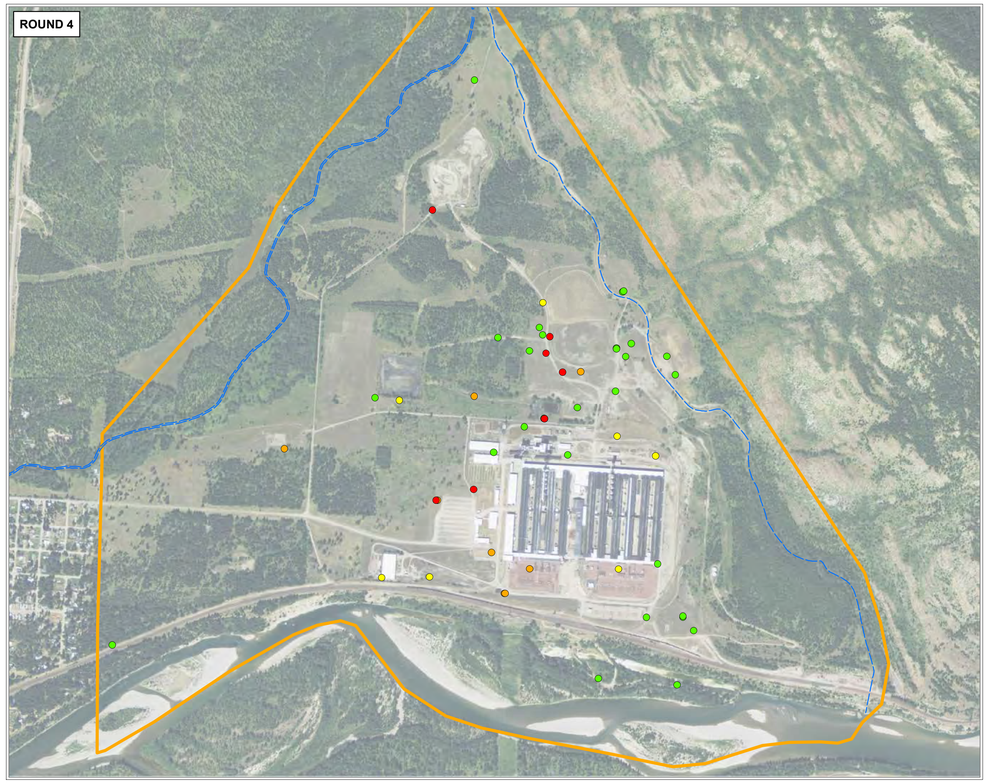

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42U)
- ND – 10,0000
- 10,000 – 20,000
- 20,000 – 30,000
- >30,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
SULFATE	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF SULFATE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED IN UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H51
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H51_2476.0001Y170.SG.mxd		

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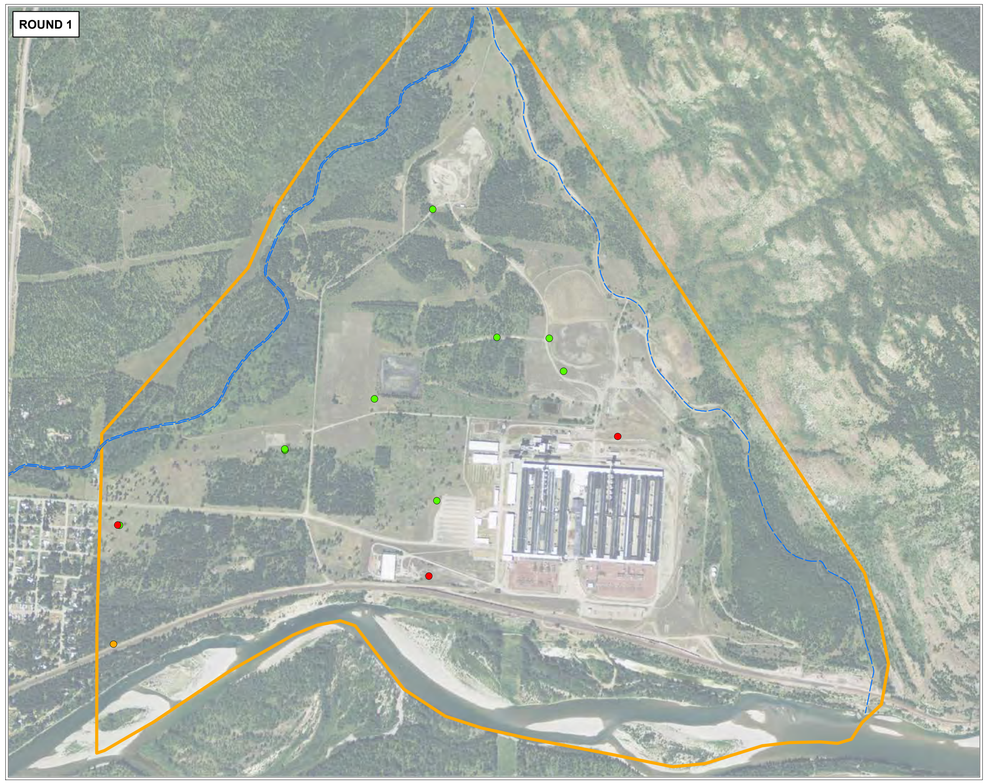

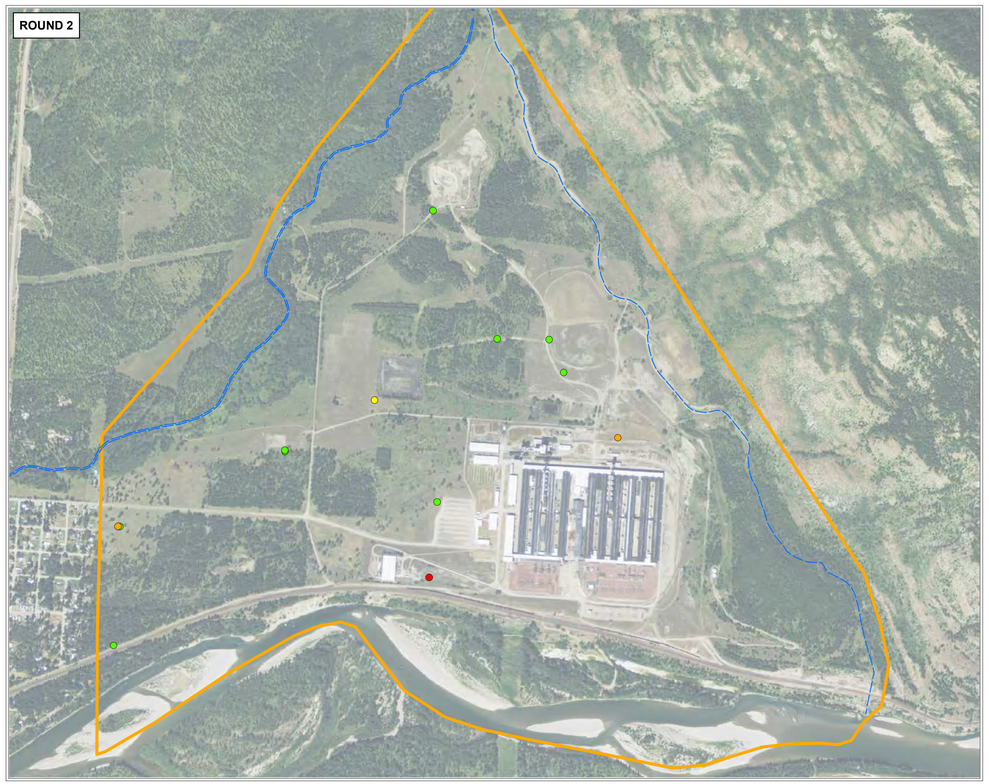

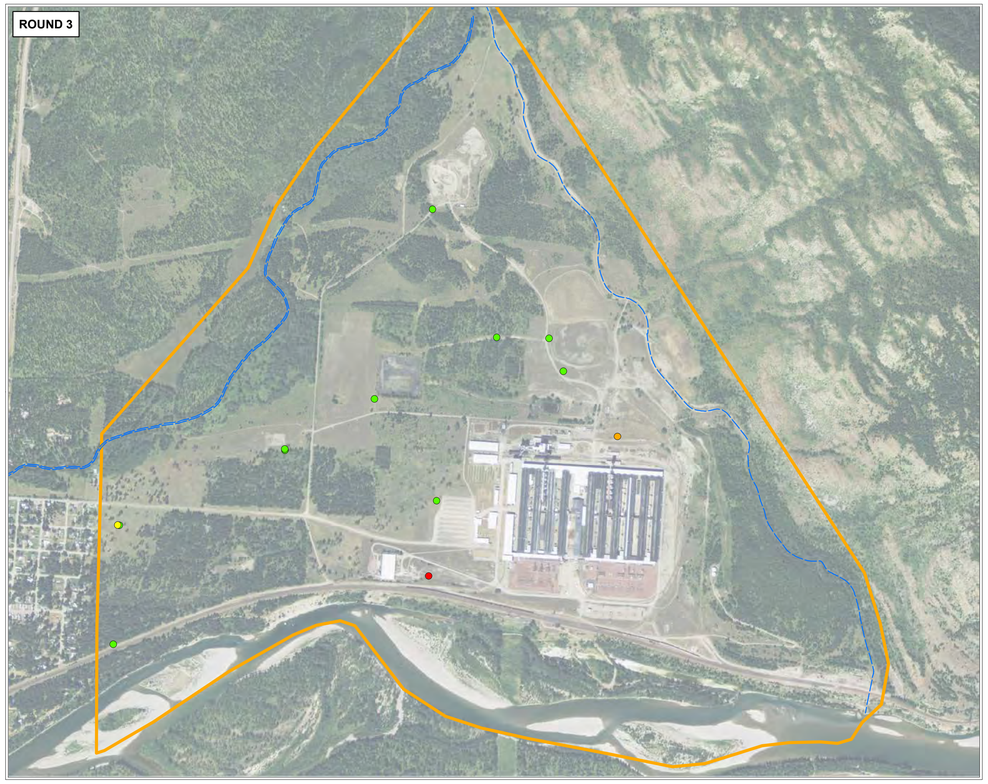

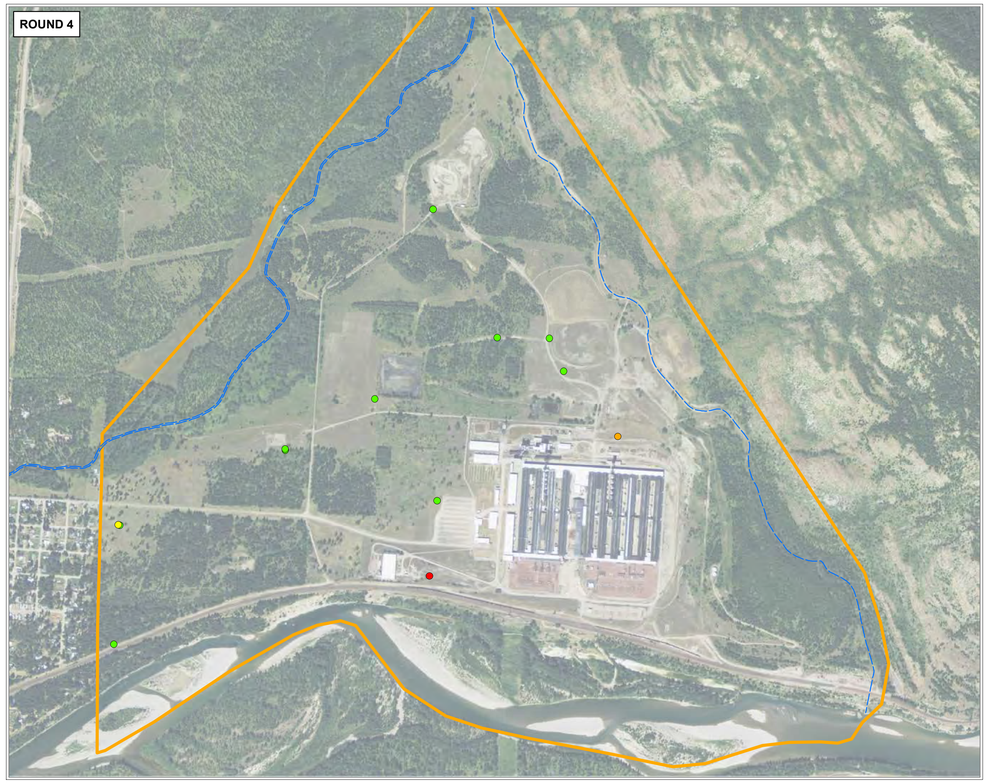

N

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 250,000
- 250,000 – 750,000
- 750,000– 1,250,000
- >1,250,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ALKALINITY	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF ALKALINITY IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H52
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H52.2476.0001Y170.87.mxd		

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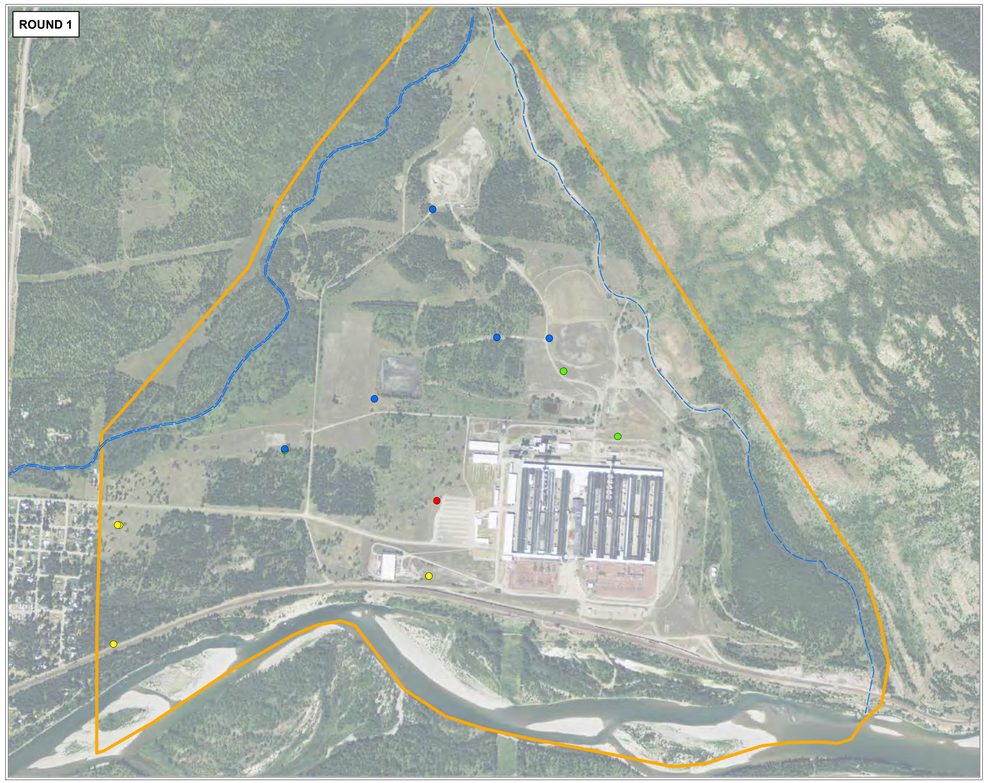

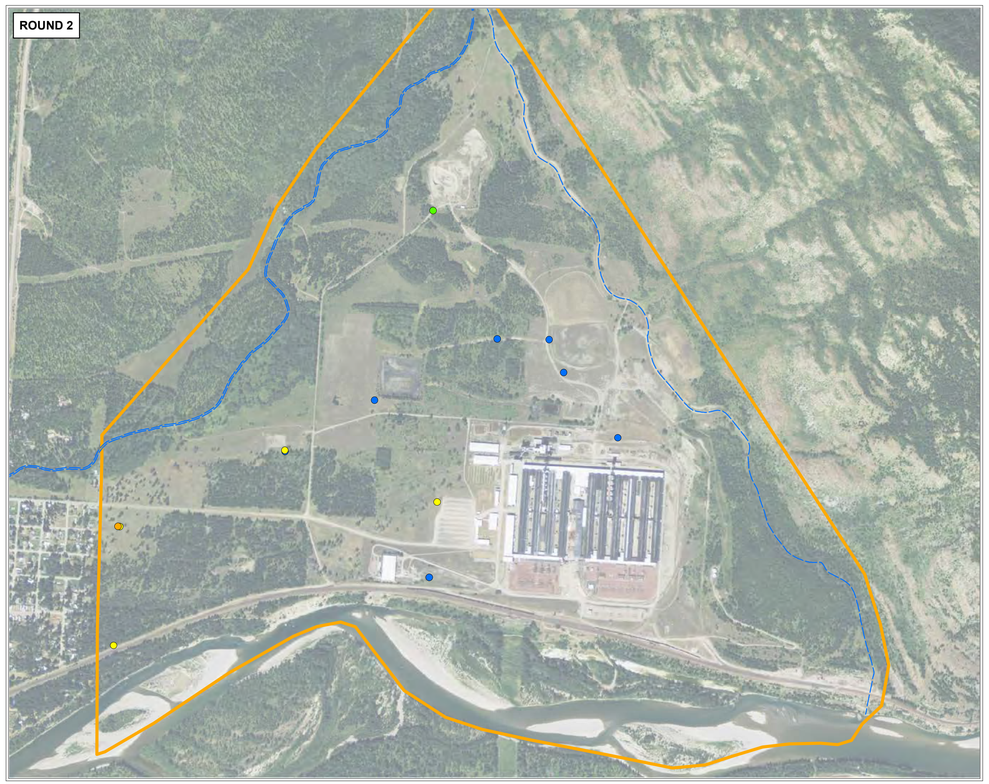

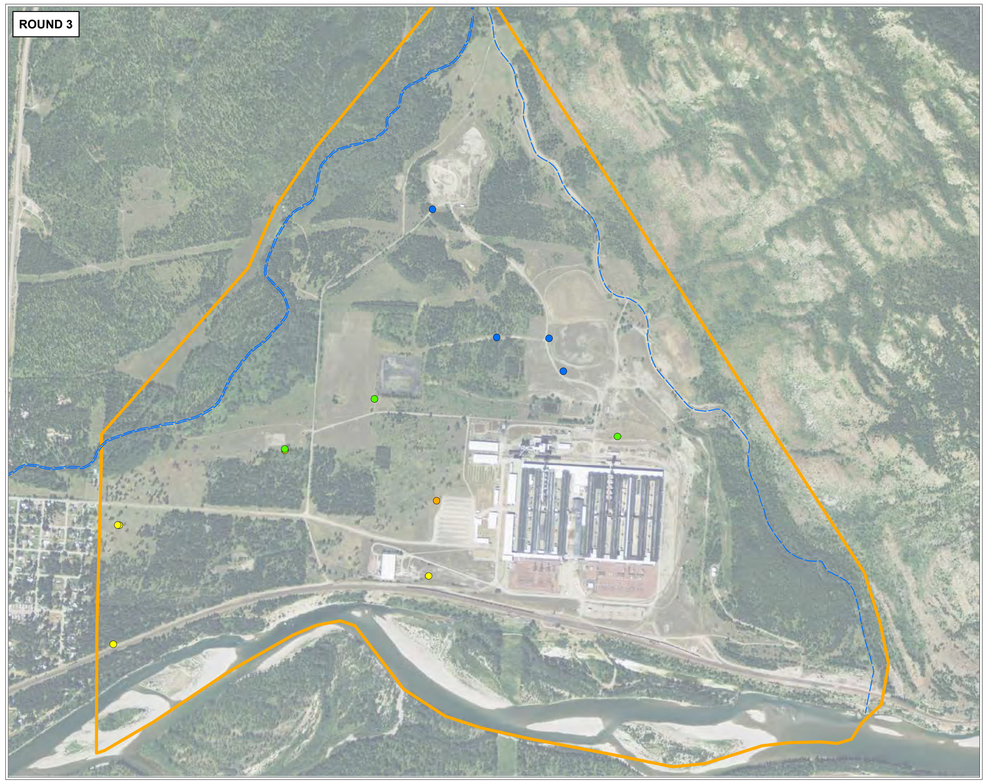

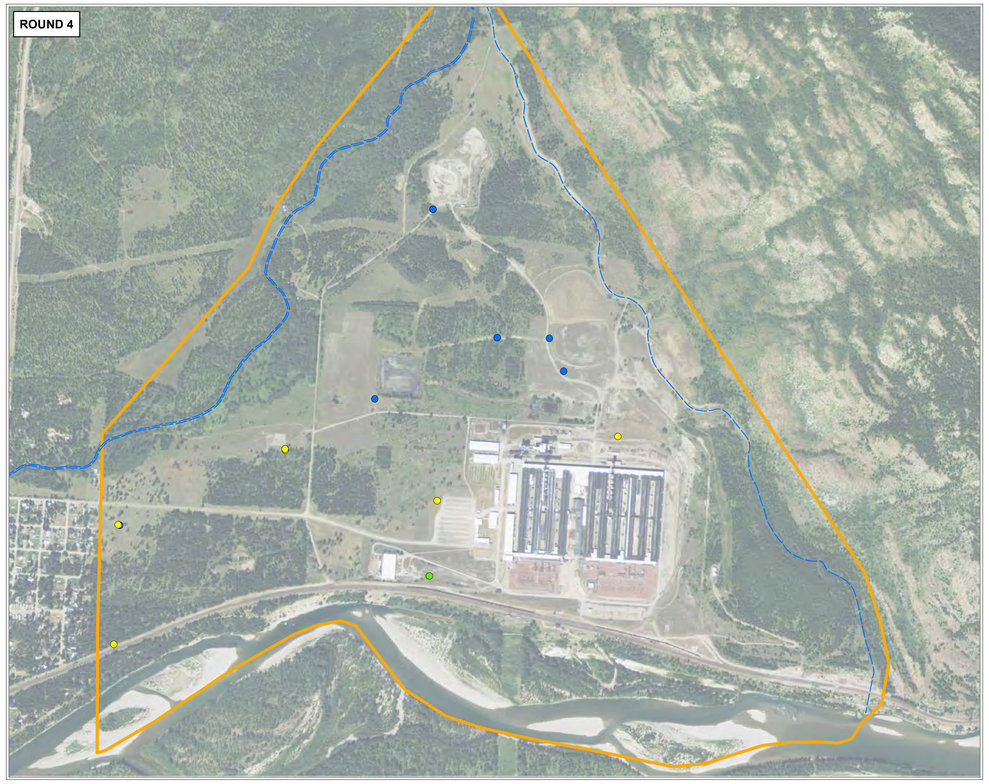

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (72U)
- ND – 100
- 100 – 500
- 500 – 5,000
- >5,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
AMMONIA	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
72U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF AMMONIA IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H53
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H53.2476.0001Y170.73.mxd		

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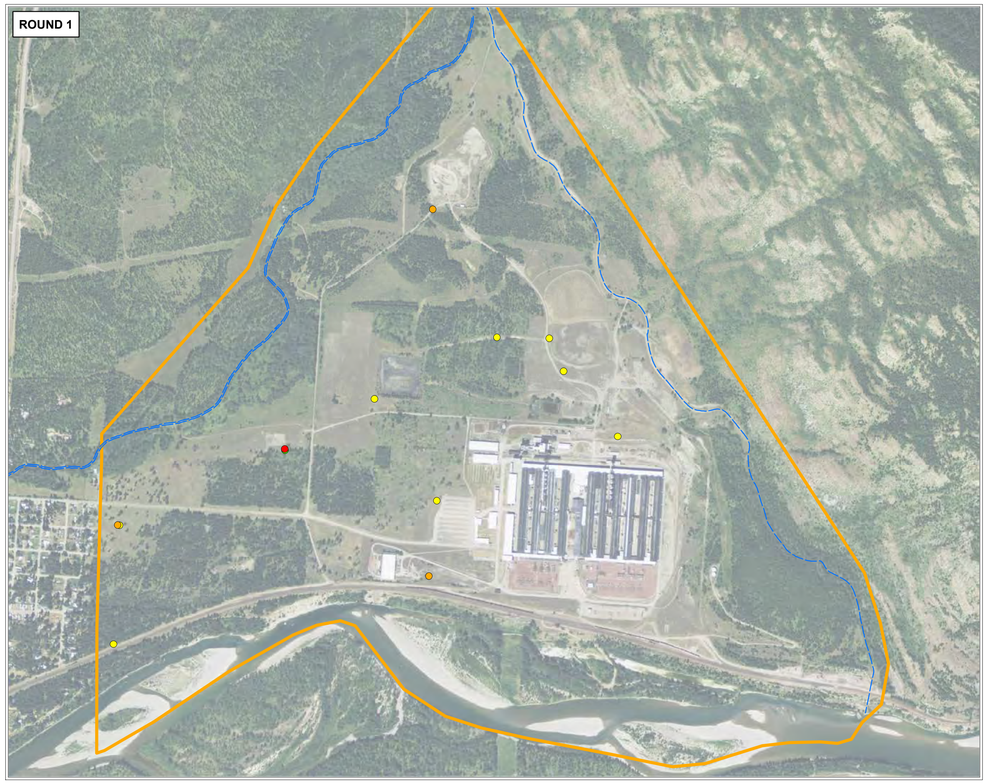

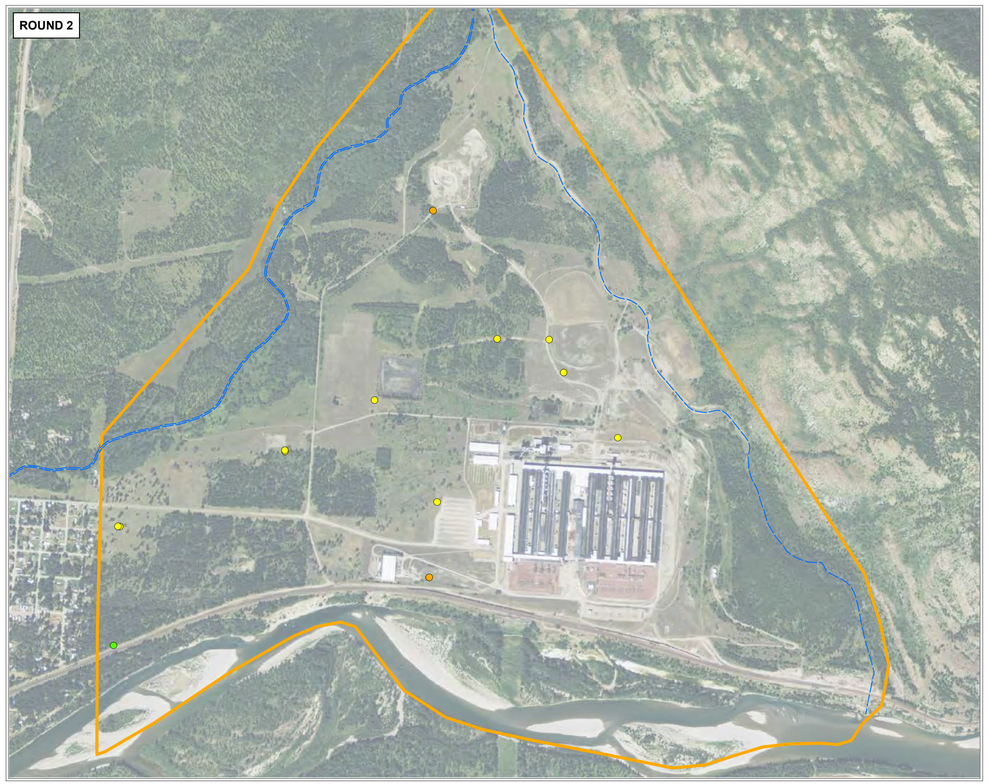

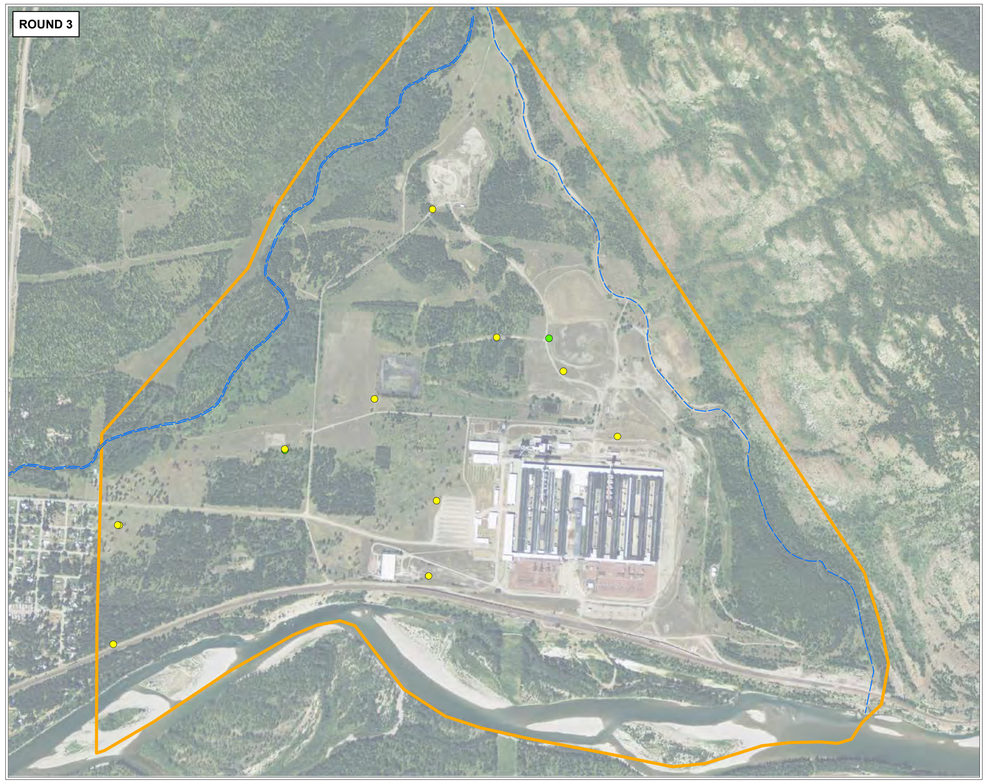

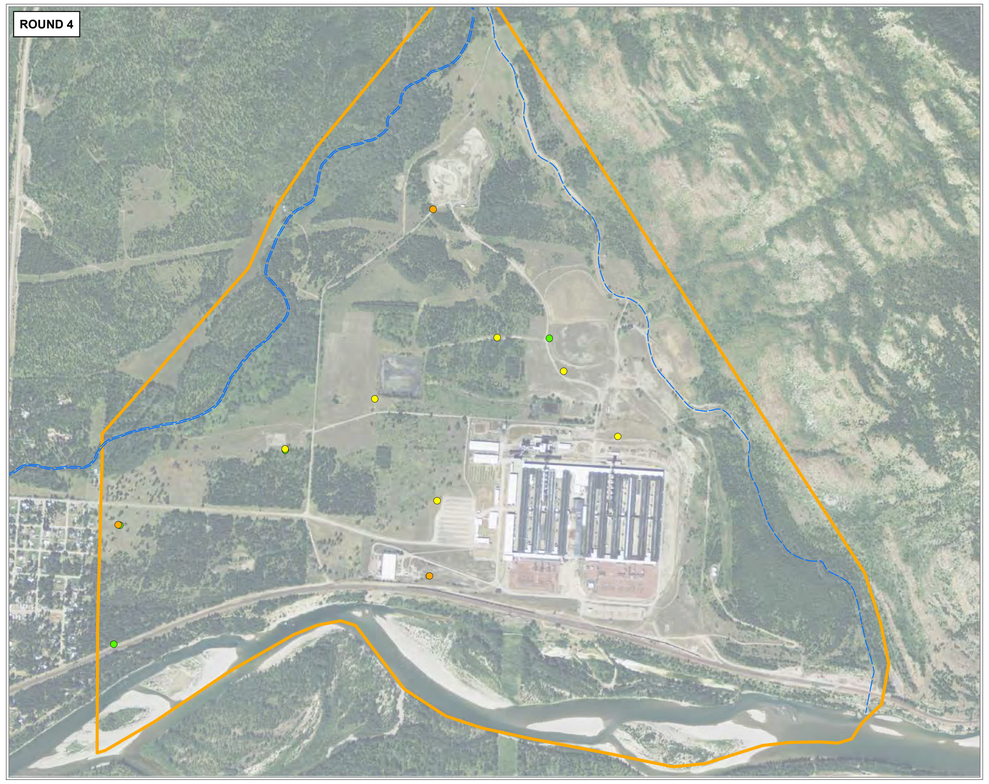

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 500
- 500 – 5,000
- 5,000 – 10,000
- >10,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
CHLORIDE	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF CHLORIDE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H54
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H54.2476.0001Y170.74.mxd		

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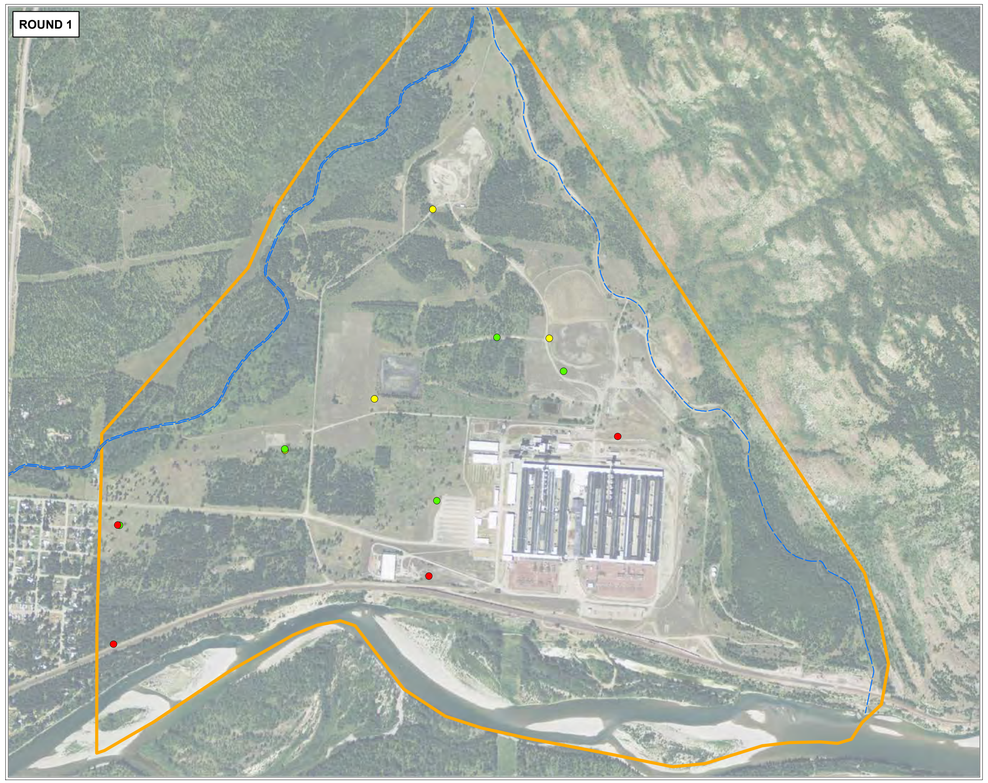

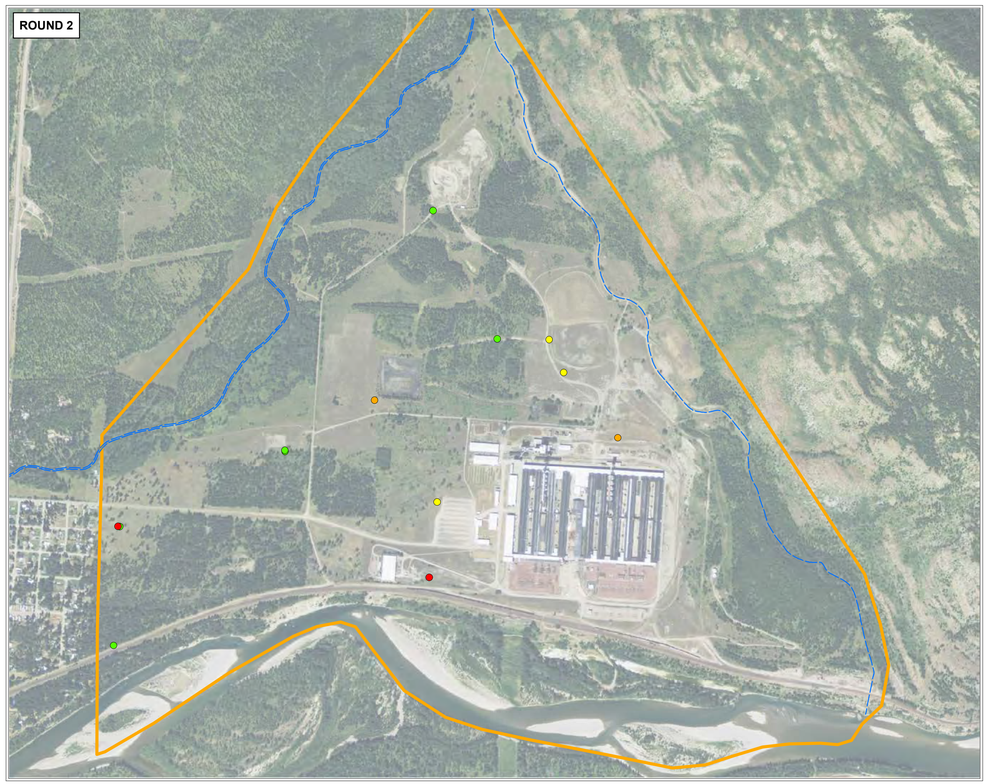

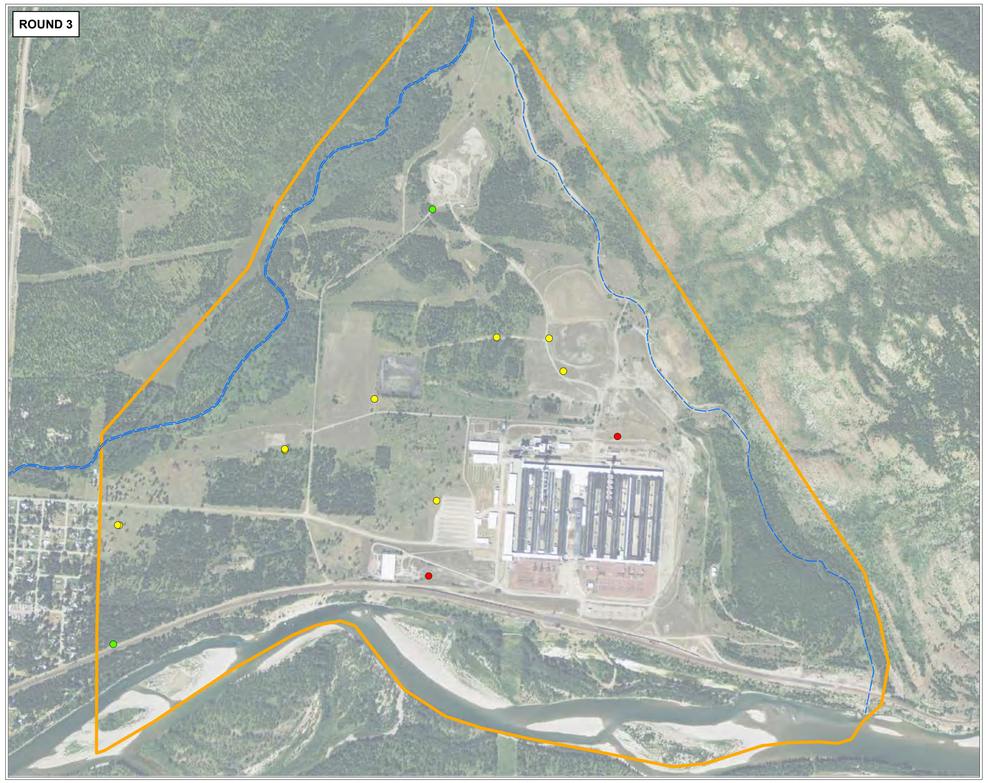

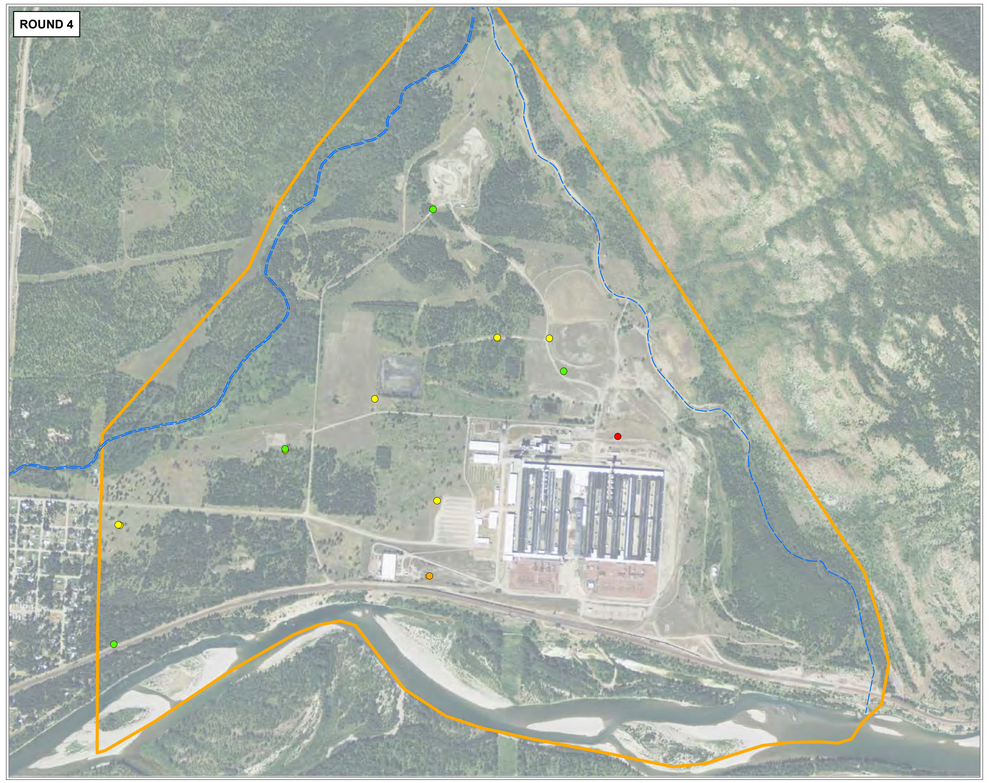

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 150,000
- 150,000 – 500,000
- 500,000 – 1,000,000
- >1,000,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
HARDNESS AS CALCIUM CARBONATE	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title: **CONCENTRATIONS OF HARDNESS AS CALCIUM CARBONATE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H55
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H55.2476.0001Y170.75.mxd		

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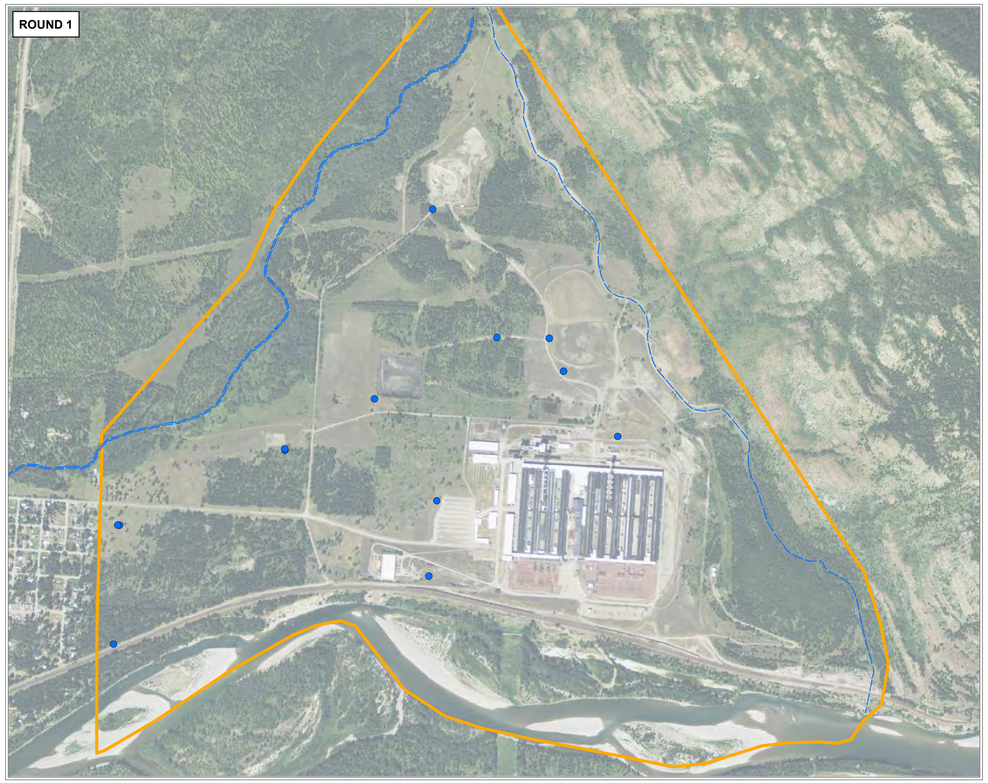

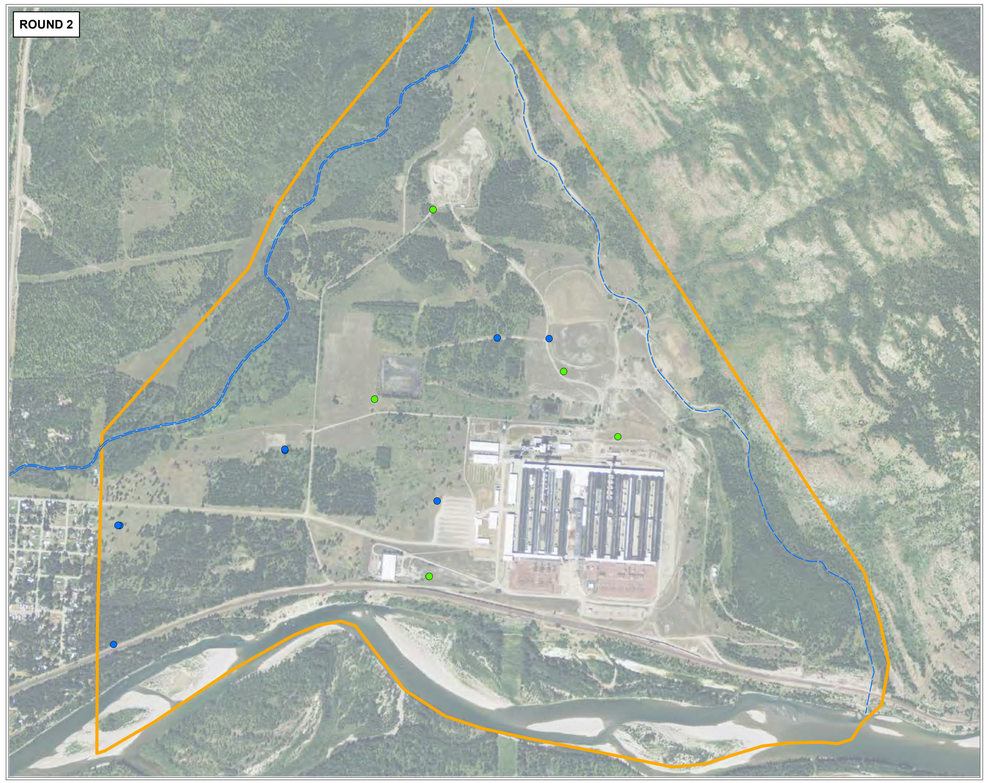

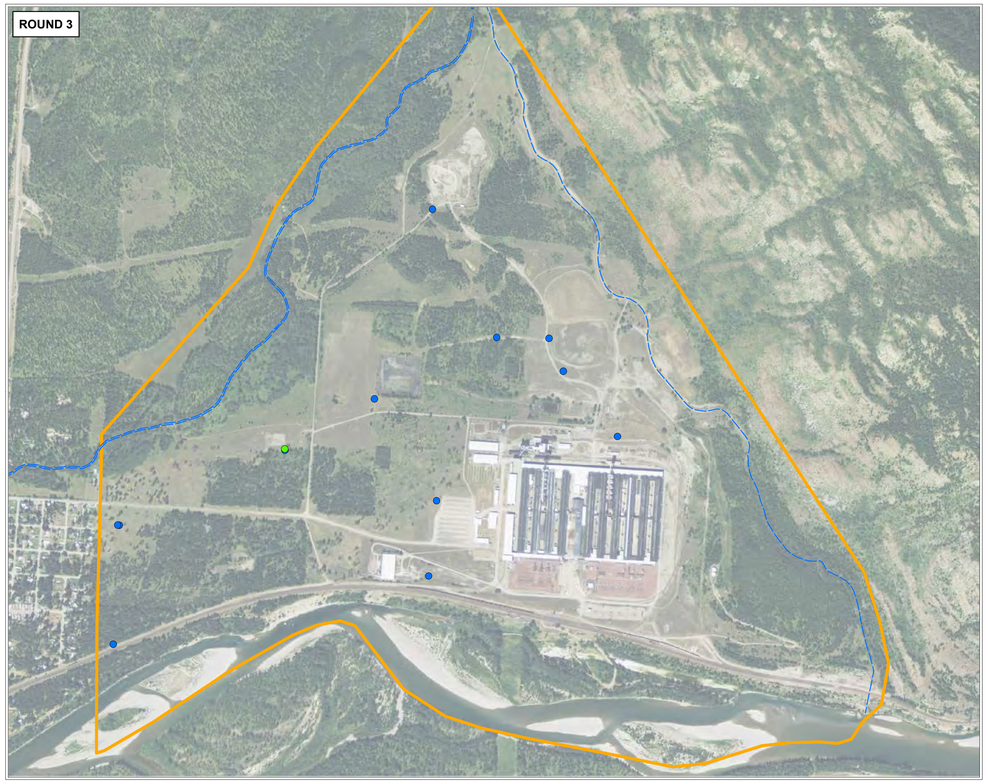

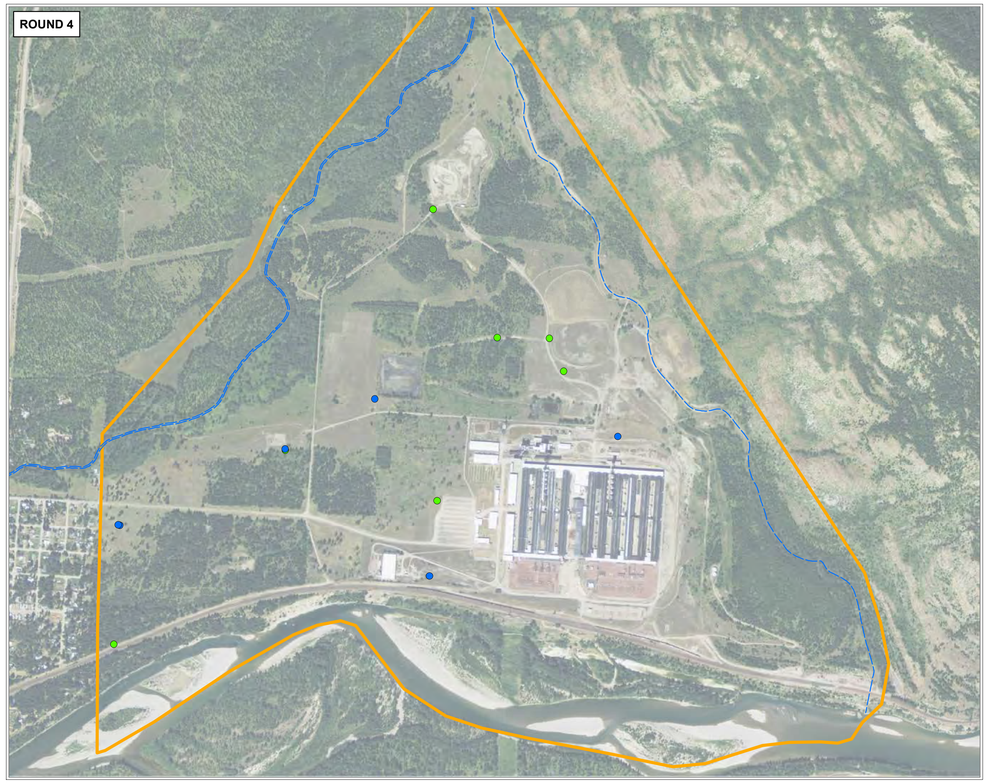

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (100U)
- ND – 5,000
- 5,000 – 10,000
- 10,000 – 100,000
- >100,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
NITRATE + NITRITE	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
100U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:
CONCENTRATIONS OF NITRATE + NITRITE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H56
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H56.2476.0001Y170.76.mxd		

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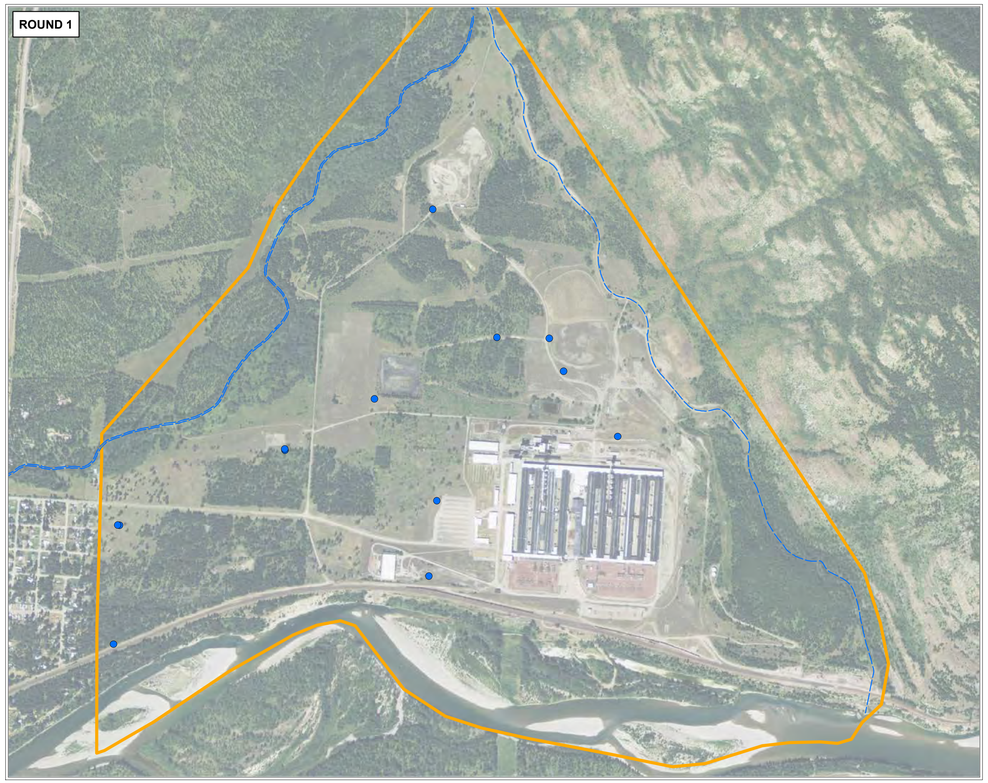

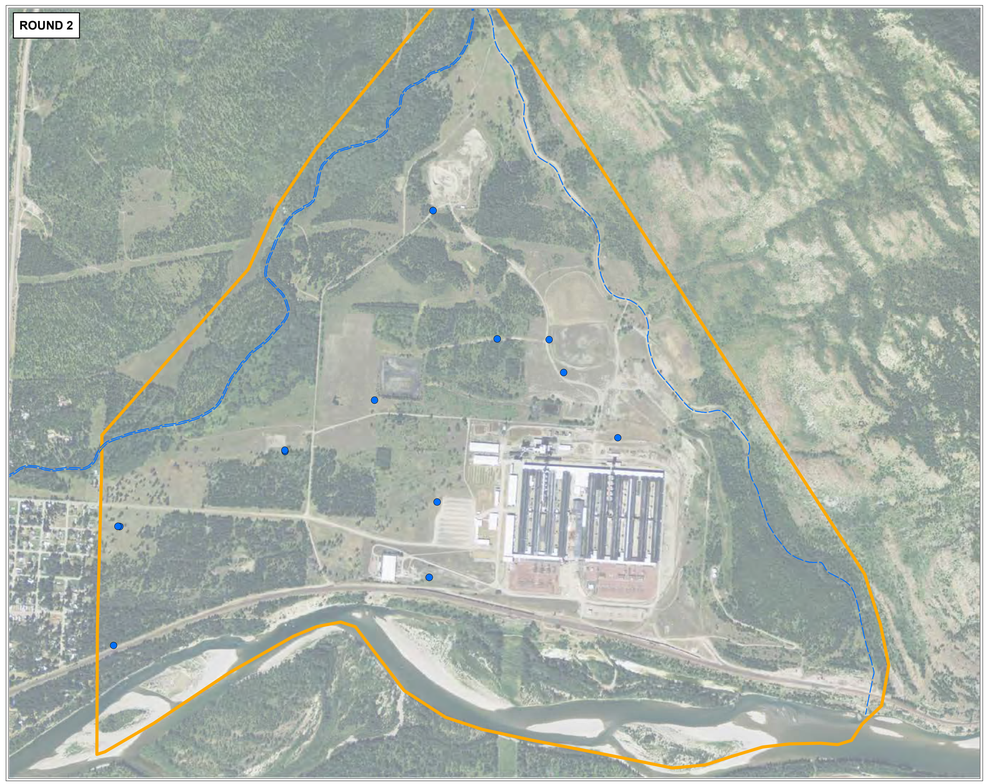

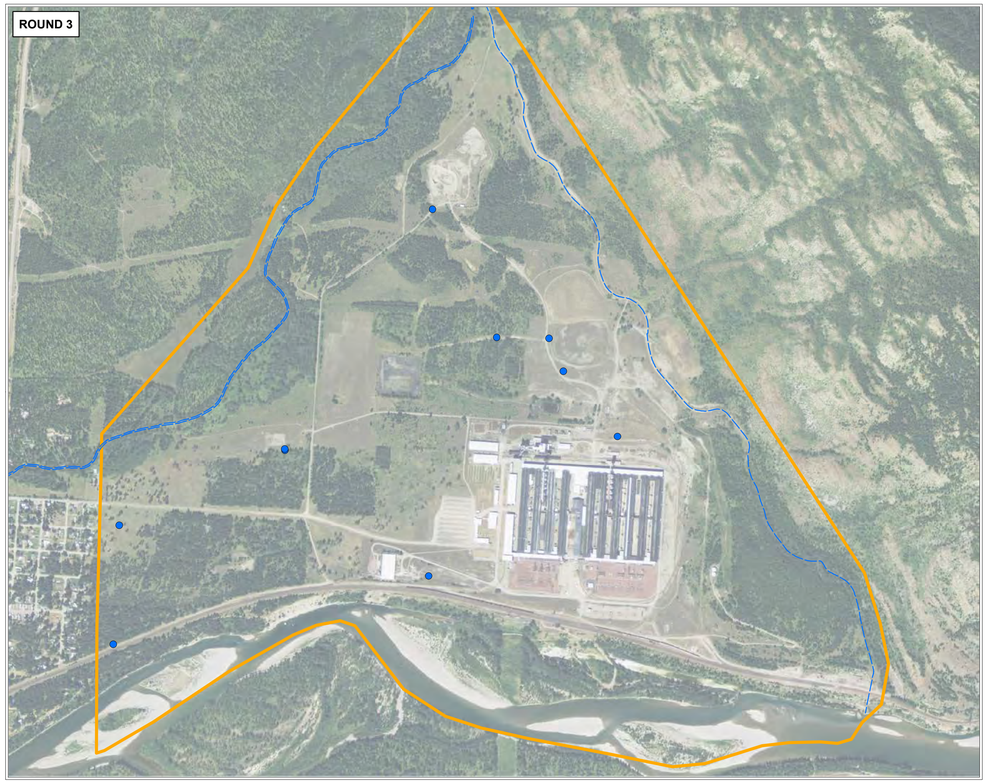

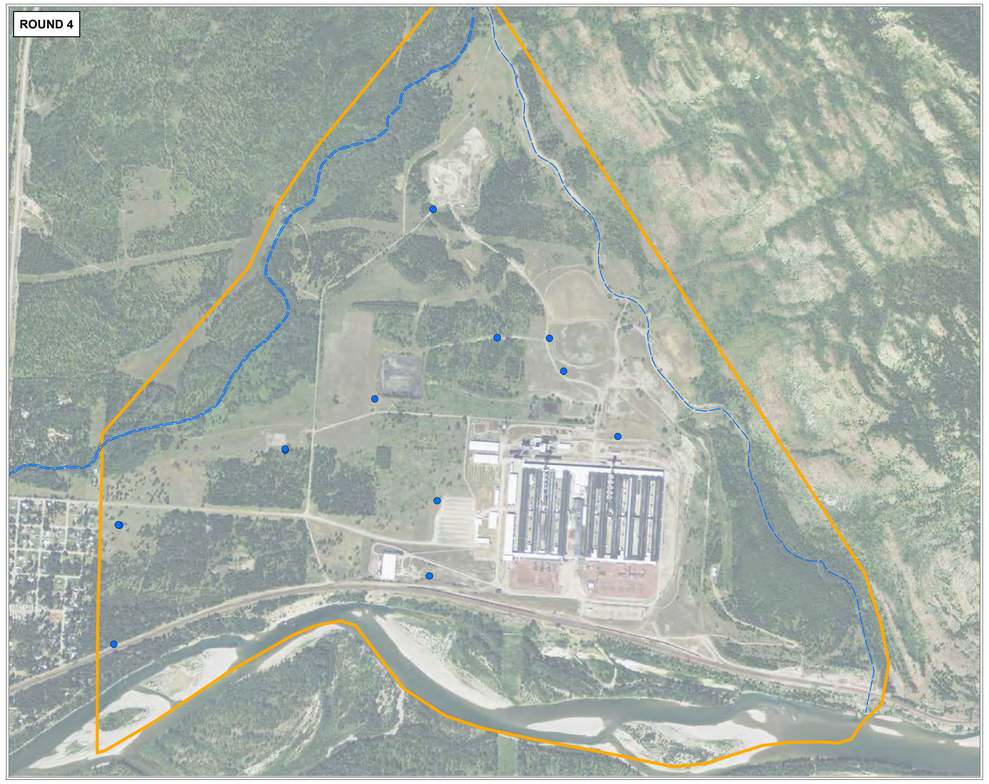

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CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42U)
- ND – 100
- 100 – 500
- 500 – 5,000
- >5,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
ORTHOPHOSPATE AS P	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
42U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF ORTHOPHOSPHATE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H57
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H57.2476.0001Y170.77.mxd		

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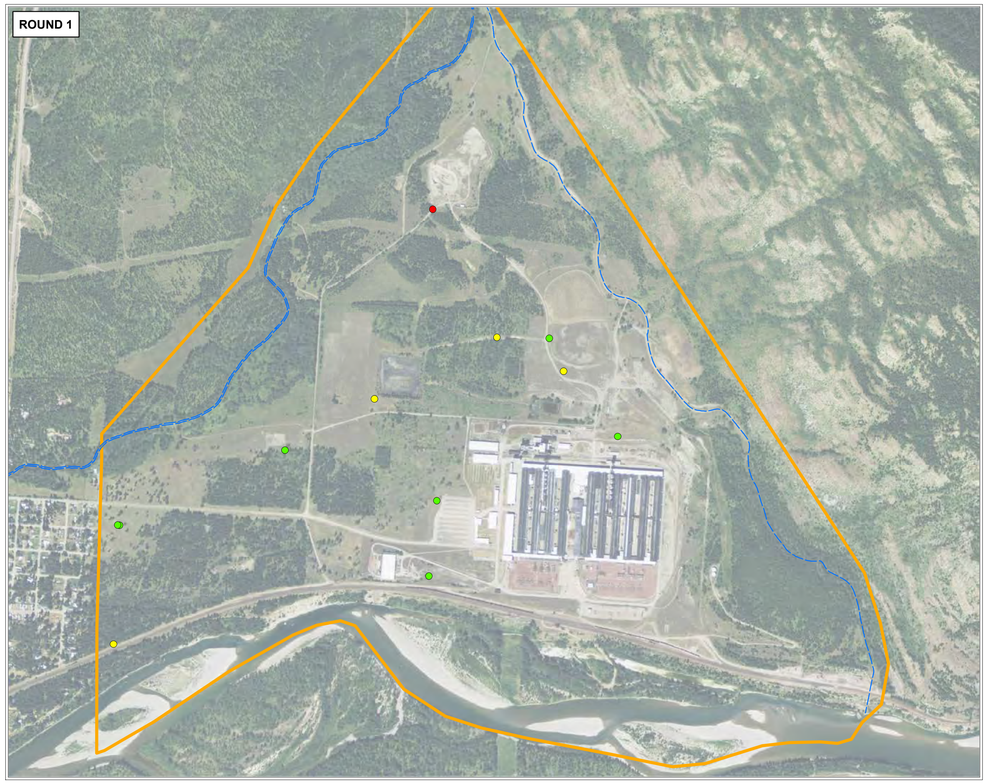

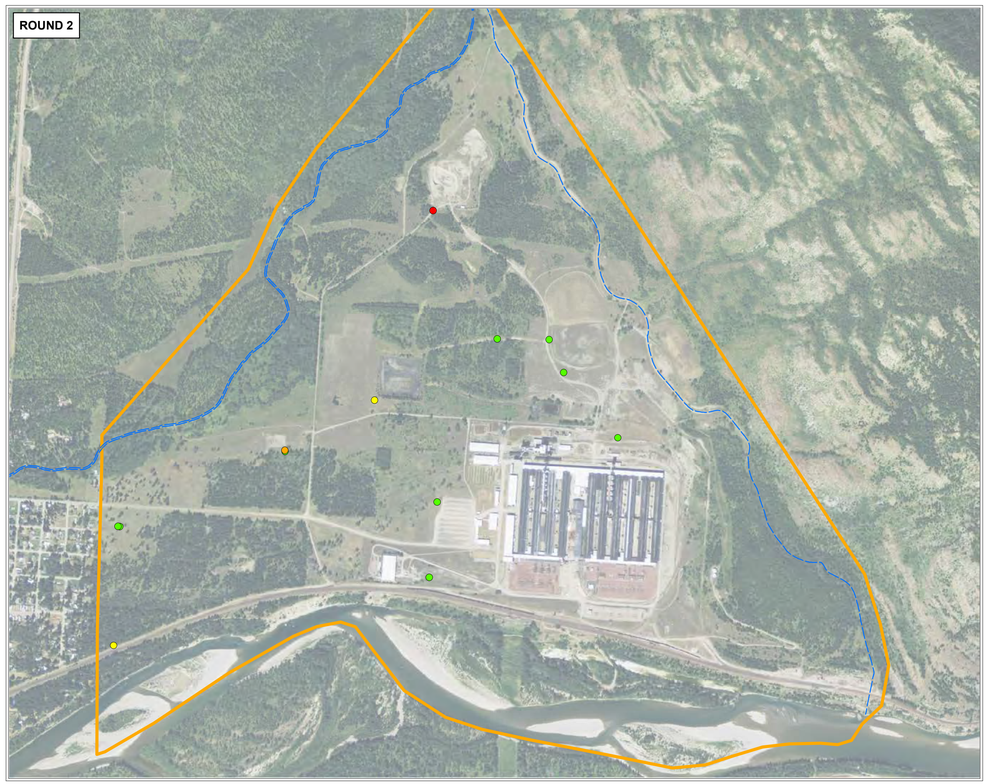

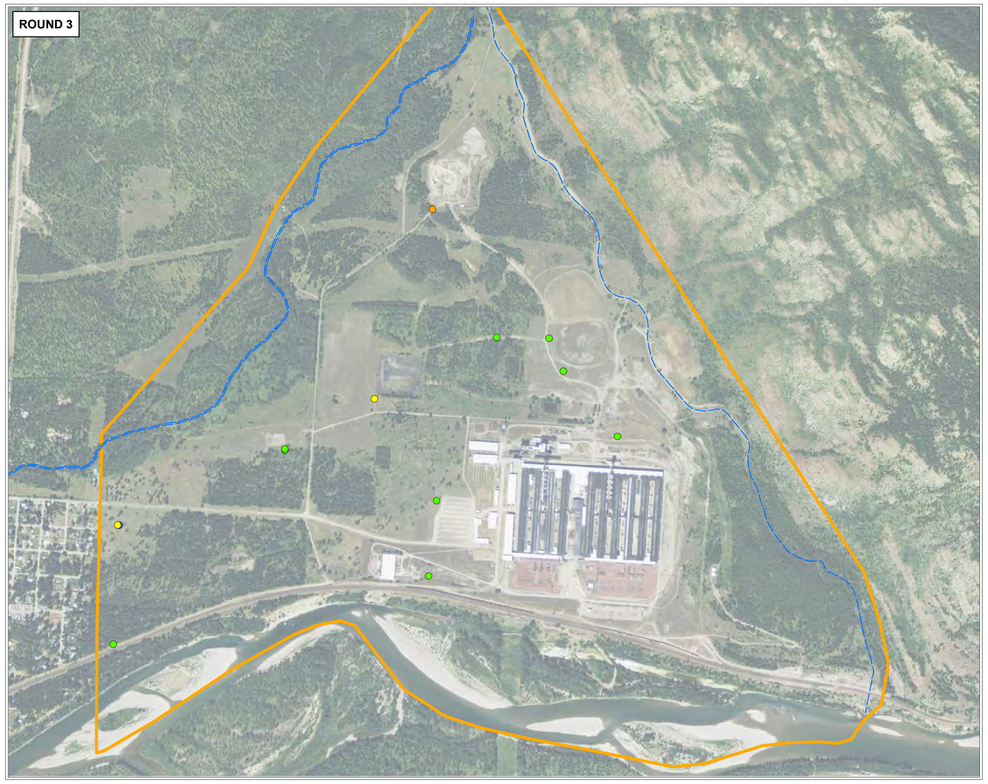

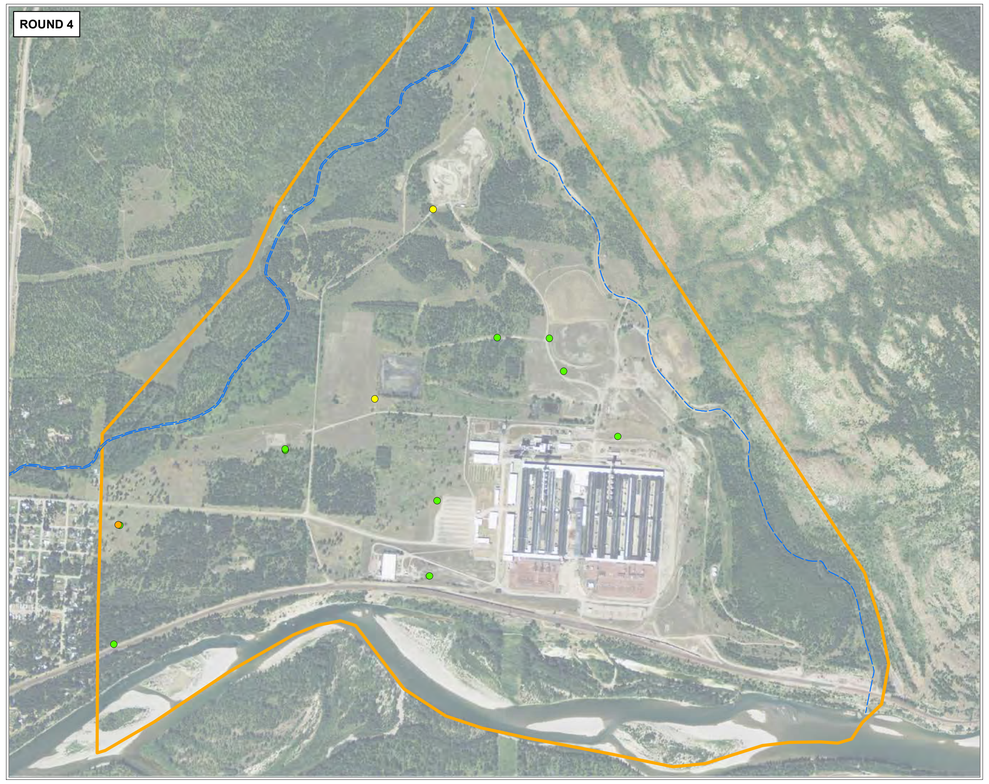

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42U)
- ND – 10,0000
- 10,000 – 20,000
- 20,000 – 30,000
- >30,000

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL
SULFATE	--	--	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF SULFATE IN ROUNDS 1, 2, 3, AND 4 GROUNDWATER FROM MONITORING WELLS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 14NOV17	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	H58
Project Mgr: M.R.	Project: 2476.0001Y004	
File: H58.2476.0001Y170.78.mxd		

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APPENDIX I

USEPA Vapor Intrusion Screening Level (VISL) Calculator

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	10.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
75-07-0	Acetaldehyde		--	--	--	2.20E-06	I	9.00E-03	I	
67-64-1	Acetone	1.0E+01	7.35E-03	No IUR	2.3E-07			3.10E+01	A	
75-05-8	Acetonitrile		--	--	--			6.00E-02	I	
107-02-8	Acrolein		--	--	--			2.00E-05	I	
79-10-7	Acrylic Acid		--	--	--			1.00E-03	I	
107-13-1	Acrylonitrile		--	--	--	6.80E-05	I	2.00E-03	I	
309-00-2	Aldrin		--	--	--	4.90E-03	I			
107-18-6	Allyl Alcohol		--	--	--			1.00E-04	X	
107-05-1	Allyl Chloride		--	--	--	6.00E-06	CA	1.00E-03	I	
7664-41-7	Ammonia		--	--	--			1.00E-01	I	
75-85-4	Amyl Alcohol, tert-		--	--	--			3.00E-03	X	
12674-11-2	Aroclor 1016		--	--	--	2.00E-05	S			
11104-28-2	Aroclor 1221		--	--	--	5.70E-04	S			
11141-16-5	Aroclor 1232		--	--	--	5.70E-04	S			
53469-21-9	Aroclor 1242		--	--	--	5.70E-04	S			
12672-29-6	Aroclor 1248		--	--	--	5.70E-04	S			
11097-69-1	Aroclor 1254		--	--	--	5.70E-04	S			
11096-82-5	Aroclor 1260		--	--	--	5.70E-04	S			
103-33-3	Azobenzene		--	--	--	3.10E-05	I			
56-55-3	Benz[a]anthracene		--	--	--	1.10E-04	CA			Mut
71-43-2	Benzene		--	--	--	7.80E-06	I	3.00E-02	I	
100-44-7	Benzyl Chloride		--	--	--	4.90E-05	CA	1.00E-03	P	
92-52-4	Biphenyl, 1,1'-		--	--	--			4.00E-04	X	
111-44-4	Bis(2-chloroethyl)ether		--	--	--	3.30E-04	I			
542-88-1	Bis(chloromethyl)ether		--	--	--	6.20E-02	I			
10294-34-5	Boron Trichloride		--	--	--			2.00E-02	P	
7637-07-2	Boron Trifluoride		--	--	--			1.30E-02	CA	
107-04-0	Bromo-2-chloroethane, 1-		--	--	--	6.00E-04	X			
108-86-1	Bromobenzene		--	--	--			6.00E-02	I	
74-97-5	Bromochloromethane		--	--	--			4.00E-02	X	
75-27-4	Bromodichloromethane		--	--	--	3.70E-05	CA			
75-25-2	Bromoform		--	--	--	1.10E-06	I			
74-83-9	Bromomethane		--	--	--			5.00E-03	I	
106-99-0	Butadiene, 1,3-		--	--	--	3.00E-05	I	2.00E-03	I	
78-92-2	Butyl alcohol, sec-		--	--	--			3.00E+01	P	
75-15-0	Carbon Disulfide	3.0E+00	9.79E-01	No IUR	1.3E-03			7.00E-01	I	
56-23-5	Carbon Tetrachloride		--	--	--	6.00E-06	I	1.00E-01	I	
463-58-1	Carbonyl Sulfide		--	--	--			1.00E-01	P	
12789-03-6	Chlordane		--	--	--	1.00E-04	I	7.00E-04	I	
7782-50-5	Chlorine		--	--	--			1.50E-04	A	
10049-04-4	Chlorine Dioxide		--	--	--			2.00E-04	I	
75-68-3	Chloro-1,1-difluoroethane, 1-		--	--	--			5.00E+01	I	
126-99-8	Chloro-1,3-butadiene, 2-		--	--	--	3.00E-04	I	2.00E-02	I	
108-90-7	Chlorobenzene		--	--	--			5.00E-02	P	
98-56-6	Chlorobenzotrifluoride, 4-		--	--	--			3.00E-01	P	
75-45-6	Chlorodifluoromethane		--	--	--			5.00E+01	I	
67-66-3	Chloroform		--	--	--	2.30E-05	I	9.80E-02	A	
74-87-3	Chloromethane		--	--	--			9.00E-02	I	
107-30-2	Chloromethyl Methyl Ether		--	--	--	6.90E-04	CA			
76-06-2	Chloropicrin		--	--	--			4.00E-04	CA	
8007-45-2	Coke Oven Emissions		--	--	--	6.20E-04	I			Mut
98-82-8	Cumene		--	--	--			4.00E-01	I	
57-12-5	Cyanide (CN-)		--	--	--			8.00E-04	S	

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	10.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
110-82-7	Cyclohexane		--	--	--			6.00E+00	I	
108-94-1	Cyclohexanone		--	--	--			7.00E-01	P	
110-83-8	Cyclohexene		--	--	--			1.00E+00	X	
72-55-9	DDE, p,p'-		--	--	--	9.70E-05	CA			
96-12-8	Dibromo-3-chloropropane, 1,2-		--	--	--	6.00E-03	P	2.00E-04	I	Mut
106-93-4	Dibromoethane, 1,2-		--	--	--	6.00E-04	I	9.00E-03	I	
74-95-3	Dibromomethane (Methylene Bromide)		--	--	--			4.00E-03	X	
764-41-0	Dichloro-2-butene, 1,4-		--	--	--	4.20E-03	P			
1476-11-5	Dichloro-2-butene, cis-1,4-		--	--	--	4.20E-03	P			
110-57-6	Dichloro-2-butene, trans-1,4-		--	--	--	4.20E-03	P			
95-50-1	Dichlorobenzene, 1,2-		--	--	--			2.00E-01	H	
106-46-7	Dichlorobenzene, 1,4-		--	--	--	1.10E-05	CA	8.00E-01	I	
75-71-8	Dichlorodifluoromethane		--	--	--			1.00E-01	X	
75-34-3	Dichloroethane, 1,1-	7.1E-01	8.46E-02	4.8E-08	No RfC	1.60E-06	CA			
107-06-2	Dichloroethane, 1,2-		--	--	--	2.60E-05	I	7.00E-03	P	
75-35-4	Dichloroethylene, 1,1-		--	--	--			2.00E-01	I	
78-87-5	Dichloropropane, 1,2-		--	--	--	1.00E-05	CA	4.00E-03	I	
542-75-6	Dichloropropene, 1,3-		--	--	--	4.00E-06	I	2.00E-02	I	
77-73-6	Dicyclopentadiene		--	--	--			3.00E-04	X	
75-37-6	Difluoroethane, 1,1-		--	--	--			4.00E+01	I	
94-58-6	Dihydrosafrole		--	--	--	1.30E-05	CA			
108-20-3	Diisopropyl Ether		--	--	--			7.00E-01	P	
68-12-2	Dimethylformamide		--	--	--			3.00E-02	I	
57-14-7	Dimethylhydrazine, 1,1-		--	--	--			2.00E-06	X	
540-73-8	Dimethylhydrazine, 1,2-		--	--	--	1.60E-01	CA			
513-37-1	Dimethylvinylchloride		--	--	--	1.30E-05	CA			
123-91-1	Dioxane, 1,4-		--	--	--	5.00E-06	I	3.00E-02	I	
106-89-8	Epichlorohydrin		--	--	--	1.20E-06	I	1.00E-03	I	
106-88-7	Epoxybutane, 1,2-		--	--	--			2.00E-02	I	
111-15-9	Ethoxyethanol Acetate, 2-		--	--	--			6.00E-02	P	
110-80-5	Ethoxyethanol, 2-		--	--	--			2.00E-01	I	
141-78-6	Ethyl Acetate		--	--	--			7.00E-02	P	
140-88-5	Ethyl Acrylate		--	--	--			8.00E-03	P	
75-00-3	Ethyl Chloride (Chloroethane)		--	--	--			1.00E+01	I	
97-63-2	Ethyl Methacrylate		--	--	--			3.00E-01	P	
100-41-4	Ethylbenzene		--	--	--	2.50E-06	CA	1.00E+00	I	
75-21-8	Ethylene Oxide		--	--	--	8.80E-05	CA	3.00E-02	CA	
151-56-4	Ethyleneimine		--	--	--	1.90E-02	CA			
50-00-0	Formaldehyde		--	--	--	1.30E-05	I	9.80E-03	A	
64-18-6	Formic Acid		--	--	--			3.00E-04	X	
98-01-1	Furfural		--	--	--			5.00E-02	H	
765-34-4	Glycidyl		--	--	--			1.00E-03	H	
76-44-8	Heptachlor		--	--	--	1.30E-03	I			
1024-57-3	Heptachlor Epoxide		--	--	--	2.60E-03	I			
39635-31-9	Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)		--	--	--	1.10E-03	E	1.30E-03	E	
118-74-1	Hexachlorobenzene		--	--	--	4.60E-04	I			
38380-08-4	Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)		--	--	--	1.10E-03	E	1.30E-03	E	
69782-90-7	Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)		--	--	--	1.10E-03	E	1.30E-03	E	
52663-72-6	Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)		--	--	--	1.10E-03	E	1.30E-03	E	
32774-16-6	Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)		--	--	--	1.10E+00	E	1.30E-06	E	
87-68-3	Hexachlorobutadiene		--	--	--	2.20E-05	I			
77-47-4	Hexachlorocyclopentadiene		--	--	--			2.00E-04	I	
67-72-1	Hexachloroethane		--	--	--	1.10E-05	CA	3.00E-02	I	

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	10.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
822-06-0	Hexamethylene Diisocyanate, 1,6-		--	--	--			1.00E-05	I	
110-54-3	Hexane, N-		--	--	--			7.00E-01	I	
591-78-6	Hexanone, 2-		--	--	--			3.00E-02	I	
302-01-2	Hydrazine		--	--	--	4.90E-03	I	3.00E-05	P	
7647-01-0	Hydrogen Chloride		--	--	--			2.00E-02	I	
74-90-8	Hydrogen Cyanide		--	--	--			8.00E-04	I	
7664-39-3	Hydrogen Fluoride		--	--	--			1.40E-02	CA	
7783-06-4	Hydrogen Sulfide		--	--	--			2.00E-03	I	
67-63-0	Isopropanol		--	--	--			2.00E-01	P	
7439-97-6	Mercury (elemental)		--	--	--			3.00E-04	I	
126-98-7	Methacrylonitrile		--	--	--			3.00E-02	P	
67-56-1	Methanol		--	--	--			2.00E+01	I	
110-49-6	Methoxyethanol Acetate, 2-		--	--	--			1.00E-03	P	
109-86-4	Methoxyethanol, 2-		--	--	--			2.00E-02	I	
96-33-3	Methyl Acrylate		--	--	--			2.00E-02	P	
78-93-3	Methyl Ethyl Ketone (2-Butanone)		--	--	--			5.00E+00	I	
60-34-4	Methyl Hydrazine		--	--	--	1.00E-03	X	2.00E-05	X	
108-10-1	Methyl Isobutyl Ketone (4-methyl-2-pentanone)		--	--	--			3.00E+00	I	
624-83-9	Methyl Isocyanate		--	--	--			1.00E-03	CA	
80-62-6	Methyl Methacrylate		--	--	--			7.00E-01	I	
25013-15-4	Methyl Styrene (Mixed Isomers)		--	--	--			4.00E-02	H	
1634-04-4	Methyl tert-Butyl Ether (MTBE)		--	--	--	2.60E-07	CA	3.00E+00	I	
75-09-2	Methylene Chloride		--	--	--	1.00E-08	I	6.00E-01	I	Mut
2385-85-5	Mirex		--	--	--	5.10E-03	CA			
64742-95-6	Naphtha, High Flash Aromatic (HFAN)		--	--	--			1.00E-01	P	
91-20-3	Naphthalene		--	--	--	3.40E-05	CA	3.00E-03	I	
13463-39-3	Nickel Carbonyl		--	--	--	2.60E-04	CA	1.40E-05	CA	
98-95-3	Nitrobenzene		--	--	--	4.00E-05	I	9.00E-03	I	
75-52-5	Nitromethane		--	--	--	8.80E-06	P	5.00E-03	P	
79-46-9	Nitropropane, 2-		--	--	--	2.70E-03	H	2.00E-02	I	
62-75-9	Nitrosodimethylamine, N-		--	--	--	1.40E-02	I	4.00E-05	X	Mut
924-16-3	Nitroso-di-N-butylamine, N-		--	--	--	1.60E-03	I			
10595-95-6	Nitrosomethylethylamine, N-		--	--	--	6.30E-03	CA			
111-84-2	Nonane, n-		--	--	--			2.00E-02	P	
32598-14-4	Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)		--	--	--	1.10E-03	E	1.30E-03	E	
74472-37-0	Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)		--	--	--	1.10E-03	E	1.30E-03	E	
31508-00-6	Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)		--	--	--	1.10E-03	E	1.30E-03	E	
65510-44-3	Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)		--	--	--	1.10E-03	E	1.30E-03	E	
57465-28-8	Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)		--	--	--	3.80E+00	E	4.00E-07	E	
109-66-0	Pentane, n-		--	--	--			1.00E+00	P	
75-44-5	Phosgene		--	--	--			3.00E-04	I	
7803-51-2	Phosphine		--	--	--			3.00E-04	I	
123-38-6	Propionaldehyde		--	--	--			8.00E-03	I	
103-65-1	Propyl benzene		--	--	--			1.00E+00	X	
115-07-1	Propylene		--	--	--			3.00E+00	CA	
107-98-2	Propylene Glycol Monomethyl Ether		--	--	--			2.00E+00	I	
75-56-9	Propylene Oxide		--	--	--	3.70E-06	I	3.00E-02	I	
100-42-5	Styrene		--	--	--			1.00E+00	I	
7446-11-9	Sulfur Trioxide		--	--	--			1.00E-03	CA	
1746-01-6	TCDD, 2,3,7,8-		--	--	--	3.80E+01	CA	4.00E-08	CA	
70362-50-4	Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)		--	--	--	1.10E-02	E	1.30E-04	E	
630-20-6	Tetrachloroethane, 1,1,1,2-		--	--	--	7.40E-06	I			
79-34-5	Tetrachloroethane, 1,1,2,2-		--	--	--	5.80E-05	CA			

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	10.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
127-18-4	Tetrachloroethylene	5.6E-01	1.74E-01	1.6E-08	4.2E-03	2.60E-07	I	4.00E-02	I	
811-97-2	Tetrafluoroethane, 1,1,1,2-		--	--	--			8.00E+01	I	
109-99-9	Tetrahydrofuran		--	--	--			2.00E+00	I	
7550-45-0	Titanium Tetrachloride		--	--	--			1.00E-04	A	
108-88-3	Toluene	2.2E+00	2.66E-01	No IUR	5.1E-05			5.00E+00	I	
584-84-9	Toluene-2,4-diisocyanate		--	--	--	1.10E-05	CA	8.00E-06	CA	
91-08-7	Toluene-2,6-diisocyanate		--	--	--	1.10E-05	CA	8.00E-06	CA	
76-13-1	Trichloro-1,2,2-trifluoroethane, 1,1,2-		--	--	--			3.00E+01	H	
120-82-1	Trichlorobenzene, 1,2,4-		--	--	--			2.00E-03	P	
71-55-6	Trichloroethane, 1,1,1-	3.8E+00	1.33E+00	No IUR	2.6E-04			5.00E+00	I	
79-00-5	Trichloroethane, 1,1,2-		--	--	--	1.60E-05	I	2.00E-04	X	
79-01-6	Trichloroethylene	7.6E-01	1.44E-01	3.0E-07	6.9E-02	see note	I	2.00E-03	I	TCE
96-18-4	Trichloropropane, 1,2,3-		--	--	--			3.00E-04	I	Mut
96-19-5	Trichloropropene, 1,2,3-		--	--	--			3.00E-04	P	
121-44-8	Triethylamine		--	--	--			7.00E-03	I	
420-46-2	Trifluoroethane, 1,1,1-		--	--	--			2.00E+01	P	
526-73-8	Trimethylbenzene, 1,2,3-		--	--	--			5.00E-03	P	
95-63-6	Trimethylbenzene, 1,2,4-		--	--	--			7.00E-03	P	
126-72-7	Tris(2,3-dibromopropyl)phosphate		--	--	--	6.60E-04	CA			
108-05-4	Vinyl Acetate		--	--	--			2.00E-01	I	
593-60-2	Vinyl Bromide		--	--	--	3.20E-05	H	3.00E-03	I	
75-01-4	Vinyl Chloride		--	--	--	4.40E-06	I	1.00E-01	I	VC
108-38-3	Xylene, m-		--	--	--			1.00E-01	S	
95-47-6	Xylene, o-		--	--	--			1.00E-01	S	
106-42-3	Xylene, P-		--	--	--			1.00E-01	S	
1330-20-7	Xylenes		--	--	--			1.00E-01	I	

Notes:

(1) **Inhalation Pathway Exposure Parameters (RME):**

Exposure Scenario	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Averaging time for carcinogens	(yrs)	ATc_R_GW	70	ATc_C_GW	70	ATc_GW	70
Averaging time for non-carcinogens	(yrs)	ATnc_R_GW	26	ATnc_C_GW	25	Atnc_GW	26
Exposure duration	(yrs)	ED_R_GW	26	ED_C_GW	25	ED_GW	26
Exposure frequency	(days/yr)	EF_R_GW	350	EF_C_GW	250	EF_GW	350
Exposure time	(hr/day)	ET_R_GW	24	ET_C_GW	8	ET_GW	24

(2) **Generic Attenuation Factors:**

Source Medium of Vapors		Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Groundwater	(-)	AFgw_R_GW	0.001	AFgw_C_GW	0.001	AFgw_GW	0.001
Sub-Slab and Exterior Soil Gas	(-)	AFss_R_GW	0.03	AFss_C_GW	0.03	AFss_GW	0.03

(3) **Formulas**

Cia, target = MIN(Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Trichloroethylene	mIURTCE_R_GW	1.00E-06	IURTCE_C_GW	0.00E+00	mIURTCE_GW	1.00E-06

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	10.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard		Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator	
		Cgw	Cia	CR	HQ		IUR		RfC		i	
		(ug/L)	(ug/m^3)				(ug/m^3)$^{-1}$		(mg/m^3)			
					IURTCE_R_GW	3.10E-06	IURTCE_C_GW	4.10E-06			IURTCE_GW	3.10E-06

Mutagenic Chemicals

The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration (years)	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 26 years	10	1

Mutagenic-mode-of-action (MMOA) adjustment factor 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride

See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html
P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml
A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html
CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp
H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml
S = See RSL User Guide, Section 5
X = PPRTV Appendix
Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).
VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).
TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).
Yellow highlighting indicates site-specific parameters that may be edited by the user.
Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.
Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 2
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	7.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
75-07-0	Acetaldehyde		--	--	--	2.20E-06	I	9.00E-03	I	
67-64-1	Acetone	3.2E+00	2.03E-03	No IUR	6.3E-08			3.10E+01	A	
75-05-8	Acetonitrile		--	--	--			6.00E-02	I	
107-02-8	Acrolein		--	--	--			2.00E-05	I	
79-10-7	Acrylic Acid		--	--	--			1.00E-03	I	
107-13-1	Acrylonitrile		--	--	--	6.80E-05	I	2.00E-03	I	
309-00-2	Aldrin		--	--	--	4.90E-03	I			
107-18-6	Allyl Alcohol		--	--	--			1.00E-04	X	
107-05-1	Allyl Chloride		--	--	--	6.00E-06	CA	1.00E-03	I	
7664-41-7	Ammonia		--	--	--			1.00E-01	I	
75-85-4	Amyl Alcohol, tert-		--	--	--			3.00E-03	X	
12674-11-2	Aroclor 1016		--	--	--	2.00E-05	S			
11104-28-2	Aroclor 1221		--	--	--	5.70E-04	S			
11141-16-5	Aroclor 1232		--	--	--	5.70E-04	S			
53469-21-9	Aroclor 1242		--	--	--	5.70E-04	S			
12672-29-6	Aroclor 1248		--	--	--	5.70E-04	S			
11097-69-1	Aroclor 1254		--	--	--	5.70E-04	S			
11096-82-5	Aroclor 1260		--	--	--	5.70E-04	S			
103-33-3	Azobenzene		--	--	--	3.10E-05	I			
56-55-3	Benz[a]anthracene		--	--	--	1.10E-04	CA			Mut
71-43-2	Benzene	1.5E-01	1.42E-02	3.9E-08	4.5E-04	7.80E-06	I	3.00E-02	I	
100-44-7	Benzyl Chloride		--	--	--	4.90E-05	CA	1.00E-03	P	
92-52-4	Biphenyl, 1,1'-		--	--	--			4.00E-04	X	
111-44-4	Bis(2-chloroethyl)ether		--	--	--	3.30E-04	I			
542-88-1	Bis(chloromethyl)ether		--	--	--	6.20E-02	I			
10294-34-5	Boron Trichloride		--	--	--			2.00E-02	P	
7637-07-2	Boron Trifluoride		--	--	--			1.30E-02	CA	
107-04-0	Bromo-2-chloroethane, 1-		--	--	--	6.00E-04	X			
108-86-1	Bromobenzene		--	--	--			6.00E-02	I	
74-97-5	Bromochloromethane		--	--	--			4.00E-02	X	
75-27-4	Bromodichloromethane		--	--	--	3.70E-05	CA			
75-25-2	Bromoform		--	--	--	1.10E-06	I			
74-83-9	Bromomethane		--	--	--			5.00E-03	I	
106-99-0	Butadiene, 1,3-		--	--	--	3.00E-05	I	2.00E-03	I	
78-92-2	Butyl alcohol, sec-		--	--	--			3.00E+01	P	
75-15-0	Carbon Disulfide		--	--	--			7.00E-01	I	
56-23-5	Carbon Tetrachloride		--	--	--	6.00E-06	I	1.00E-01	I	
463-58-1	Carbonyl Sulfide		--	--	--			1.00E-01	P	
12789-03-6	Chlordane		--	--	--	1.00E-04	I	7.00E-04	I	
7782-50-5	Chlorine		--	--	--			1.50E-04	A	
10049-04-4	Chlorine Dioxide		--	--	--			2.00E-04	I	
75-68-3	Chloro-1,1-difluoroethane, 1-		--	--	--			5.00E+01	I	
126-99-8	Chloro-1,3-butadiene, 2-		--	--	--	3.00E-04	I	2.00E-02	I	
108-90-7	Chlorobenzene		--	--	--			5.00E-02	P	
98-56-6	Chlorobenzotrifluoride, 4-		--	--	--			3.00E-01	P	
75-45-6	Chlorodifluoromethane		--	--	--			5.00E+01	I	
67-66-3	Chloroform		--	--	--	2.30E-05	I	9.80E-02	A	
74-87-3	Chloromethane		--	--	--			9.00E-02	I	
107-30-2	Chloromethyl Methyl Ether		--	--	--	6.90E-04	CA			
76-06-2	Chloropicrin		--	--	--			4.00E-04	CA	
8007-45-2	Coke Oven Emissions		--	--	--	6.20E-04	I			Mut
98-82-8	Cumene		--	--	--			4.00E-01	I	
57-12-5	Cyanide (CN-)		--	--	--			8.00E-04	S	

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 2
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	7.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
110-82-7	Cyclohexane		--	--	--			6.00E+00	I	
108-94-1	Cyclohexanone		--	--	--			7.00E-01	P	
110-83-8	Cyclohexene		--	--	--			1.00E+00	X	
72-55-9	DDE, p,p'-		--	--	--	9.70E-05	CA			
96-12-8	Dibromo-3-chloropropane, 1,2-		--	--	--	6.00E-03	P	2.00E-04	I	Mut
106-93-4	Dibromoethane, 1,2-		--	--	--	6.00E-04	I	9.00E-03	I	
74-95-3	Dibromomethane (Methylene Bromide)		--	--	--			4.00E-03	X	
764-41-0	Dichloro-2-butene, 1,4-		--	--	--	4.20E-03	P			
1476-11-5	Dichloro-2-butene, cis-1,4-		--	--	--	4.20E-03	P			
110-57-6	Dichloro-2-butene, trans-1,4-		--	--	--	4.20E-03	P			
95-50-1	Dichlorobenzene, 1,2-		--	--	--			2.00E-01	H	
106-46-7	Dichlorobenzene, 1,4-		--	--	--	1.10E-05	CA	8.00E-01	I	
75-71-8	Dichlorodifluoromethane		--	--	--			1.00E-01	X	
75-34-3	Dichloroethane, 1,1-	9.5E-01	9.78E-02	5.6E-08	No RfC	1.60E-06	CA			
107-06-2	Dichloroethane, 1,2-		--	--	--	2.60E-05	I	7.00E-03	P	
75-35-4	Dichloroethylene, 1,1-		--	--	--			2.00E-01	I	
78-87-5	Dichloropropane, 1,2-		--	--	--	1.00E-05	CA	4.00E-03	I	
542-75-6	Dichloropropene, 1,3-		--	--	--	4.00E-06	I	2.00E-02	I	
77-73-6	Dicyclopentadiene		--	--	--			3.00E-04	X	
75-37-6	Difluoroethane, 1,1-		--	--	--			4.00E+01	I	
94-58-6	Dihydrosafrole		--	--	--	1.30E-05	CA			
108-20-3	Diisopropyl Ether		--	--	--			7.00E-01	P	
68-12-2	Dimethylformamide		--	--	--			3.00E-02	I	
57-14-7	Dimethylhydrazine, 1,1-		--	--	--			2.00E-06	X	
540-73-8	Dimethylhydrazine, 1,2-		--	--	--	1.60E-01	CA			
513-37-1	Dimethylvinylchloride		--	--	--	1.30E-05	CA			
123-91-1	Dioxane, 1,4-		--	--	--	5.00E-06	I	3.00E-02	I	
106-89-8	Epichlorohydrin		--	--	--	1.20E-06	I	1.00E-03	I	
106-88-7	Epoxybutane, 1,2-		--	--	--			2.00E-02	I	
111-15-9	Ethoxyethanol Acetate, 2-		--	--	--			6.00E-02	P	
110-80-5	Ethoxyethanol, 2-		--	--	--			2.00E-01	I	
141-78-6	Ethyl Acetate		--	--	--			7.00E-02	P	
140-88-5	Ethyl Acrylate		--	--	--			8.00E-03	P	
75-00-3	Ethyl Chloride (Chloroethane)		--	--	--			1.00E+01	I	
97-63-2	Ethyl Methacrylate		--	--	--			3.00E-01	P	
100-41-4	Ethylbenzene		--	--	--	2.50E-06	CA	1.00E+00	I	
75-21-8	Ethylene Oxide		--	--	--	8.80E-05	CA	3.00E-02	CA	
151-56-4	Ethyleneimine		--	--	--	1.90E-02	CA			
50-00-0	Formaldehyde		--	--	--	1.30E-05	I	9.80E-03	A	
64-18-6	Formic Acid		--	--	--			3.00E-04	X	
98-01-1	Furfural		--	--	--			5.00E-02	H	
765-34-4	Glycidyl		--	--	--			1.00E-03	H	
76-44-8	Heptachlor		--	--	--	1.30E-03	I			
1024-57-3	Heptachlor Epoxide		--	--	--	2.60E-03	I			
39635-31-9	Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)		--	--	--	1.10E-03	E	1.30E-03	E	
118-74-1	Hexachlorobenzene		--	--	--	4.60E-04	I			
38380-08-4	Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)		--	--	--	1.10E-03	E	1.30E-03	E	
69782-90-7	Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)		--	--	--	1.10E-03	E	1.30E-03	E	
52663-72-6	Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)		--	--	--	1.10E-03	E	1.30E-03	E	
32774-16-6	Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)		--	--	--	1.10E+00	E	1.30E-06	E	
87-68-3	Hexachlorobutadiene		--	--	--	2.20E-05	I			
77-47-4	Hexachlorocyclopentadiene		--	--	--			2.00E-04	I	
67-72-1	Hexachloroethane		--	--	--	1.10E-05	CA	3.00E-02	I	

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 2
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	7.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
822-06-0	Hexamethylene Diisocyanate, 1,6-		--	--	--			1.00E-05	I	
110-54-3	Hexane, N-		--	--	--			7.00E-01	I	
591-78-6	Hexanone, 2-		--	--	--			3.00E-02	I	
302-01-2	Hydrazine		--	--	--	4.90E-03	I	3.00E-05	P	
7647-01-0	Hydrogen Chloride		--	--	--			2.00E-02	I	
74-90-8	Hydrogen Cyanide		--	--	--			8.00E-04	I	
7664-39-3	Hydrogen Fluoride		--	--	--			1.40E-02	CA	
7783-06-4	Hydrogen Sulfide		--	--	--			2.00E-03	I	
67-63-0	Isopropanol		--	--	--			2.00E-01	P	
7439-97-6	Mercury (elemental)		--	--	--			3.00E-04	I	
126-98-7	Methacrylonitrile		--	--	--			3.00E-02	P	
67-56-1	Methanol		--	--	--			2.00E+01	I	
110-49-6	Methoxyethanol Acetate, 2-		--	--	--			1.00E-03	P	
109-86-4	Methoxyethanol, 2-		--	--	--			2.00E-02	I	
96-33-3	Methyl Acrylate		--	--	--			2.00E-02	P	
78-93-3	Methyl Ethyl Ketone (2-Butanone)		--	--	--			5.00E+00	I	
60-34-4	Methyl Hydrazine		--	--	--	1.00E-03	X	2.00E-05	X	
108-10-1	Methyl Isobutyl Ketone (4-methyl-2-pentanone)		--	--	--			3.00E+00	I	
624-83-9	Methyl Isocyanate		--	--	--			1.00E-03	CA	
80-62-6	Methyl Methacrylate		--	--	--			7.00E-01	I	
25013-15-4	Methyl Styrene (Mixed Isomers)		--	--	--			4.00E-02	H	
1634-04-4	Methyl tert-Butyl Ether (MTBE)		--	--	--	2.60E-07	CA	3.00E+00	I	
75-09-2	Methylene Chloride	1.8E+00	1.12E-01	1.1E-09	1.8E-04	1.00E-08	I	6.00E-01	I	Mut
2385-85-5	Mirex		--	--	--	5.10E-03	CA			
64742-95-6	Naphtha, High Flash Aromatic (HFAN)		--	--	--			1.00E-01	P	
91-20-3	Naphthalene		--	--	--	3.40E-05	CA	3.00E-03	I	
13463-39-3	Nickel Carbonyl		--	--	--	2.60E-04	CA	1.40E-05	CA	
98-95-3	Nitrobenzene		--	--	--	4.00E-05	I	9.00E-03	I	
75-52-5	Nitromethane		--	--	--	8.80E-06	P	5.00E-03	P	
79-46-9	Nitropropane, 2-		--	--	--	2.70E-03	H	2.00E-02	I	
62-75-9	Nitrosodimethylamine, N-		--	--	--	1.40E-02	I	4.00E-05	X	Mut
924-16-3	Nitroso-di-N-butylamine, N-		--	--	--	1.60E-03	I			
10595-95-6	Nitrosomethylethylamine, N-		--	--	--	6.30E-03	CA			
111-84-2	Nonane, n-		--	--	--			2.00E-02	P	
32598-14-4	Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)		--	--	--	1.10E-03	E	1.30E-03	E	
74472-37-0	Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)		--	--	--	1.10E-03	E	1.30E-03	E	
31508-00-6	Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)		--	--	--	1.10E-03	E	1.30E-03	E	
65510-44-3	Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)		--	--	--	1.10E-03	E	1.30E-03	E	
57465-28-8	Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)		--	--	--	3.80E+00	E	4.00E-07	E	
109-66-0	Pentane, n-		--	--	--			1.00E+00	P	
75-44-5	Phosgene		--	--	--			3.00E-04	I	
7803-51-2	Phosphine		--	--	--			3.00E-04	I	
123-38-6	Propionaldehyde		--	--	--			8.00E-03	I	
103-65-1	Propyl benzene		--	--	--			1.00E+00	X	
115-07-1	Propylene		--	--	--			3.00E+00	CA	
107-98-2	Propylene Glycol Monomethyl Ether		--	--	--			2.00E+00	I	
75-56-9	Propylene Oxide		--	--	--	3.70E-06	I	3.00E-02	I	
100-42-5	Styrene		--	--	--			1.00E+00	I	
7446-11-9	Sulfur Trioxide		--	--	--			1.00E-03	CA	
1746-01-6	TCDD, 2,3,7,8-		--	--	--	3.80E+01	CA	4.00E-08	CA	
70362-50-4	Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)		--	--	--	1.10E-02	E	1.30E-04	E	
630-20-6	Tetrachloroethane, 1,1,1,2-		--	--	--	7.40E-06	I			
79-34-5	Tetrachloroethane, 1,1,2,2-		--	--	--	5.80E-05	CA			

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EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	7.2	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR (ug/m^3)$^{-1}$	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
127-18-4	Tetrachloroethylene	2.9E-01	7.51E-02	7.0E-09	1.8E-03	2.60E-07	I	4.00E-02	I	
811-97-2	Tetrafluoroethane, 1,1,1,2-		--	--	--			8.00E+01	I	
109-99-9	Tetrahydrofuran		--	--	--			2.00E+00	I	
7550-45-0	Titanium Tetrachloride		--	--	--			1.00E-04	A	
108-88-3	Toluene	6.6E-01	6.69E-02	No IUR	1.3E-05			5.00E+00	I	
584-84-9	Toluene-2,4-diisocyanate		--	--	--	1.10E-05	CA	8.00E-06	CA	
91-08-7	Toluene-2,6-diisocyanate		--	--	--	1.10E-05	CA	8.00E-06	CA	
76-13-1	Trichloro-1,2,2-trifluoroethane, 1,1,2-		--	--	--			3.00E+01	H	
120-82-1	Trichlorobenzene, 1,2,4-		--	--	--			2.00E-03	P	
71-55-6	Trichloroethane, 1,1,1-	3.2E+00	9.63E-01	No IUR	1.8E-04			5.00E+00	I	
79-00-5	Trichloroethane, 1,1,2-		--	--	--	1.60E-05	I	2.00E-04	X	
79-01-6	Trichloroethylene	6.2E-01	9.94E-02	2.1E-07	4.8E-02	see note	I	2.00E-03	I	TCE
96-18-4	Trichloropropane, 1,2,3-		--	--	--			3.00E-04	I	Mut
96-19-5	Trichloropropene, 1,2,3-		--	--	--			3.00E-04	P	
121-44-8	Triethylamine		--	--	--			7.00E-03	I	
420-46-2	Trifluoroethane, 1,1,1-		--	--	--			2.00E+01	P	
526-73-8	Trimethylbenzene, 1,2,3-		--	--	--			5.00E-03	P	
95-63-6	Trimethylbenzene, 1,2,4-		--	--	--			7.00E-03	P	
126-72-7	Tris(2,3-dibromopropyl)phosphate		--	--	--	6.60E-04	CA			
108-05-4	Vinyl Acetate		--	--	--			2.00E-01	I	
593-60-2	Vinyl Bromide		--	--	--	3.20E-05	H	3.00E-03	I	
75-01-4	Vinyl Chloride		--	--	--	4.40E-06	I	1.00E-01	I	VC
108-38-3	Xylene, m-		--	--	--			1.00E-01	S	
95-47-6	Xylene, o-		--	--	--			1.00E-01	S	
106-42-3	Xylene, P-		--	--	--			1.00E-01	S	
1330-20-7	Xylenes		--	--	--			1.00E-01	I	

Notes:

(1) **Inhalation Pathway Exposure Parameters (RME):**

Exposure Scenario	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Averaging time for carcinogens	(yrs)	ATc_R_GW	70	ATc_C_GW	70	ATc_GW	70
Averaging time for non-carcinogens	(yrs)	ATnc_R_GW	26	ATnc_C_GW	25	Atnc_GW	26
Exposure duration	(yrs)	ED_R_GW	26	ED_C_GW	25	ED_GW	26
Exposure frequency	(days/yr)	EF_R_GW	350	EF_C_GW	250	EF_GW	350
Exposure time	(hr/day)	ET_R_GW	24	ET_C_GW	8	ET_GW	24

(2) **Generic Attenuation Factors:**

Source Medium of Vapors		Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Groundwater	(-)	AFgw_R_GW	0.001	AFgw_C_GW	0.001	AFgw_GW	0.001
Sub-Slab and Exterior Soil Gas	(-)	AFss_R_GW	0.03	AFss_C_GW	0.03	AFss_GW	0.03

(3) **Formulas**

Cia, target = MIN(Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

Trichloroethylene	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
	mIURTCE_R_GW	1.00E-06	IURTCE_C_GW	0.00E+00	mIURTCE_GW	1.00E-06

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CAS	Chemical Name	Site Groundwater Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard		Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator	
		Cgw	Cia	CR	HQ		IUR		RfC		i	
		(ug/L)	(ug/m^3)				(ug/m^3)$^{-1}$		(mg/m^3)			
					IURTCE_R_GW	3.10E-06	IURTCE_C_GW	4.10E-06			IURTCE_GW	3.10E-06

Mutagenic Chemicals

The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration (years)	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 26 years	10	1

Mutagenic-mode-of-action (MMOA) adjustment factor 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride

See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html
P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml
A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html
CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp
H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml
S = See RSL User Guide, Section 5
X = PPRTV Appendix
Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).
VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).
TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).
Yellow highlighting indicates site-specific parameters that may be edited by the user.
Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.
Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	8	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
75-07-0	Acetaldehyde		--	--	--	2.20E-06	I	9.00E-03	I	
67-64-1	Acetone	7.6E+00	5.02E-03	No IUR	1.6E-07			3.10E+01	A	
75-05-8	Acetonitrile		--	--	--			6.00E-02	I	
107-02-8	Acrolein		--	--	--			2.00E-05	I	
79-10-7	Acrylic Acid		--	--	--			1.00E-03	I	
107-13-1	Acrylonitrile		--	--	--	6.80E-05	I	2.00E-03	I	
309-00-2	Aldrin		--	--	--	4.90E-03	I			
107-18-6	Allyl Alcohol		--	--	--			1.00E-04	X	
107-05-1	Allyl Chloride		--	--	--	6.00E-06	CA	1.00E-03	I	
7664-41-7	Ammonia		--	--	--			1.00E-01	I	
75-85-4	Amyl Alcohol, tert-		--	--	--			3.00E-03	X	
12674-11-2	Aroclor 1016		--	--	--	2.00E-05	S			
11104-28-2	Aroclor 1221		--	--	--	5.70E-04	S			
11141-16-5	Aroclor 1232		--	--	--	5.70E-04	S			
53469-21-9	Aroclor 1242		--	--	--	5.70E-04	S			
12672-29-6	Aroclor 1248		--	--	--	5.70E-04	S			
11097-69-1	Aroclor 1254		--	--	--	5.70E-04	S			
11096-82-5	Aroclor 1260		--	--	--	5.70E-04	S			
103-33-3	Azobenzene		--	--	--	3.10E-05	I			
56-55-3	Benz[a]anthracene		--	--	--	1.10E-04	CA			Mut
71-43-2	Benzene	1.6E-01	1.58E-02	4.4E-08	5.1E-04	7.80E-06	I	3.00E-02	I	
100-44-7	Benzyl Chloride		--	--	--	4.90E-05	CA	1.00E-03	P	
92-52-4	Biphenyl, 1,1'-		--	--	--			4.00E-04	X	
111-44-4	Bis(2-chloroethyl)ether		--	--	--	3.30E-04	I			
542-88-1	Bis(chloromethyl)ether		--	--	--	6.20E-02	I			
10294-34-5	Boron Trichloride		--	--	--			2.00E-02	P	
7637-07-2	Boron Trifluoride		--	--	--			1.30E-02	CA	
107-04-0	Bromo-2-chloroethane, 1-		--	--	--	6.00E-04	X			
108-86-1	Bromobenzene		--	--	--			6.00E-02	I	
74-97-5	Bromochloromethane		--	--	--			4.00E-02	X	
75-27-4	Bromodichloromethane		--	--	--	3.70E-05	CA			
75-25-2	Bromoform		--	--	--	1.10E-06	I			
74-83-9	Bromomethane		--	--	--			5.00E-03	I	
106-99-0	Butadiene, 1,3-		--	--	--	3.00E-05	I	2.00E-03	I	
78-92-2	Butyl alcohol, sec-		--	--	--			3.00E+01	P	
75-15-0	Carbon Disulfide		--	--	--			7.00E-01	I	
56-23-5	Carbon Tetrachloride		--	--	--	6.00E-06	I	1.00E-01	I	
463-58-1	Carbonyl Sulfide		--	--	--			1.00E-01	P	
12789-03-6	Chlordane		--	--	--	1.00E-04	I	7.00E-04	I	
7782-50-5	Chlorine		--	--	--			1.50E-04	A	
10049-04-4	Chlorine Dioxide		--	--	--			2.00E-04	I	
75-68-3	Chloro-1,1-difluoroethane, 1-		--	--	--			5.00E+01	I	
126-99-8	Chloro-1,3-butadiene, 2-		--	--	--	3.00E-04	I	2.00E-02	I	
108-90-7	Chlorobenzene		--	--	--			5.00E-02	P	
98-56-6	Chlorobenzotrifluoride, 4-		--	--	--			3.00E-01	P	
75-45-6	Chlorodifluoromethane		--	--	--			5.00E+01	I	
67-66-3	Chloroform		--	--	--	2.30E-05	I	9.80E-02	A	
74-87-3	Chloromethane		--	--	--			9.00E-02	I	
107-30-2	Chloromethyl Methyl Ether		--	--	--	6.90E-04	CA			
76-06-2	Chloropicrin		--	--	--			4.00E-04	CA	
8007-45-2	Coke Oven Emissions		--	--	--	6.20E-04	I			Mut
98-82-8	Cumene		--	--	--			4.00E-01	I	
57-12-5	Cyanide (CN-)		--	--	--			8.00E-04	S	

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	8	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
110-82-7	Cyclohexane		--	--	--			6.00E+00	I	
108-94-1	Cyclohexanone		--	--	--			7.00E-01	P	
110-83-8	Cyclohexene		--	--	--			1.00E+00	X	
72-55-9	DDE, p,p'-		--	--	--	9.70E-05	CA			
96-12-8	Dibromo-3-chloropropane, 1,2-		--	--	--	6.00E-03	P	2.00E-04	I	Mut
106-93-4	Dibromoethane, 1,2-		--	--	--	6.00E-04	I	9.00E-03	I	
74-95-3	Dibromomethane (Methylene Bromide)		--	--	--			4.00E-03	X	
764-41-0	Dichloro-2-butene, 1,4-		--	--	--	4.20E-03	P			
1476-11-5	Dichloro-2-butene, cis-1,4-		--	--	--	4.20E-03	P			
110-57-6	Dichloro-2-butene, trans-1,4-		--	--	--	4.20E-03	P			
95-50-1	Dichlorobenzene, 1,2-		--	--	--			2.00E-01	H	
106-46-7	Dichlorobenzene, 1,4-		--	--	--	1.10E-05	CA	8.00E-01	I	
75-71-8	Dichlorodifluoromethane		--	--	--			1.00E-01	X	
75-34-3	Dichloroethane, 1,1-	8.8E-01	9.43E-02	5.4E-08	No RfC	1.60E-06	CA			
107-06-2	Dichloroethane, 1,2-		--	--	--	2.60E-05	I	7.00E-03	P	
75-35-4	Dichloroethylene, 1,1-		--	--	--			2.00E-01	I	
78-87-5	Dichloropropane, 1,2-		--	--	--	1.00E-05	CA	4.00E-03	I	
542-75-6	Dichloropropene, 1,3-		--	--	--	4.00E-06	I	2.00E-02	I	
77-73-6	Dicyclopentadiene		--	--	--			3.00E-04	X	
75-37-6	Difluoroethane, 1,1-		--	--	--			4.00E+01	I	
94-58-6	Dihydrosafrole		--	--	--	1.30E-05	CA			
108-20-3	Diisopropyl Ether		--	--	--			7.00E-01	P	
68-12-2	Dimethylformamide		--	--	--			3.00E-02	I	
57-14-7	Dimethylhydrazine, 1,1-		--	--	--			2.00E-06	X	
540-73-8	Dimethylhydrazine, 1,2-		--	--	--	1.60E-01	CA			
513-37-1	Dimethylvinylchloride		--	--	--	1.30E-05	CA			
123-91-1	Dioxane, 1,4-		--	--	--	5.00E-06	I	3.00E-02	I	
106-89-8	Epichlorohydrin		--	--	--	1.20E-06	I	1.00E-03	I	
106-88-7	Epoxybutane, 1,2-		--	--	--			2.00E-02	I	
111-15-9	Ethoxyethanol Acetate, 2-		--	--	--			6.00E-02	P	
110-80-5	Ethoxyethanol, 2-		--	--	--			2.00E-01	I	
141-78-6	Ethyl Acetate		--	--	--			7.00E-02	P	
140-88-5	Ethyl Acrylate		--	--	--			8.00E-03	P	
75-00-3	Ethyl Chloride (Chloroethane)		--	--	--			1.00E+01	I	
97-63-2	Ethyl Methacrylate		--	--	--			3.00E-01	P	
100-41-4	Ethylbenzene		--	--	--	2.50E-06	CA	1.00E+00	I	
75-21-8	Ethylene Oxide		--	--	--	8.80E-05	CA	3.00E-02	CA	
151-56-4	Ethyleneimine		--	--	--	1.90E-02	CA			
50-00-0	Formaldehyde		--	--	--	1.30E-05	I	9.80E-03	A	
64-18-6	Formic Acid		--	--	--			3.00E-04	X	
98-01-1	Furfural		--	--	--			5.00E-02	H	
765-34-4	Glycidyl		--	--	--			1.00E-03	H	
76-44-8	Heptachlor		--	--	--	1.30E-03	I			
1024-57-3	Heptachlor Epoxide		--	--	--	2.60E-03	I			
39635-31-9	Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)		--	--	--	1.10E-03	E	1.30E-03	E	
118-74-1	Hexachlorobenzene		--	--	--	4.60E-04	I			
38380-08-4	Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)		--	--	--	1.10E-03	E	1.30E-03	E	
69782-90-7	Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)		--	--	--	1.10E-03	E	1.30E-03	E	
52663-72-6	Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)		--	--	--	1.10E-03	E	1.30E-03	E	
32774-16-6	Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)		--	--	--	1.10E+00	E	1.30E-06	E	
87-68-3	Hexachlorobutadiene		--	--	--	2.20E-05	I			
77-47-4	Hexachlorocyclopentadiene		--	--	--			2.00E-04	I	
67-72-1	Hexachloroethane		--	--	--	1.10E-05	CA	3.00E-02	I	

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EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	8	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
822-06-0	Hexamethylene Diisocyanate, 1,6-		--	--	--			1.00E-05	I	
110-54-3	Hexane, N-		--	--	--			7.00E-01	I	
591-78-6	Hexanone, 2-		--	--	--			3.00E-02	I	
302-01-2	Hydrazine		--	--	--	4.90E-03	I	3.00E-05	P	
7647-01-0	Hydrogen Chloride		--	--	--			2.00E-02	I	
74-90-8	Hydrogen Cyanide		--	--	--			8.00E-04	I	
7664-39-3	Hydrogen Fluoride		--	--	--			1.40E-02	CA	
7783-06-4	Hydrogen Sulfide		--	--	--			2.00E-03	I	
67-63-0	Isopropanol		--	--	--			2.00E-01	P	
7439-97-6	Mercury (elemental)		--	--	--			3.00E-04	I	
126-98-7	Methacrylonitrile		--	--	--			3.00E-02	P	
67-56-1	Methanol		--	--	--			2.00E+01	I	
110-49-6	Methoxyethanol Acetate, 2-		--	--	--			1.00E-03	P	
109-86-4	Methoxyethanol, 2-		--	--	--			2.00E-02	I	
96-33-3	Methyl Acrylate		--	--	--			2.00E-02	P	
78-93-3	Methyl Ethyl Ketone (2-Butanone)	2.3E+00	2.26E-03	No IUR	4.3E-07			5.00E+00	I	
60-34-4	Methyl Hydrazine		--	--	--	1.00E-03	X	2.00E-05	X	
108-10-1	Methyl Isobutyl Ketone (4-methyl-2-pentanone)		--	--	--			3.00E+00	I	
624-83-9	Methyl Isocyanate		--	--	--			1.00E-03	CA	
80-62-6	Methyl Methacrylate		--	--	--			7.00E-01	I	
25013-15-4	Methyl Styrene (Mixed Isomers)		--	--	--			4.00E-02	H	
1634-04-4	Methyl tert-Butyl Ether (MTBE)		--	--	--	2.60E-07	CA	3.00E+00	I	
75-09-2	Methylene Chloride	5.9E-01	3.81E-02	3.8E-10	6.1E-05	1.00E-08	I	6.00E-01	I	Mut
2385-85-5	Mirex		--	--	--	5.10E-03	CA			
64742-95-6	Naphtha, High Flash Aromatic (HFAN)		--	--	--			1.00E-01	P	
91-20-3	Naphthalene		--	--	--	3.40E-05	CA	3.00E-03	I	
13463-39-3	Nickel Carbonyl		--	--	--	2.60E-04	CA	1.40E-05	CA	
98-95-3	Nitrobenzene		--	--	--	4.00E-05	I	9.00E-03	I	
75-52-5	Nitromethane		--	--	--	8.80E-06	P	5.00E-03	P	
79-46-9	Nitropropane, 2-		--	--	--	2.70E-03	H	2.00E-02	I	
62-75-9	Nitrosodimethylamine, N-		--	--	--	1.40E-02	I	4.00E-05	X	Mut
924-16-3	Nitroso-di-N-butylamine, N-		--	--	--	1.60E-03	I			
10595-95-6	Nitrosomethylethylamine, N-		--	--	--	6.30E-03	CA			
111-84-2	Nonane, n-		--	--	--			2.00E-02	P	
32598-14-4	Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)		--	--	--	1.10E-03	E	1.30E-03	E	
74472-37-0	Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)		--	--	--	1.10E-03	E	1.30E-03	E	
31508-00-6	Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)		--	--	--	1.10E-03	E	1.30E-03	E	
65510-44-3	Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)		--	--	--	1.10E-03	E	1.30E-03	E	
57465-28-8	Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)		--	--	--	3.80E+00	E	4.00E-07	E	
109-66-0	Pentane, n-		--	--	--			1.00E+00	P	
75-44-5	Phosgene		--	--	--			3.00E-04	I	
7803-51-2	Phosphine		--	--	--			3.00E-04	I	
123-38-6	Propionaldehyde		--	--	--			8.00E-03	I	
103-65-1	Propyl benzene		--	--	--			1.00E+00	X	
115-07-1	Propylene		--	--	--			3.00E+00	CA	
107-98-2	Propylene Glycol Monomethyl Ether		--	--	--			2.00E+00	I	
75-56-9	Propylene Oxide		--	--	--	3.70E-06	I	3.00E-02	I	
100-42-5	Styrene		--	--	--			1.00E+00	I	
7446-11-9	Sulfur Trioxide		--	--	--			1.00E-03	CA	
1746-01-6	TCDD, 2,3,7,8-		--	--	--	3.80E+01	CA	4.00E-08	CA	
70362-50-4	Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)		--	--	--	1.10E-02	E	1.30E-04	E	
630-20-6	Tetrachloroethane, 1,1,1,2-		--	--	--	7.40E-06	I			
79-34-5	Tetrachloroethane, 1,1,2,2-		--	--	--	5.80E-05	CA			

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127-18-4	Tetrachloroethylene	6.9E-01	1.88E-01	1.7E-08	4.5E-03	2.60E-07	I	4.00E-02	I	
811-97-2	Tetrafluoroethane, 1,1,1,2-		--	--	--			8.00E+01	I	
109-99-9	Tetrahydrofuran		--	--	--			2.00E+00	I	
7550-45-0	Titanium Tetrachloride		--	--	--			1.00E-04	A	
108-88-3	Toluene	3.2E-01	3.40E-02	No IUR	6.5E-06			5.00E+00	I	
584-84-9	Toluene-2,4-diisocyanate		--	--	--	1.10E-05	CA	8.00E-06	CA	
91-08-7	Toluene-2,6-diisocyanate		--	--	--	1.10E-05	CA	8.00E-06	CA	
76-13-1	Trichloro-1,2,2-trifluoroethane, 1,1,2-		--	--	--			3.00E+01	H	
120-82-1	Trichlorobenzene, 1,2,4-		--	--	--			2.00E-03	P	
71-55-6	Trichloroethane, 1,1,1-	3.7E+00	1.16E+00	No IUR	2.2E-04			5.00E+00	I	
79-00-5	Trichloroethane, 1,1,2-		--	--	--	1.60E-05	I	2.00E-04	X	
79-01-6	Trichloroethylene	5.8E-01	9.72E-02	2.0E-07	4.7E-02	see note	I	2.00E-03	I	TCE
96-18-4	Trichloropropane, 1,2,3-		--	--	--			3.00E-04	I	Mut
96-19-5	Trichloropropene, 1,2,3-		--	--	--			3.00E-04	P	
121-44-8	Triethylamine		--	--	--			7.00E-03	I	
420-46-2	Trifluoroethane, 1,1,1-		--	--	--			2.00E+01	P	
526-73-8	Trimethylbenzene, 1,2,3-		--	--	--			5.00E-03	P	
95-63-6	Trimethylbenzene, 1,2,4-		--	--	--			7.00E-03	P	
126-72-7	Tris(2,3-dibromopropyl)phosphate		--	--	--	6.60E-04	CA			
108-05-4	Vinyl Acetate		--	--	--			2.00E-01	I	
593-60-2	Vinyl Bromide		--	--	--	3.20E-05	H	3.00E-03	I	
75-01-4	Vinyl Chloride		--	--	--	4.40E-06	I	1.00E-01	I	VC
108-38-3	Xylene, m-		--	--	--			1.00E-01	S	
95-47-6	Xylene, o-		--	--	--			1.00E-01	S	
106-42-3	Xylene, P-		--	--	--			1.00E-01	S	
1330-20-7	Xylenes		--	--	--			1.00E-01	I	

Notes:

(1) **Inhalation Pathway Exposure Parameters (RME):**

Exposure Scenario	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Averaging time for carcinogens	(yrs)	ATc_R_GW	70	ATc_C_GW	70	ATc_GW	70
Averaging time for non-carcinogens	(yrs)	ATnc_R_GW	26	ATnc_C_GW	25	Atnc_GW	26
Exposure duration	(yrs)	ED_R_GW	26	ED_C_GW	25	ED_GW	26
Exposure frequency	(days/yr)	EF_R_GW	350	EF_C_GW	250	EF_GW	350
Exposure time	(hr/day)	ET_R_GW	24	ET_C_GW	8	ET_GW	24

(2) **Generic Attenuation Factors:**

Source Medium of Vapors		Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Groundwater	(-)	AFgw_R_GW	0.001	AFgw_C_GW	0.001	AFgw_GW	0.001
Sub-Slab and Exterior Soil Gas	(-)	AFss_R_GW	0.03	AFss_C_GW	0.03	AFss_GW	0.03

(3) **Formulas**

Cia, target = MIN(Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Trichloroethylene	mIURTCE_R_GW	1.00E-06	IURTCE_C_GW	0.00E+00	mIURTCE_GW	1.00E-06

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	8	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard		Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator	
		Cgw	Cia	CR	HQ		IUR		RfC		i	
		(ug/L)	(ug/m^3)				$(ug/m^3)^{-1}$		(mg/m^3)			
					IURTCE_R_GW	3.10E-06	IURTCE_C_GW	4.10E-06			IURTCE_GW	3.10E-06

Mutagenic Chemicals

The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration (years)	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 26 years	10	1

Mutagenic-mode-of-action (MMOA) adjustment factor 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride

See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html
P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml
A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html
CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp
H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml
S = See RSL User Guide, Section 5
X = PPRTV Appendix
Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).
VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).
TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).
Yellow highlighting indicates site-specific parameters that may be edited by the user.
Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.
Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	11	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
75-07-0	Acetaldehyde		--	--	--	2.20E-06	I	9.00E-03	I	
67-64-1	Acetone	1.3E+01	9.93E-03	No IUR	3.1E-07			3.10E+01	A	
75-05-8	Acetonitrile		--	--	--			6.00E-02	I	
107-02-8	Acrolein		--	--	--			2.00E-05	I	
79-10-7	Acrylic Acid		--	--	--			1.00E-03	I	
107-13-1	Acrylonitrile		--	--	--	6.80E-05	I	2.00E-03	I	
309-00-2	Aldrin		--	--	--	4.90E-03	I			
107-18-6	Allyl Alcohol		--	--	--			1.00E-04	X	
107-05-1	Allyl Chloride		--	--	--	6.00E-06	CA	1.00E-03	I	
7664-41-7	Ammonia		--	--	--			1.00E-01	I	
75-85-4	Amyl Alcohol, tert-		--	--	--			3.00E-03	X	
12674-11-2	Aroclor 1016		--	--	--	2.00E-05	S			
11104-28-2	Aroclor 1221		--	--	--	5.70E-04	S			
11141-16-5	Aroclor 1232		--	--	--	5.70E-04	S			
53469-21-9	Aroclor 1242		--	--	--	5.70E-04	S			
12672-29-6	Aroclor 1248		--	--	--	5.70E-04	S			
11097-69-1	Aroclor 1254		--	--	--	5.70E-04	S			
11096-82-5	Aroclor 1260		--	--	--	5.70E-04	S			
103-33-3	Azobenzene		--	--	--	3.10E-05	I			
56-55-3	Benz[a]anthracene		--	--	--	1.10E-04	CA			Mut
71-43-2	Benzene	1.7E-01	1.96E-02	5.5E-08	6.3E-04	7.80E-06	I	3.00E-02	I	
100-44-7	Benzyl Chloride		--	--	--	4.90E-05	CA	1.00E-03	P	
92-52-4	Biphenyl, 1,1'-		--	--	--			4.00E-04	X	
111-44-4	Bis(2-chloroethyl)ether		--	--	--	3.30E-04	I			
542-88-1	Bis(chloromethyl)ether		--	--	--	6.20E-02	I			
10294-34-5	Boron Trichloride		--	--	--			2.00E-02	P	
7637-07-2	Boron Trifluoride		--	--	--			1.30E-02	CA	
107-04-0	Bromo-2-chloroethane, 1-		--	--	--	6.00E-04	X			
108-86-1	Bromobenzene		--	--	--			6.00E-02	I	
74-97-5	Bromochloromethane		--	--	--			4.00E-02	X	
75-27-4	Bromodichloromethane		--	--	--	3.70E-05	CA			
75-25-2	Bromoform		--	--	--	1.10E-06	I			
74-83-9	Bromomethane		--	--	--			5.00E-03	I	
106-99-0	Butadiene, 1,3-		--	--	--	3.00E-05	I	2.00E-03	I	
78-92-2	Butyl alcohol, sec-		--	--	--			3.00E+01	P	
75-15-0	Carbon Disulfide	3.7E-01	1.25E-01	No IUR	1.7E-04			7.00E-01	I	
56-23-5	Carbon Tetrachloride		--	--	--	6.00E-06	I	1.00E-01	I	
463-58-1	Carbonyl Sulfide		--	--	--			1.00E-01	P	
12789-03-6	Chlordane		--	--	--	1.00E-04	I	7.00E-04	I	
7782-50-5	Chlorine		--	--	--			1.50E-04	A	
10049-04-4	Chlorine Dioxide		--	--	--			2.00E-04	I	
75-68-3	Chloro-1,1-difluoroethane, 1-		--	--	--			5.00E+01	I	
126-99-8	Chloro-1,3-butadiene, 2-		--	--	--	3.00E-04	I	2.00E-02	I	
108-90-7	Chlorobenzene		--	--	--			5.00E-02	P	
98-56-6	Chlorobenzotrifluoride, 4-		--	--	--			3.00E-01	P	
75-45-6	Chlorodifluoromethane		--	--	--			5.00E+01	I	
67-66-3	Chloroform		--	--	--	2.30E-05	I	9.80E-02	A	
74-87-3	Chloromethane		--	--	--			9.00E-02	I	
107-30-2	Chloromethyl Methyl Ether		--	--	--	6.90E-04	CA			
76-06-2	Chloropicrin		--	--	--			4.00E-04	CA	
8007-45-2	Coke Oven Emissions		--	--	--	6.20E-04	I			Mut
98-82-8	Cumene		--	--	--			4.00E-01	I	
57-12-5	Cyanide (CN-)		--	--	--			8.00E-04	S	

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	11	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
110-82-7	Cyclohexane		--	--	--			6.00E+00	I	
108-94-1	Cyclohexanone		--	--	--			7.00E-01	P	
110-83-8	Cyclohexene		--	--	--			1.00E+00	X	
72-55-9	DDE, p,p'-		--	--	--	9.70E-05	CA			
96-12-8	Dibromo-3-chloropropane, 1,2-		--	--	--	6.00E-03	P	2.00E-04	I	Mut
106-93-4	Dibromoethane, 1,2-		--	--	--	6.00E-04	I	9.00E-03	I	
74-95-3	Dibromomethane (Methylene Bromide)		--	--	--			4.00E-03	X	
764-41-0	Dichloro-2-butene, 1,4-		--	--	--	4.20E-03	P			
1476-11-5	Dichloro-2-butene, cis-1,4-		--	--	--	4.20E-03	P			
110-57-6	Dichloro-2-butene, trans-1,4-		--	--	--	4.20E-03	P			
95-50-1	Dichlorobenzene, 1,2-		--	--	--			2.00E-01	H	
106-46-7	Dichlorobenzene, 1,4-		--	--	--	1.10E-05	CA	8.00E-01	I	
75-71-8	Dichlorodifluoromethane		--	--	--			1.00E-01	X	
75-34-3	Dichloroethane, 1,1-	8.0E-01	9.90E-02	5.6E-08	No RfC	1.60E-06	CA			
107-06-2	Dichloroethane, 1,2-		--	--	--	2.60E-05	I	7.00E-03	P	
75-35-4	Dichloroethylene, 1,1-		--	--	--			2.00E-01	I	
78-87-5	Dichloropropane, 1,2-		--	--	--	1.00E-05	CA	4.00E-03	I	
542-75-6	Dichloropropene, 1,3-		--	--	--	4.00E-06	I	2.00E-02	I	
77-73-6	Dicyclopentadiene		--	--	--			3.00E-04	X	
75-37-6	Difluoroethane, 1,1-		--	--	--			4.00E+01	I	
94-58-6	Dihydrosafrole		--	--	--	1.30E-05	CA			
108-20-3	Diisopropyl Ether		--	--	--			7.00E-01	P	
68-12-2	Dimethylformamide		--	--	--			3.00E-02	I	
57-14-7	Dimethylhydrazine, 1,1-		--	--	--			2.00E-06	X	
540-73-8	Dimethylhydrazine, 1,2-		--	--	--	1.60E-01	CA			
513-37-1	Dimethylvinylchloride		--	--	--	1.30E-05	CA			
123-91-1	Dioxane, 1,4-		--	--	--	5.00E-06	I	3.00E-02	I	
106-89-8	Epichlorohydrin		--	--	--	1.20E-06	I	1.00E-03	I	
106-88-7	Epoxybutane, 1,2-		--	--	--			2.00E-02	I	
111-15-9	Ethoxyethanol Acetate, 2-		--	--	--			6.00E-02	P	
110-80-5	Ethoxyethanol, 2-		--	--	--			2.00E-01	I	
141-78-6	Ethyl Acetate		--	--	--			7.00E-02	P	
140-88-5	Ethyl Acrylate		--	--	--			8.00E-03	P	
75-00-3	Ethyl Chloride (Chloroethane)		--	--	--			1.00E+01	I	
97-63-2	Ethyl Methacrylate		--	--	--			3.00E-01	P	
100-41-4	Ethylbenzene		--	--	--	2.50E-06	CA	1.00E+00	I	
75-21-8	Ethylene Oxide		--	--	--	8.80E-05	CA	3.00E-02	CA	
151-56-4	Ethyleneimine		--	--	--	1.90E-02	CA			
50-00-0	Formaldehyde		--	--	--	1.30E-05	I	9.80E-03	A	
64-18-6	Formic Acid		--	--	--			3.00E-04	X	
98-01-1	Furfural		--	--	--			5.00E-02	H	
765-34-4	Glycidyl		--	--	--			1.00E-03	H	
76-44-8	Heptachlor		--	--	--	1.30E-03	I			
1024-57-3	Heptachlor Epoxide		--	--	--	2.60E-03	I			
39635-31-9	Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)		--	--	--	1.10E-03	E	1.30E-03	E	
118-74-1	Hexachlorobenzene		--	--	--	4.60E-04	I			
38380-08-4	Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)		--	--	--	1.10E-03	E	1.30E-03	E	
69782-90-7	Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)		--	--	--	1.10E-03	E	1.30E-03	E	
52663-72-6	Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)		--	--	--	1.10E-03	E	1.30E-03	E	
32774-16-6	Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)		--	--	--	1.10E+00	E	1.30E-06	E	
87-68-3	Hexachlorobutadiene		--	--	--	2.20E-05	I			
77-47-4	Hexachlorocyclopentadiene		--	--	--			2.00E-04	I	
67-72-1	Hexachloroethane		--	--	--	1.10E-05	CA	3.00E-02	I	

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EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	11	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR ($(ug/m^3)^{-1}$)	IUR Source*	Reference Concentration RfC ((mg/m^3))	RFC Source*	Mutagenic Indicator i
822-06-0	Hexamethylene Diisocyanate, 1,6-		--	--	--			1.00E-05	I	
110-54-3	Hexane, N-		--	--	--			7.00E-01	I	
591-78-6	Hexanone, 2-		--	--	--			3.00E-02	I	
302-01-2	Hydrazine		--	--	--	4.90E-03	I	3.00E-05	P	
7647-01-0	Hydrogen Chloride		--	--	--			2.00E-02	I	
74-90-8	Hydrogen Cyanide		--	--	--			8.00E-04	I	
7664-39-3	Hydrogen Fluoride		--	--	--			1.40E-02	CA	
7783-06-4	Hydrogen Sulfide		--	--	--			2.00E-03	I	
67-63-0	Isopropanol		--	--	--			2.00E-01	P	
7439-97-6	Mercury (elemental)		--	--	--			3.00E-04	I	
126-98-7	Methacrylonitrile		--	--	--			3.00E-02	P	
67-56-1	Methanol		--	--	--			2.00E+01	I	
110-49-6	Methoxyethanol Acetate, 2-		--	--	--			1.00E-03	P	
109-86-4	Methoxyethanol, 2-		--	--	--			2.00E-02	I	
96-33-3	Methyl Acrylate		--	--	--			2.00E-02	P	
78-93-3	Methyl Ethyl Ketone (2-Butanone)		--	--	--			5.00E+00	I	
60-34-4	Methyl Hydrazine		--	--	--	1.00E-03	X	2.00E-05	X	
108-10-1	Methyl Isobutyl Ketone (4-methyl-2-pentanone)		--	--	--			3.00E+00	I	
624-83-9	Methyl Isocyanate		--	--	--			1.00E-03	CA	
80-62-6	Methyl Methacrylate		--	--	--			7.00E-01	I	
25013-15-4	Methyl Styrene (Mixed Isomers)		--	--	--			4.00E-02	H	
1634-04-4	Methyl tert-Butyl Ether (MTBE)		--	--	--	2.60E-07	CA	3.00E+00	I	
75-09-2	Methylene Chloride		--	--	--	1.00E-08	I	6.00E-01	I	Mut
2385-85-5	Mirex		--	--	--	5.10E-03	CA			
64742-95-6	Naphtha, High Flash Aromatic (HFAN)		--	--	--			1.00E-01	P	
91-20-3	Naphthalene		--	--	--	3.40E-05	CA	3.00E-03	I	
13463-39-3	Nickel Carbonyl		--	--	--	2.60E-04	CA	1.40E-05	CA	
98-95-3	Nitrobenzene		--	--	--	4.00E-05	I	9.00E-03	I	
75-52-5	Nitromethane		--	--	--	8.80E-06	P	5.00E-03	P	
79-46-9	Nitropropane, 2-		--	--	--	2.70E-03	H	2.00E-02	I	
62-75-9	Nitrosodimethylamine, N-		--	--	--	1.40E-02	I	4.00E-05	X	Mut
924-16-3	Nitroso-di-N-butylamine, N-		--	--	--	1.60E-03	I			
10595-95-6	Nitrosomethylethylamine, N-		--	--	--	6.30E-03	CA			
111-84-2	Nonane, n-		--	--	--			2.00E-02	P	
32598-14-4	Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)		--	--	--	1.10E-03	E	1.30E-03	E	
74472-37-0	Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)		--	--	--	1.10E-03	E	1.30E-03	E	
31508-00-6	Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)		--	--	--	1.10E-03	E	1.30E-03	E	
65510-44-3	Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)		--	--	--	1.10E-03	E	1.30E-03	E	
57465-28-8	Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)		--	--	--	3.80E+00	E	4.00E-07	E	
109-66-0	Pentane, n-		--	--	--			1.00E+00	P	
75-44-5	Phosgene		--	--	--			3.00E-04	I	
7803-51-2	Phosphine		--	--	--			3.00E-04	I	
123-38-6	Propionaldehyde		--	--	--			8.00E-03	I	
103-65-1	Propyl benzene		--	--	--			1.00E+00	X	
115-07-1	Propylene		--	--	--			3.00E+00	CA	
107-98-2	Propylene Glycol Monomethyl Ether		--	--	--			2.00E+00	I	
75-56-9	Propylene Oxide		--	--	--	3.70E-06	I	3.00E-02	I	
100-42-5	Styrene		--	--	--			1.00E+00	I	
7446-11-9	Sulfur Trioxide		--	--	--			1.00E-03	CA	
1746-01-6	TCDD, 2,3,7,8-		--	--	--	3.80E+01	CA	4.00E-08	CA	
70362-50-4	Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)		--	--	--	1.10E-02	E	1.30E-04	E	
630-20-6	Tetrachloroethane, 1,1,1,2-		--	--	--	7.40E-06	I			
79-34-5	Tetrachloroethane, 1,1,2,2-		--	--	--	5.80E-05	CA			

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	11	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m^3)	VI Carcinogenic Risk CR	VI Hazard HQ	Inhalation Unit Risk IUR (ug/m^3)$^{-1}$	IUR Source*	Reference Concentration RfC (mg/m^3)	RFC Source*	Mutagenic Indicator i
127-18-4	Tetrachloroethylene	5.4E-01	1.77E-01	1.6E-08	4.2E-03	2.60E-07	I	4.00E-02	I	
811-97-2	Tetrafluoroethane, 1,1,1,2-		--	--	--			8.00E+01	I	
109-99-9	Tetrahydrofuran		--	--	--			2.00E+00	I	
7550-45-0	Titanium Tetrachloride		--	--	--			1.00E-04	A	
108-88-3	Toluene	2.7E-01	3.42E-02	No IUR	6.6E-06			5.00E+00	I	
584-84-9	Toluene-2,4-diisocyanate		--	--	--	1.10E-05	CA	8.00E-06	CA	
91-08-7	Toluene-2,6-diisocyanate		--	--	--	1.10E-05	CA	8.00E-06	CA	
76-13-1	Trichloro-1,2,2-trifluoroethane, 1,1,2-		--	--	--			3.00E+01	H	
120-82-1	Trichlorobenzene, 1,2,4-		--	--	--			2.00E-03	P	
71-55-6	Trichloroethane, 1,1,1-	3.3E+00	1.21E+00	No IUR	2.3E-04			5.00E+00	I	
79-00-5	Trichloroethane, 1,1,2-		--	--	--	1.60E-05	I	2.00E-04	X	
79-01-6	Trichloroethylene	7.2E-01	1.42E-01	3.0E-07	6.8E-02	see note	I	2.00E-03	I	TCE
96-18-4	Trichloropropane, 1,2,3-		--	--	--			3.00E-04	I	Mut
96-19-5	Trichloropropene, 1,2,3-		--	--	--			3.00E-04	P	
121-44-8	Triethylamine		--	--	--			7.00E-03	I	
420-46-2	Trifluoroethane, 1,1,1-		--	--	--			2.00E+01	P	
526-73-8	Trimethylbenzene, 1,2,3-		--	--	--			5.00E-03	P	
95-63-6	Trimethylbenzene, 1,2,4-		--	--	--			7.00E-03	P	
126-72-7	Tris(2,3-dibromopropyl)phosphate		--	--	--	6.60E-04	CA			
108-05-4	Vinyl Acetate		--	--	--			2.00E-01	I	
593-60-2	Vinyl Bromide		--	--	--	3.20E-05	H	3.00E-03	I	
75-01-4	Vinyl Chloride		--	--	--	4.40E-06	I	1.00E-01	I	VC
108-38-3	Xylene, m-		--	--	--			1.00E-01	S	
95-47-6	Xylene, o-		--	--	--			1.00E-01	S	
106-42-3	Xylene, P-		--	--	--			1.00E-01	S	
1330-20-7	Xylenes		--	--	--			1.00E-01	I	

Notes:

(1) **Inhalation Pathway Exposure Parameters (RME):**

Exposure Scenario	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Averaging time for carcinogens	(yrs)	ATc_R_GW	70	ATc_C_GW	70	ATc_GW	70
Averaging time for non-carcinogens	(yrs)	ATnc_R_GW	26	ATnc_C_GW	25	Atnc_GW	26
Exposure duration	(yrs)	ED_R_GW	26	ED_C_GW	25	ED_GW	26
Exposure frequency	(days/yr)	EF_R_GW	350	EF_C_GW	250	EF_GW	350
Exposure time	(hr/day)	ET_R_GW	24	ET_C_GW	8	ET_GW	24

(2) **Generic Attenuation Factors:**

Source Medium of Vapors		Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Groundwater	(-)	AFgw_R_GW	0.001	AFgw_C_GW	0.001	AFgw_GW	0.001
Sub-Slab and Exterior Soil Gas	(-)	AFss_R_GW	0.03	AFss_C_GW	0.03	AFss_GW	0.03

(3) **Formulas**

Cia, target = MIN(Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario) Symbol	Selected (based on scenario) Value
Trichloroethylene	mIURTCE_R_GW	1.00E-06	IURTCE_C_GW	0.00E+00	mIURTCE_GW	1.00E-06

Table I. USEPA Vapor Intrusion Screening Level Calculator - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

EPA-OLEM VAPOR INTRUSION ASSESSMENT
Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.5.1 (May 2016 RSLs)

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	0.1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (^oC)	Tgw	11	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard		Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator	
		Cgw	Cia	CR	HQ		IUR		RfC		i	
		(ug/L)	(ug/m^3)				$(ug/m^3)^{-1}$		(mg/m^3)			
					IURTCE_R_GW	3.10E-06	IURTCE_C_GW	4.10E-06			IURTCE_GW	3.10E-06

Mutagenic Chemicals

The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration (years)	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 26 years	10	1

Mutagenic-mode-of-action (MMOA) adjustment factor 72 This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride

See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html
P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhpprtv.ornl.gov/pprtv.shtml
A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html
CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp
H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml
S = See RSL User Guide, Section 5
X = PPRTV Appendix
Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).
VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).
TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).
Yellow highlighting indicates site-specific parameters that may be edited by the user.
Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.
Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).

APPENDIX J

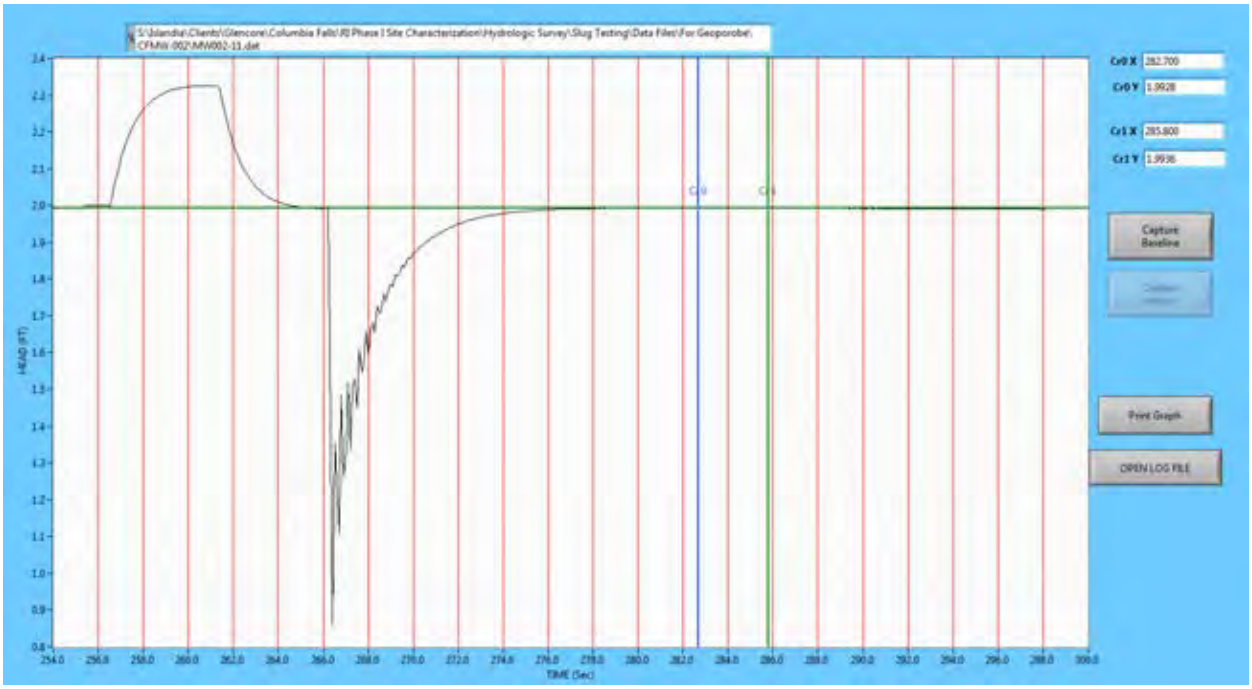
Slug Testing Curves

1. Geoprobe Software Slug Testing Curves
2. Aqtesolv Software Slug Testing Curves

APPENDIX J-1

Geoprobe Software Slug Testing Curves

CFMW-002
1 Foot Displacement
Test #1



SITE INFORMATION -- SLUG TEST REV. 3.0

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START TIME: 12:55 PM
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UNITS: ENGLISH
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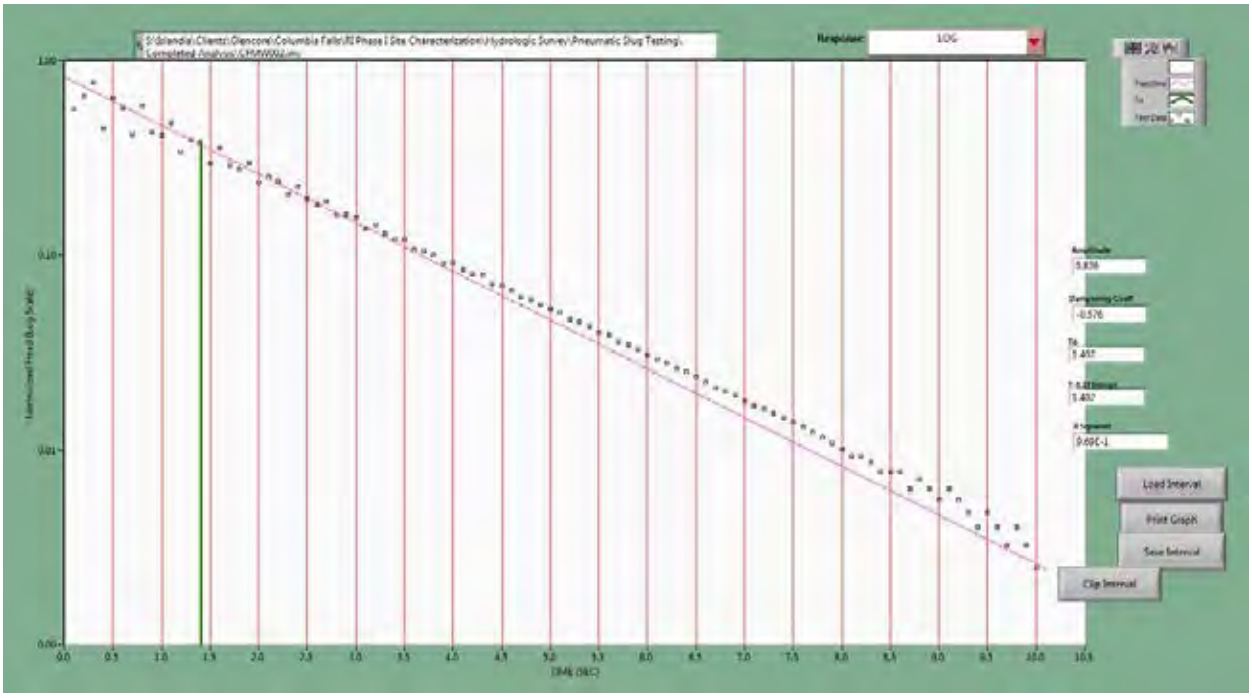
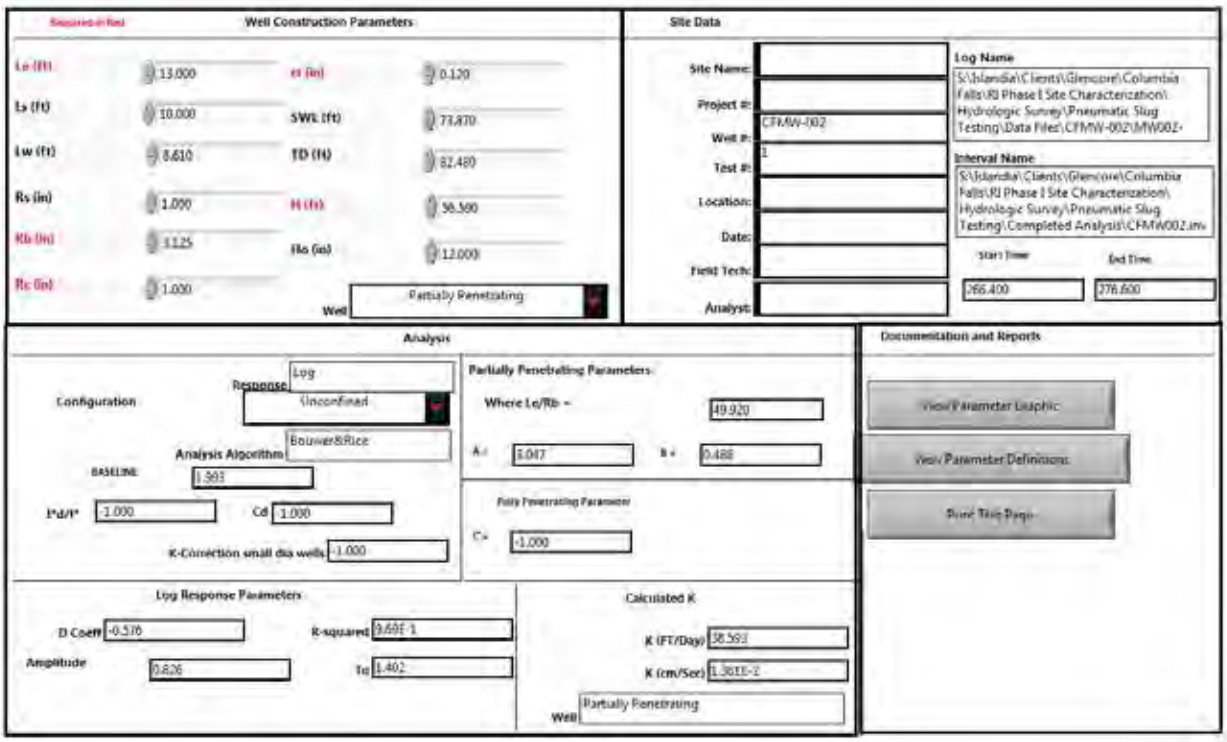
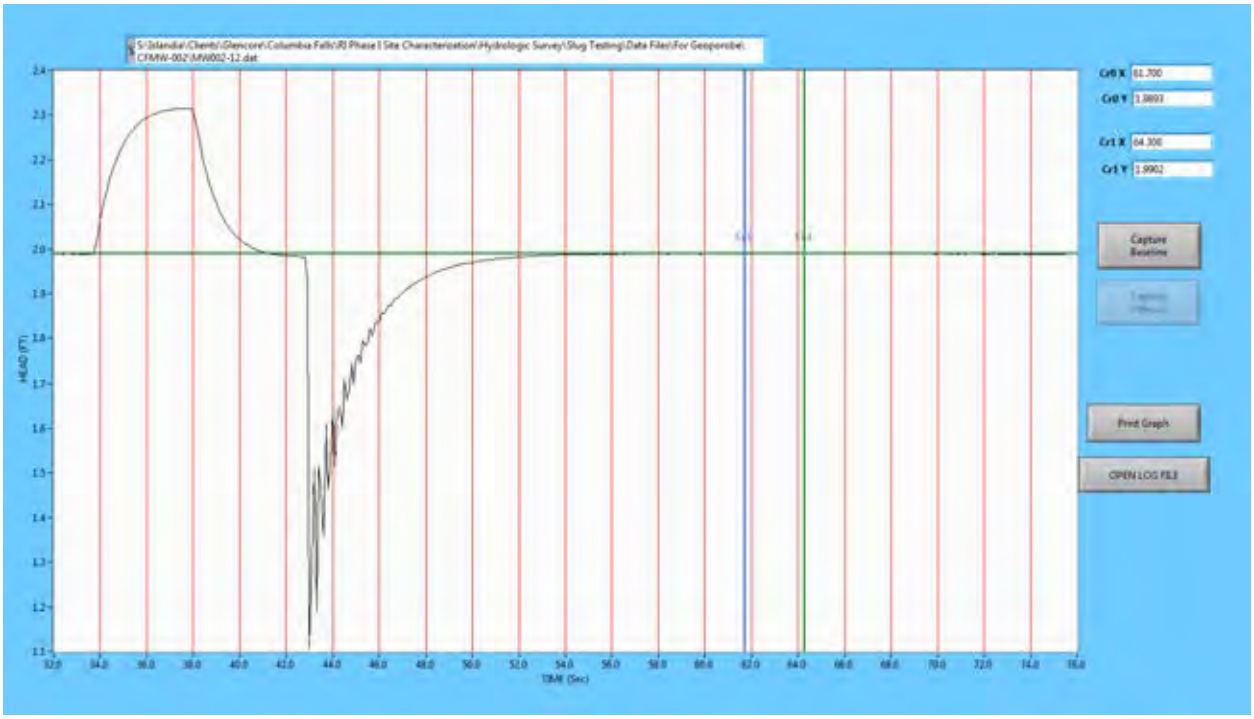
LOG FREQUENCY: 10 Hz

CFMW-002
1 Foot Displacement
Test #1





CFMW-002
1 Foot Displacement
Test #2



SITE INFORMATION -- SLUG TEST REV. 3.0

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START TIME: 1:00 PM
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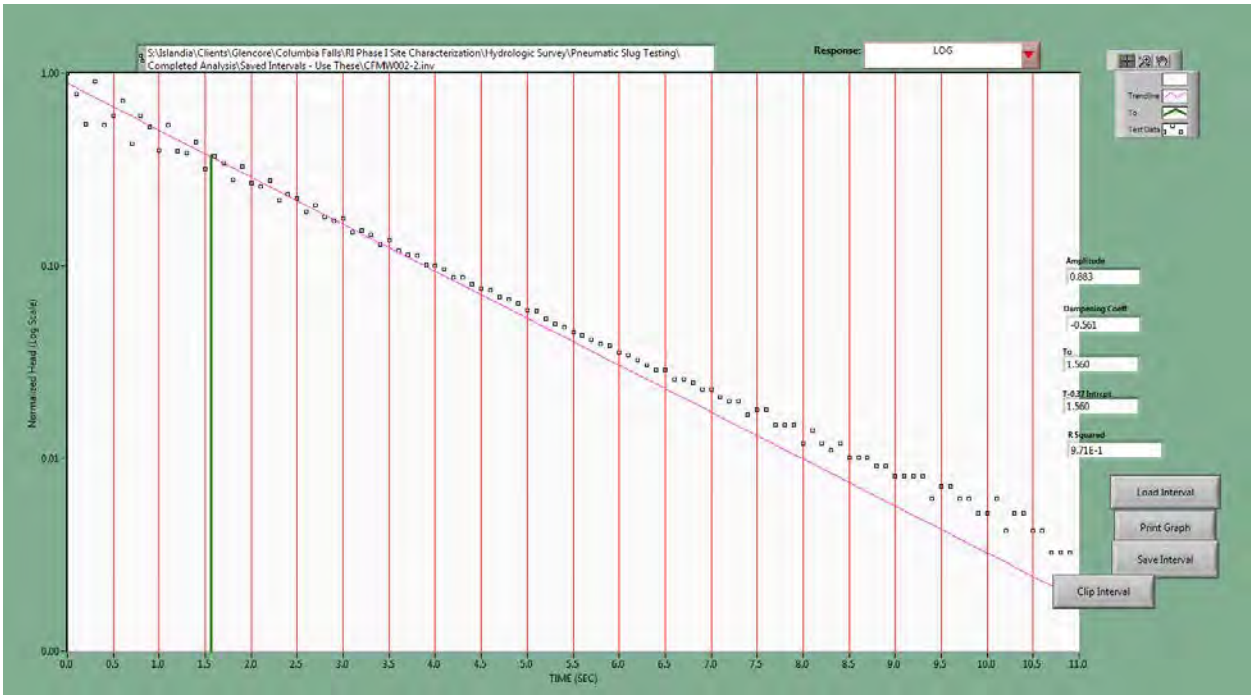
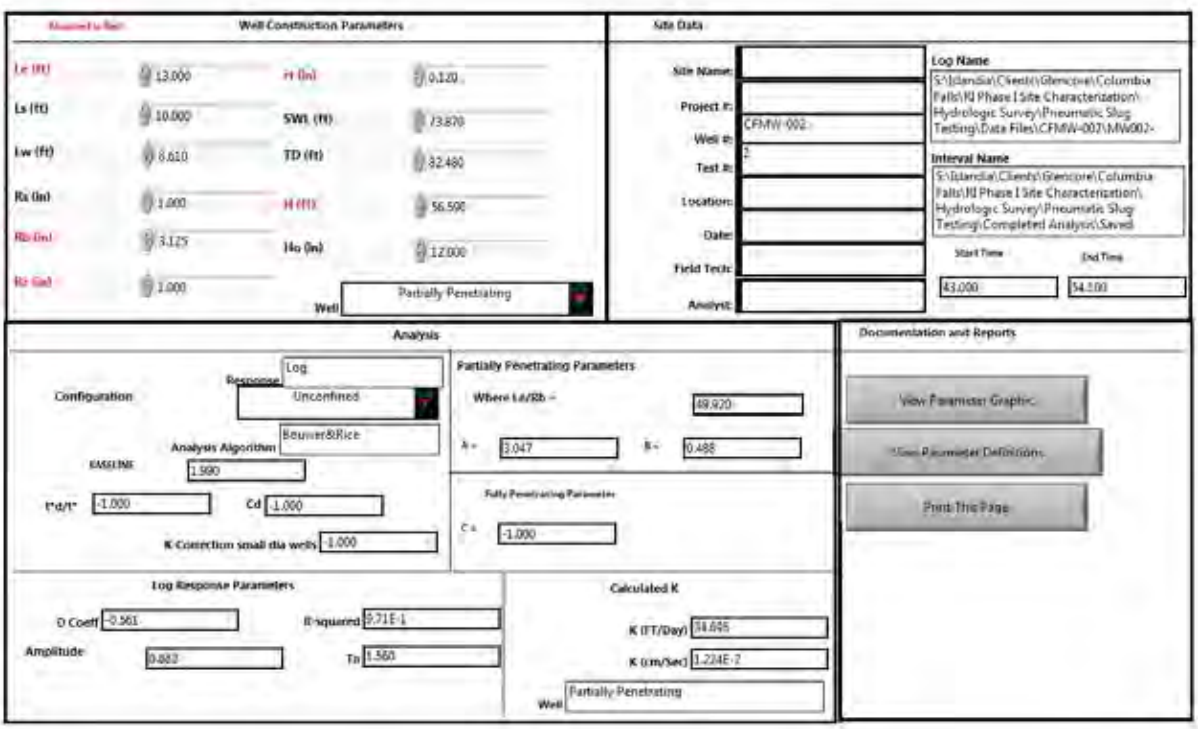
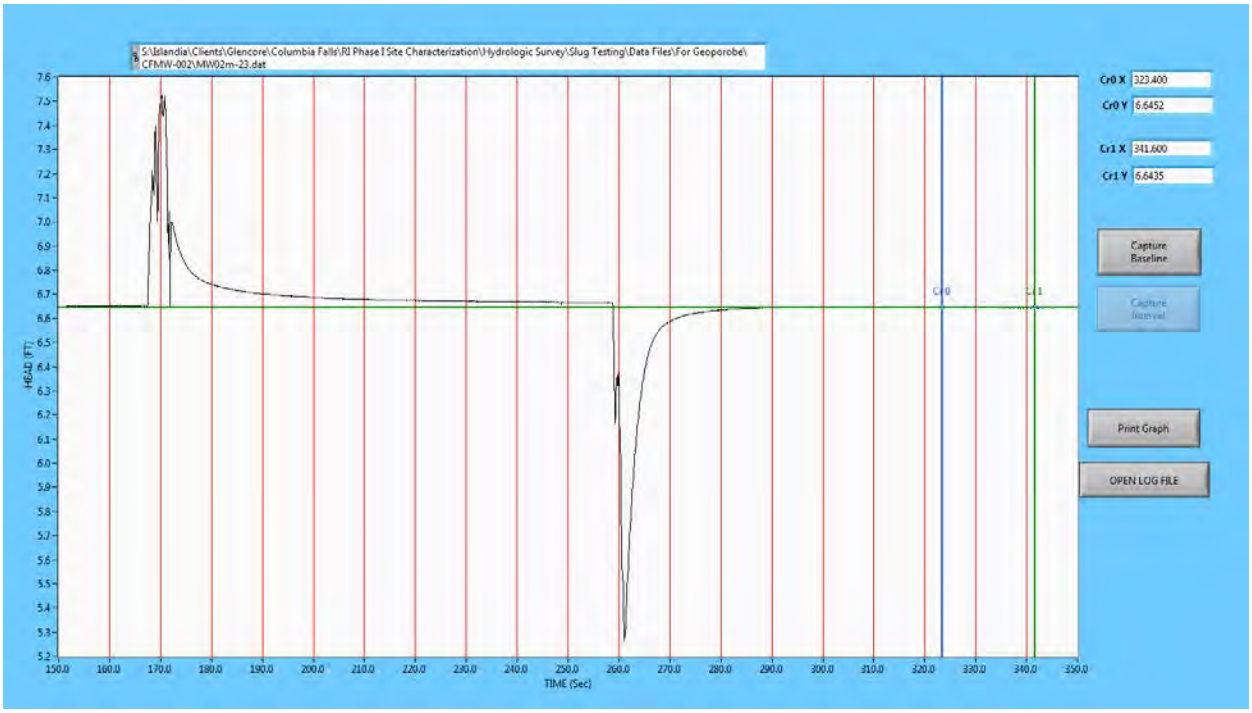
LOG FREQUENCY: 10 Hz

CFMW-002
1 Foot Displacement
Test #2





CFMW-002
2 Foot Displacement
Test #1



SITE INFORMATION -- SLUG TEST REV. 3.0

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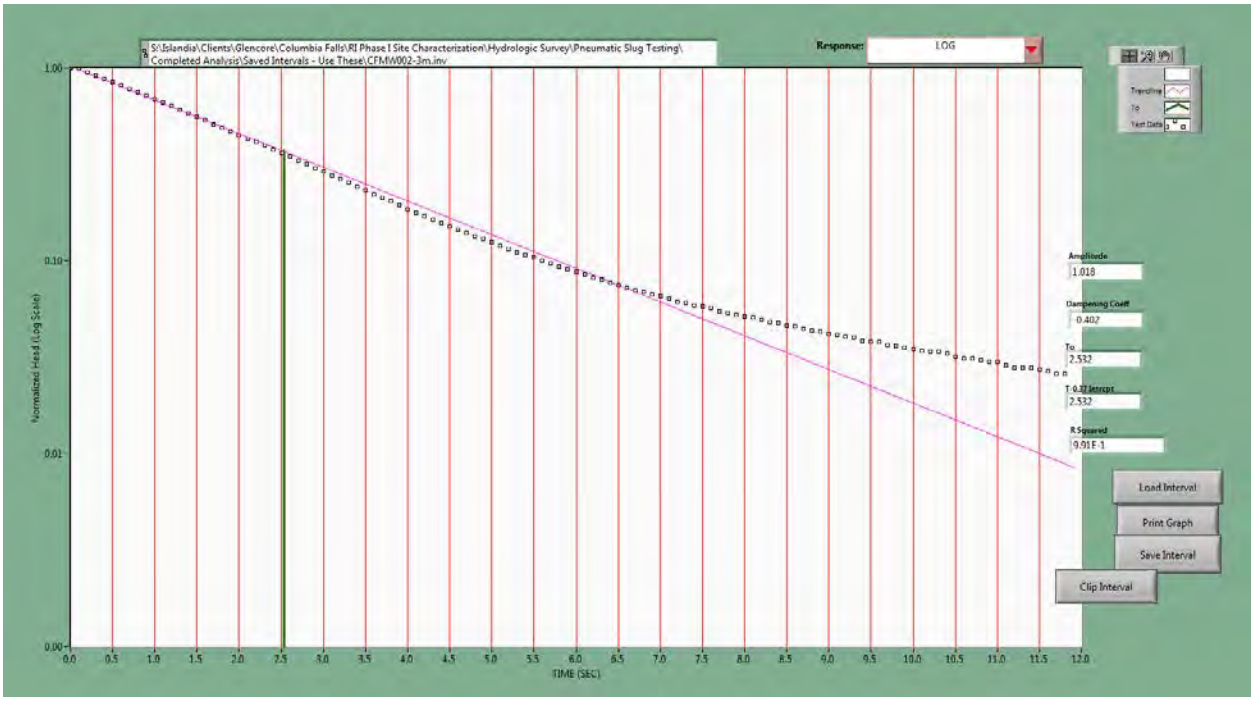
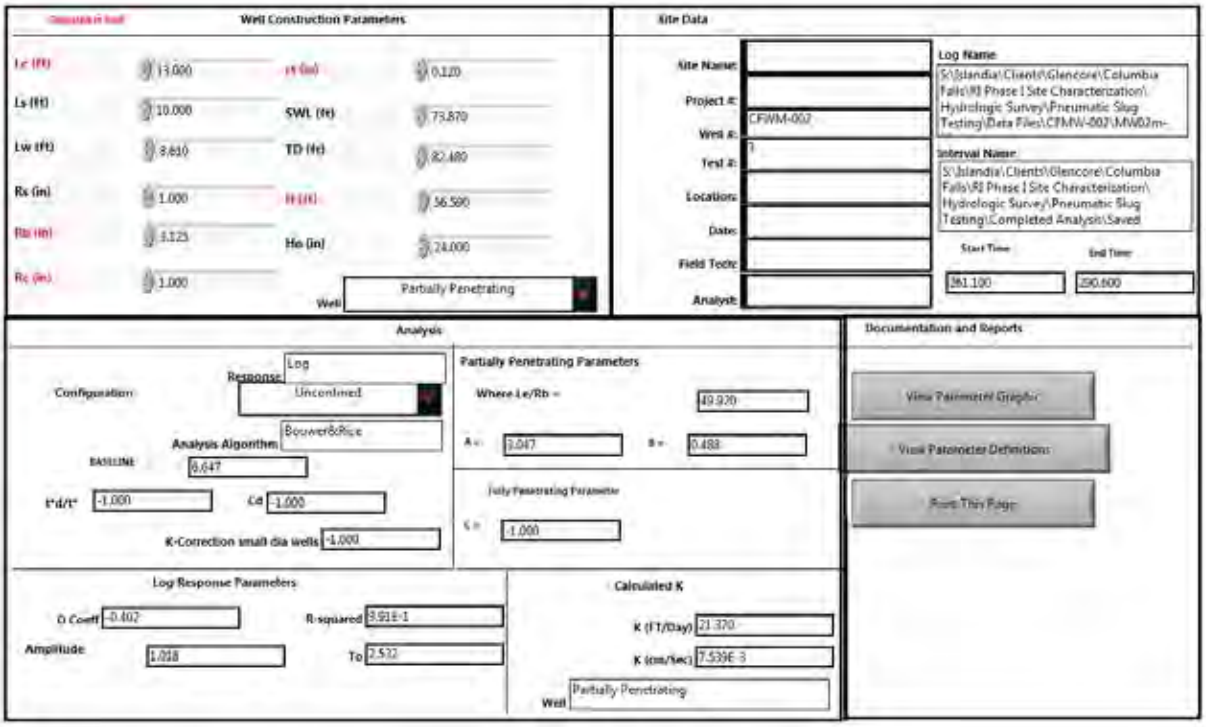
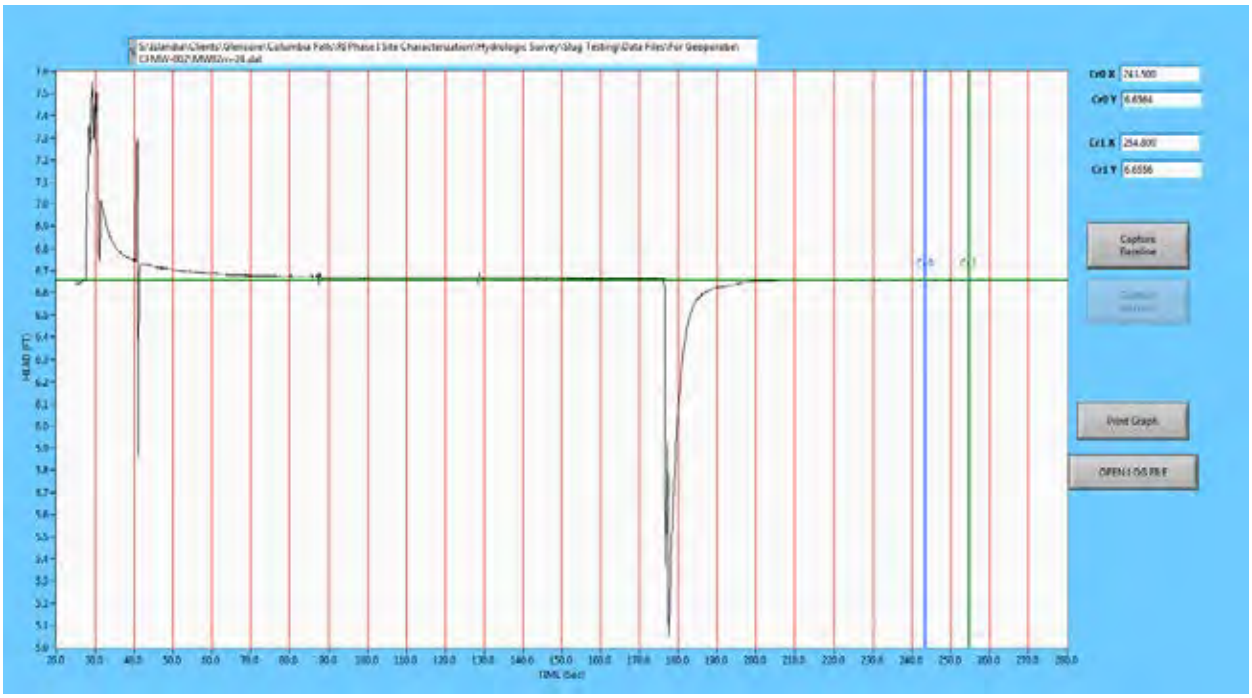
LOG FREQUENCY: 10 Hz

CFMW-002
2 Foot Displacement
Test #1





CFMW-002
2 Foot Displacement
Test #2



SITE INFORMATION -- SLUG TEST REV. 3.0

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START TIME: 10:14 AM
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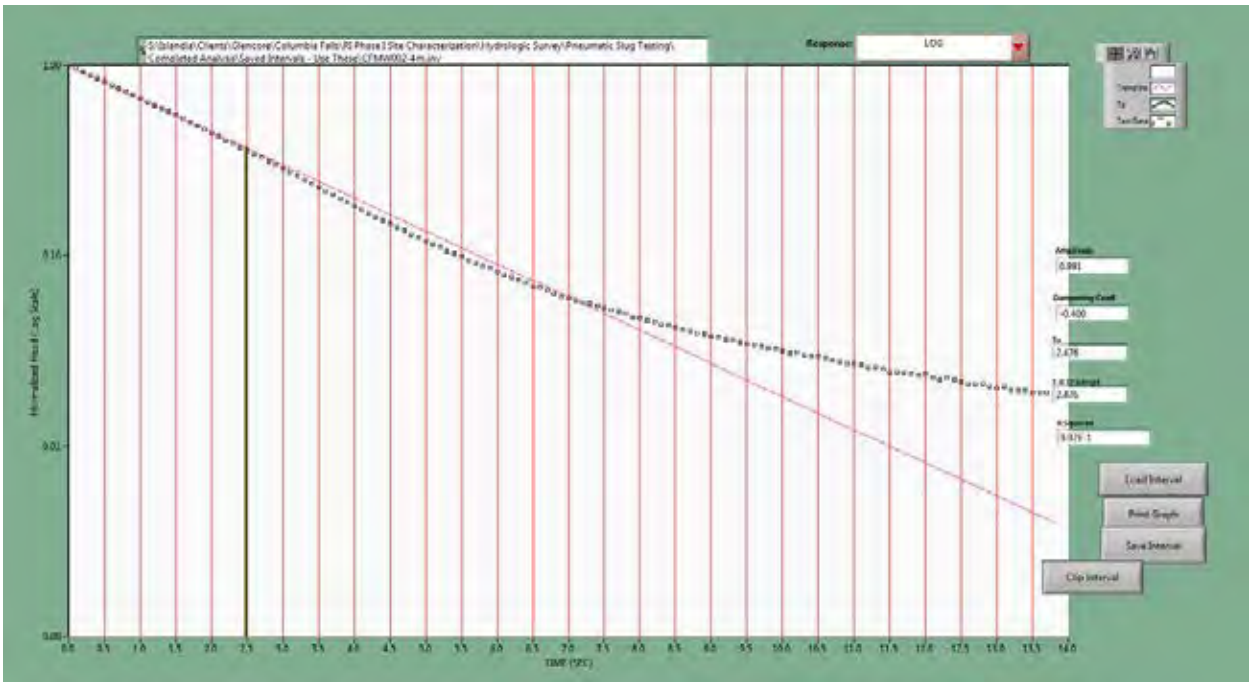
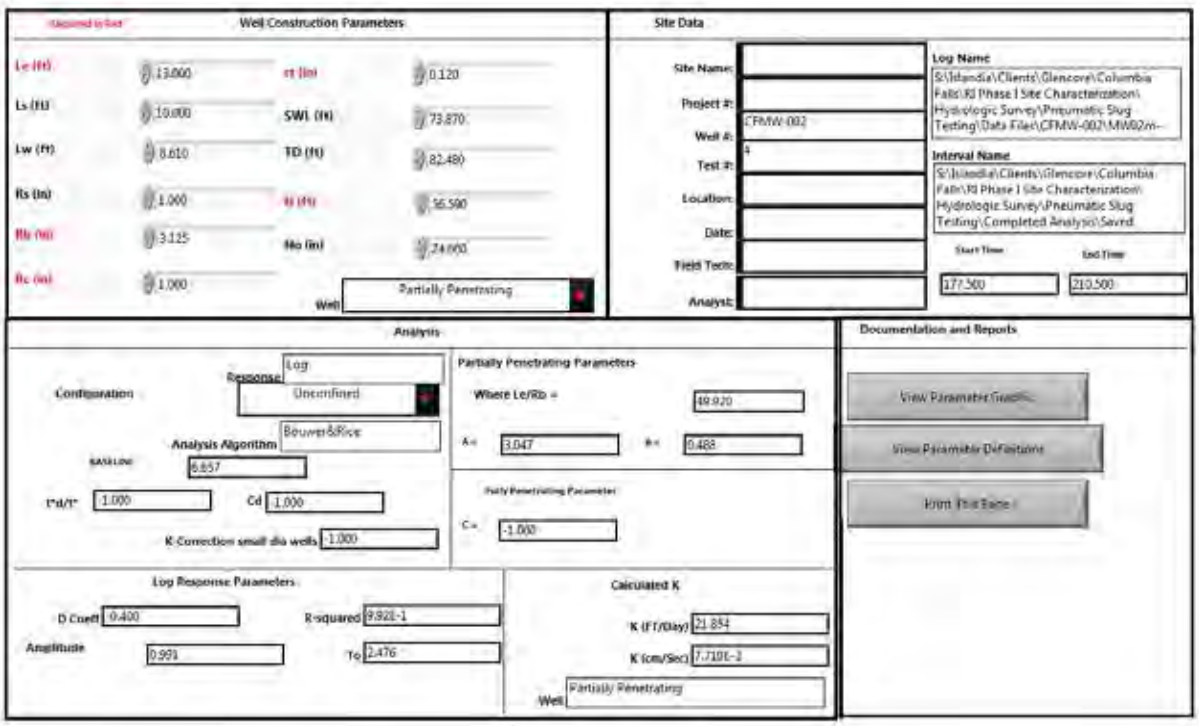
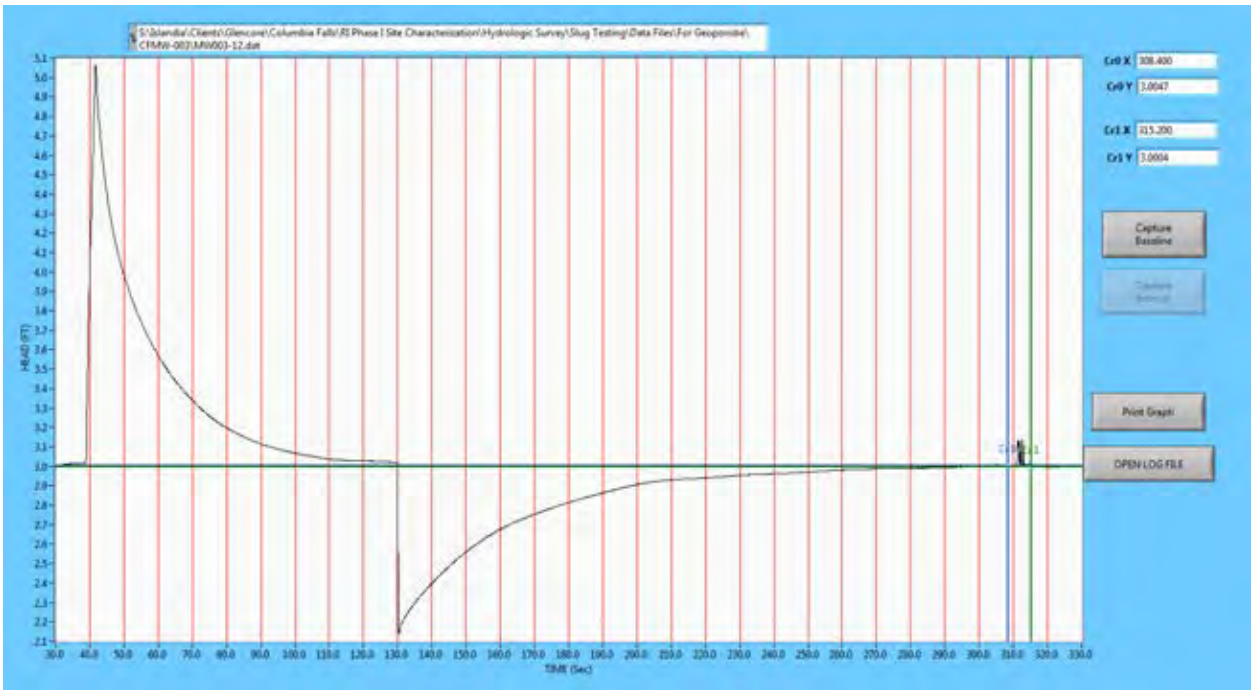
LOG FREQUENCY: 10 Hz

CFMW-002
2 Foot Displacement
Test #2





CFMW-003
1 Foot Displacement
Test #1



SITE INFORMATION -- SLUG TEST REV. 3.0

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START TIME: 2:10 PM
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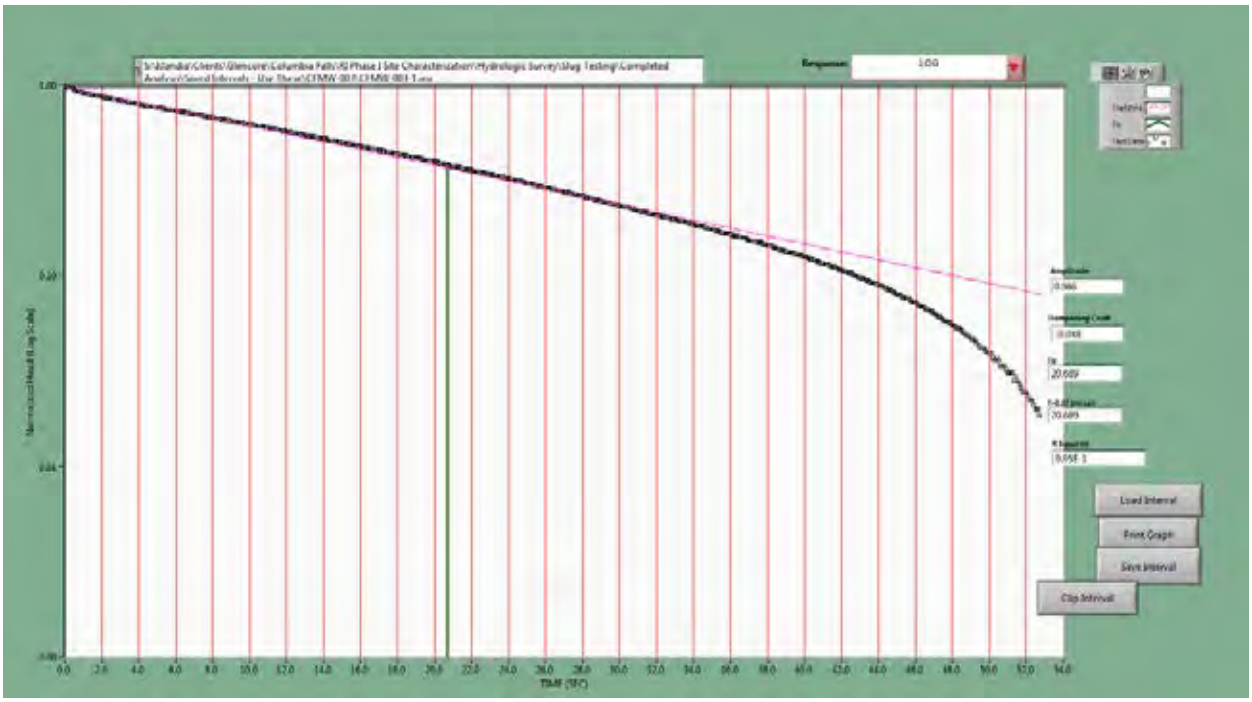
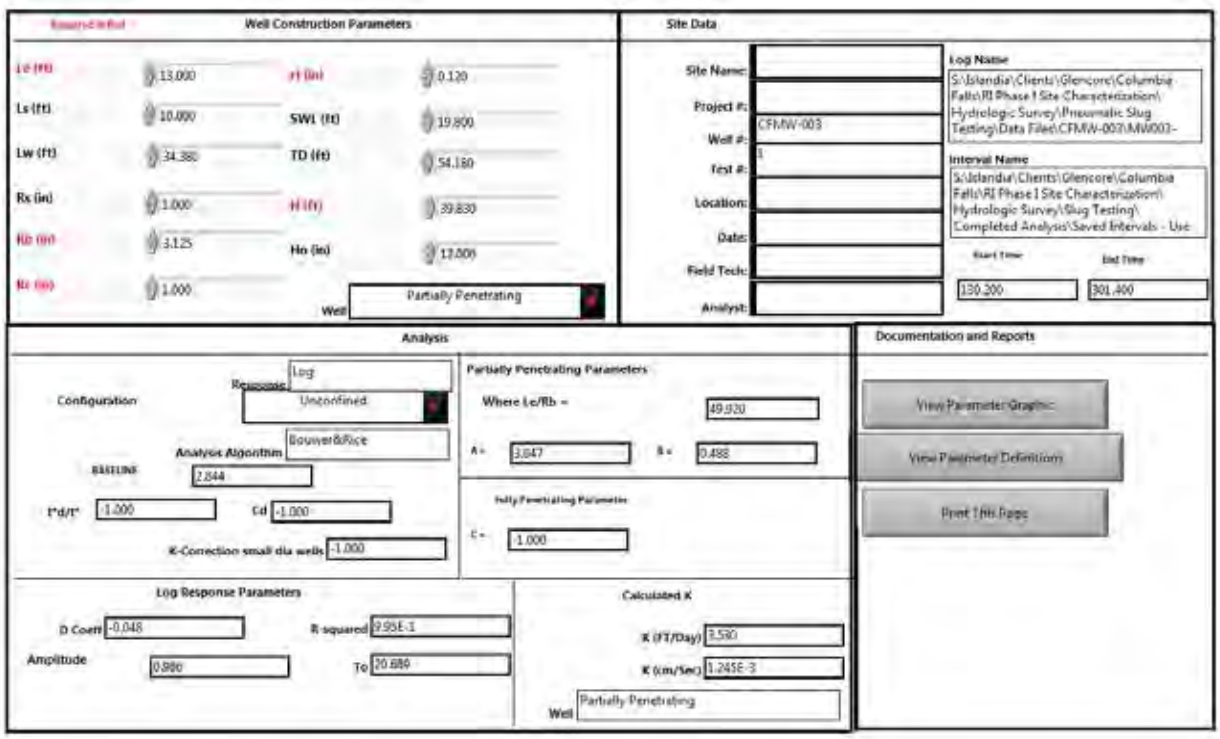
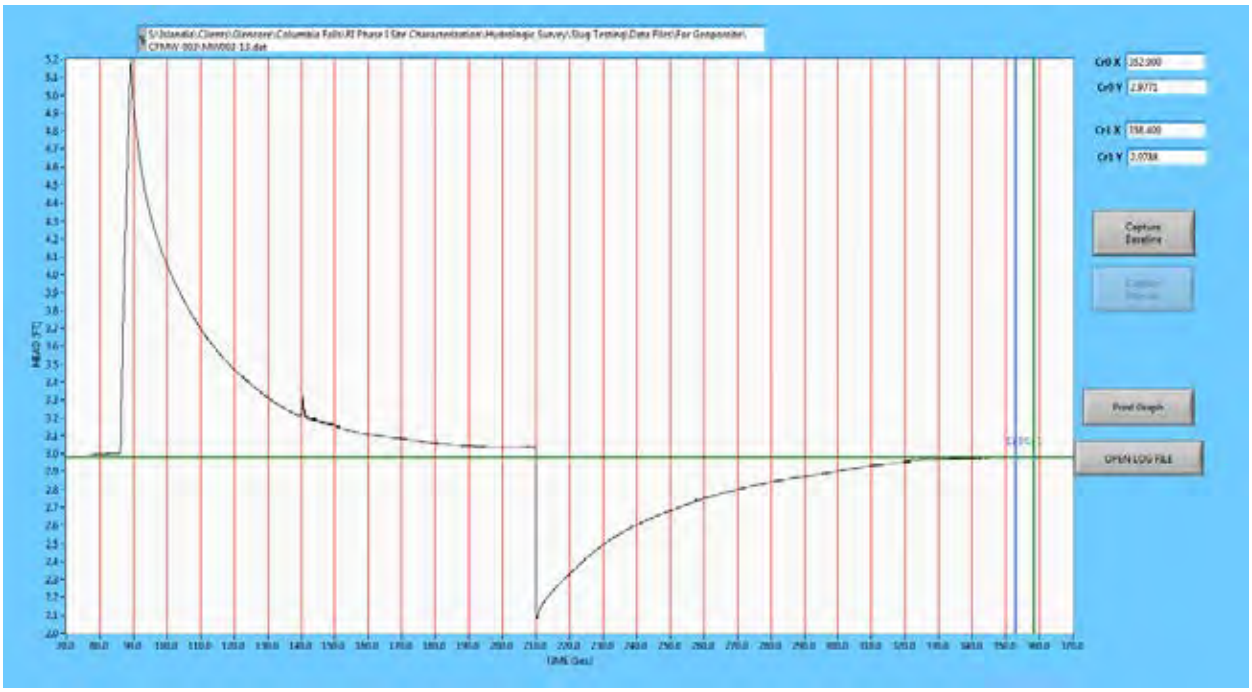
LOG FREQUENCY: 10 Hz

CFMW-003
1 Foot Displacement
Test #1





CFMW-003
1 Foot Displacement
Test #2



SITE INFORMATION -- SLUG TEST REV. 3.0

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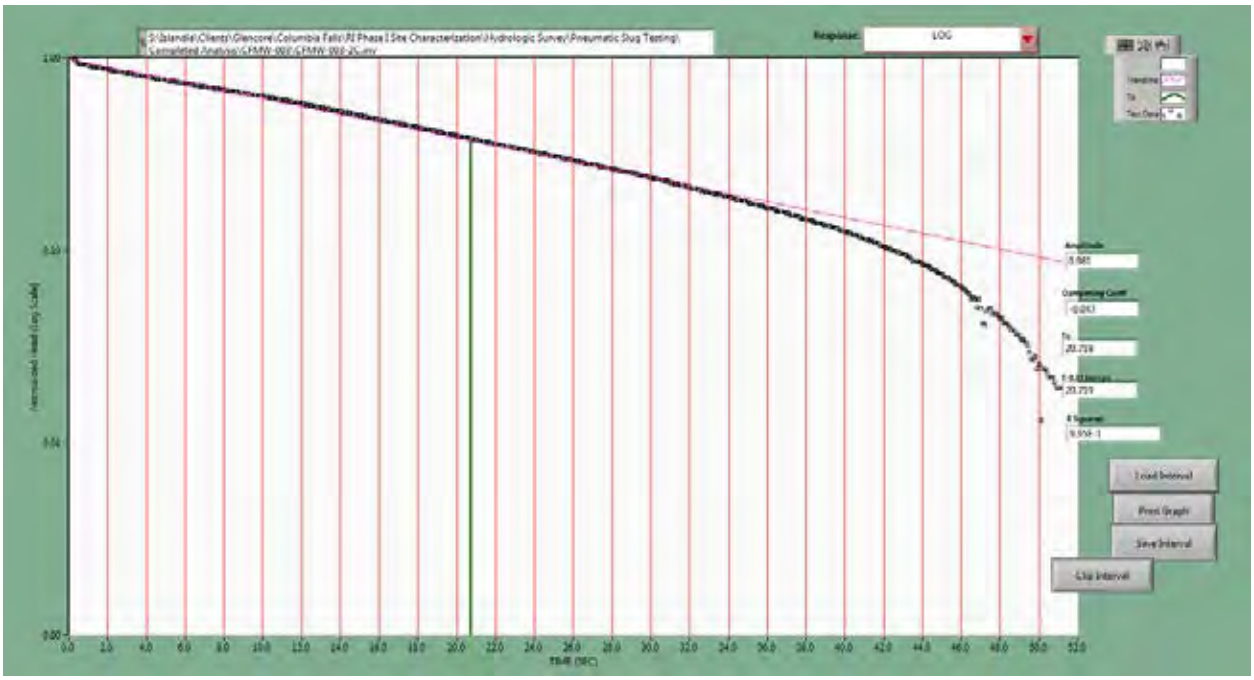
LOG FREQUENCY: 10 Hz

CFMW-003
1 Foot Displacement
Test #2



Well Construction Parameters

Le (Ft)	13.000	r (in)	0.120
Ls (Ft)	10.000	SWL (Ft)	19.800
Lw (Ft)	34.380	TD (Ft)	54.180
Rs (in)	1.000	H (Ft)	39.830
Rb (in)	3.125	Ho (in)	12.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:	
Project #:	
Well #:	CFMW-003
Test #:	2
Location:	
Date:	
Field Tech:	
Analyst:	

Log Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Pneumatic Slug Testing\Data Files\CFMW-003\MW003-

Interval Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Pneumatic Slug Testing\Completed Analysis\CFMW-003\

Start Time: 210.300 End Time: 351.400

Analysis

Response: Log
Configuration: Unconfined
Analysis Algorithm: Bouwer&Rice
BASELINE: 2.769
t*d/t*: -1.000 Cd: -1.000
K-Correction small dia wells: -1.000

Partially Penetrating Parameters
Where Le/Rb = 49.920
A = 3.047 B = 0.488

Fully Penetrating Parameter
C = -1.000

Log Response Parameters

D Coeff: -0.047 R-squared: 9.85E-1
Amplitude: 0.981 To: 20.719

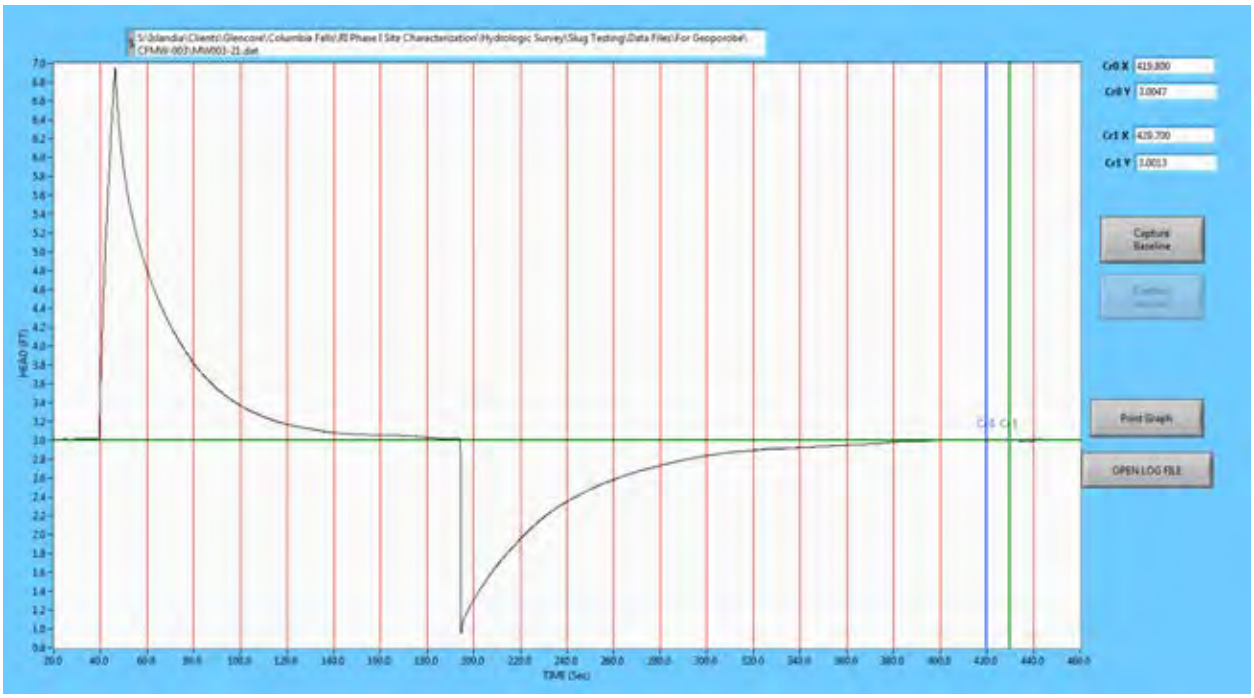
Calculated K

K (FT/Day): 3.325
K (cm/Sec): 1.243E-3
Well: Partially Penetrating

Documentation and Reports

View Parameter Graphic
View Parameter Definitions
Print This Page

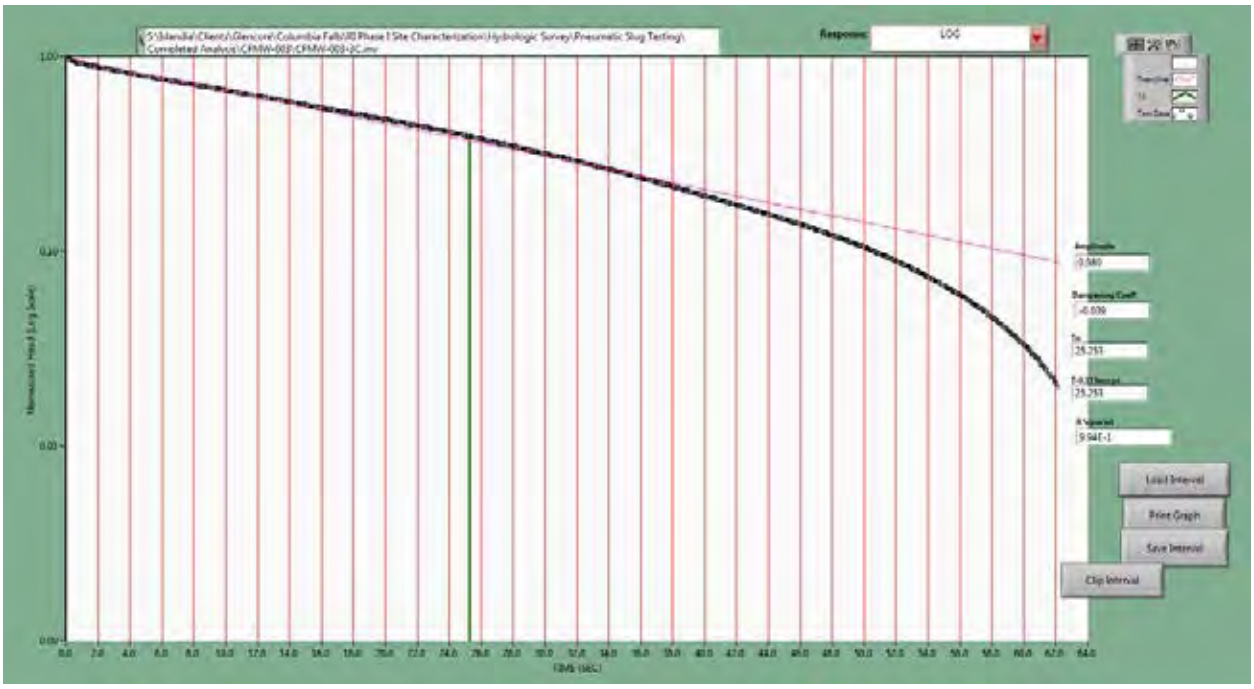
CFMW-003
2 Foot Displacement
Test #1

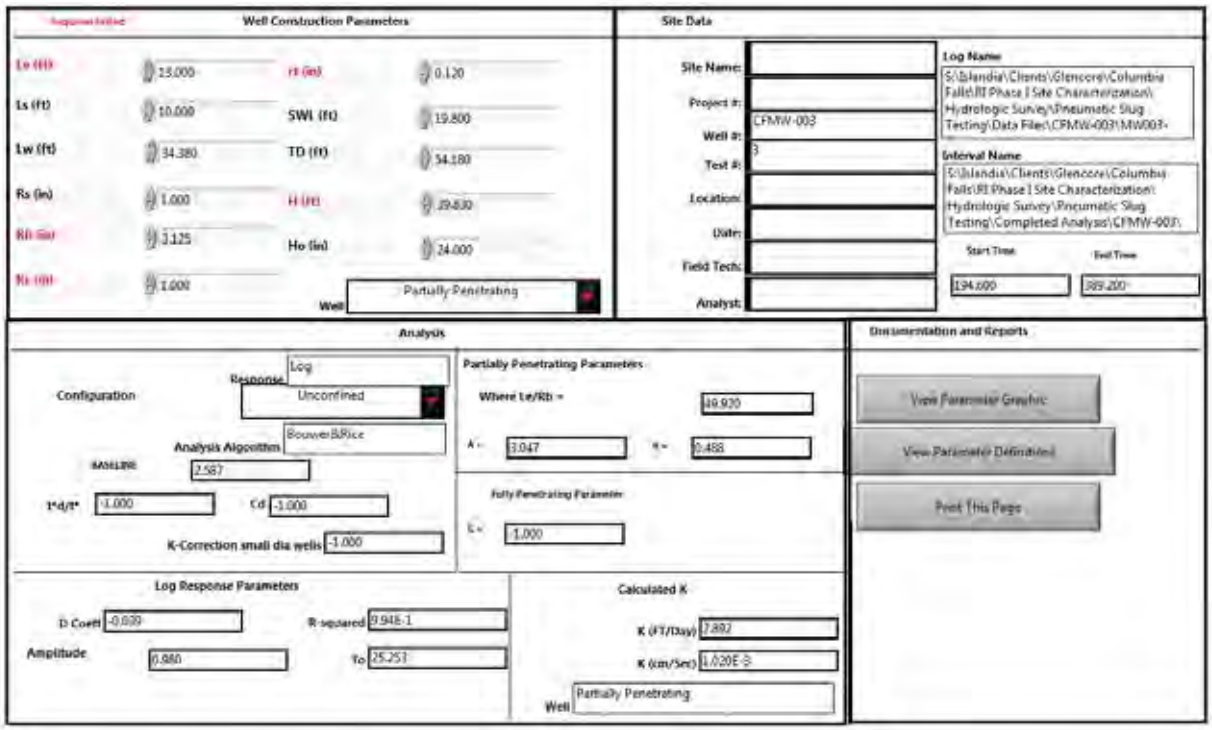


SITE INFORMATION -- SLUG TEST REV. 3.0

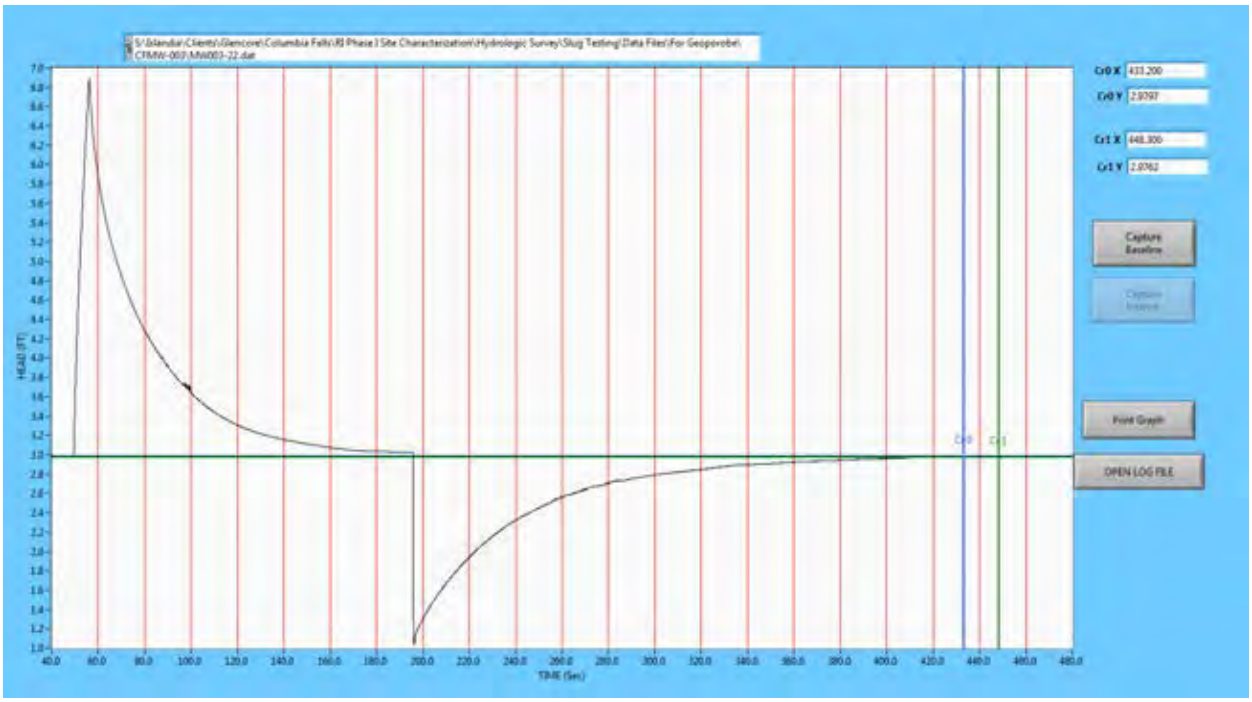
START DATE: 7/11/2017
START TIME: 2:16 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW003-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-003
2 Foot Displacement
Test #1





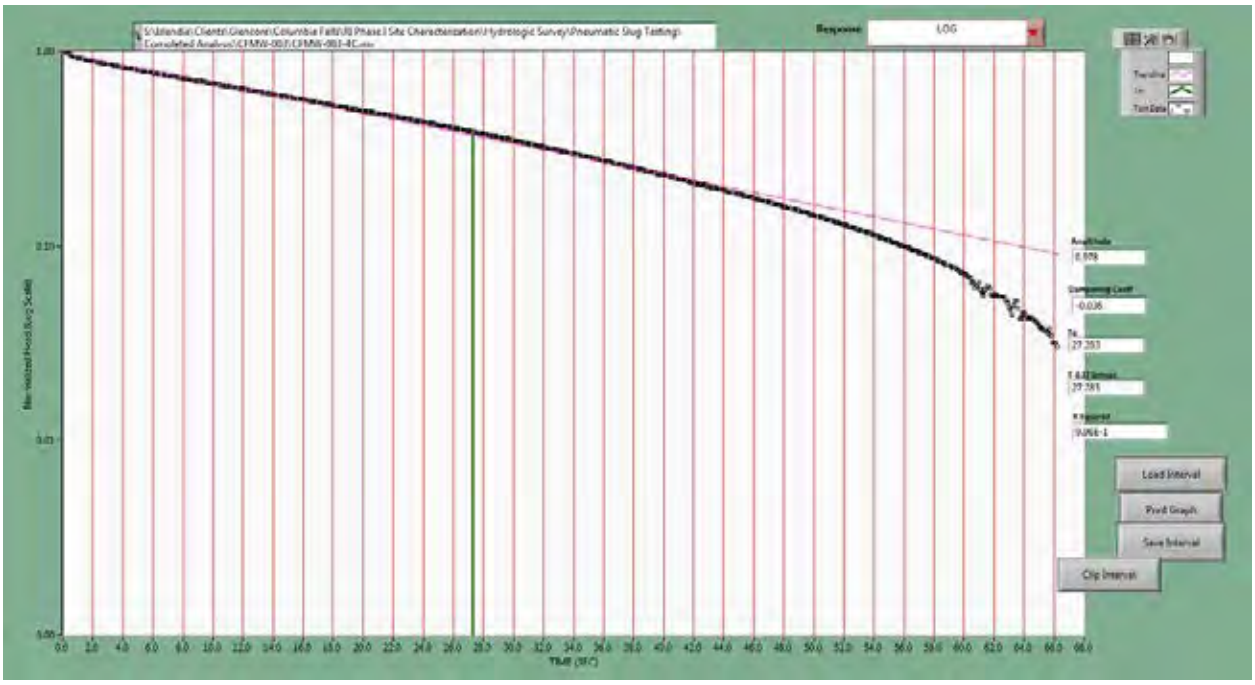
CFMW-003
2 Foot Displacement
Test #2

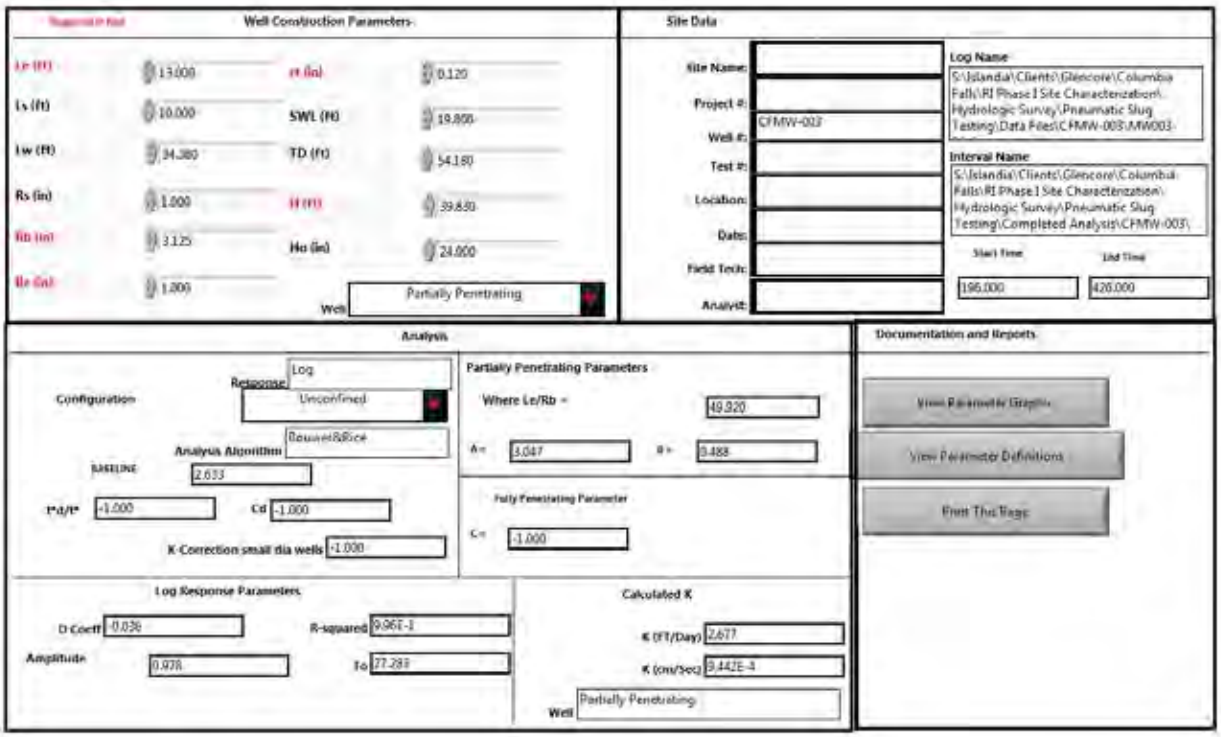


SITE INFORMATION -- SLUG TEST REV. 3.0

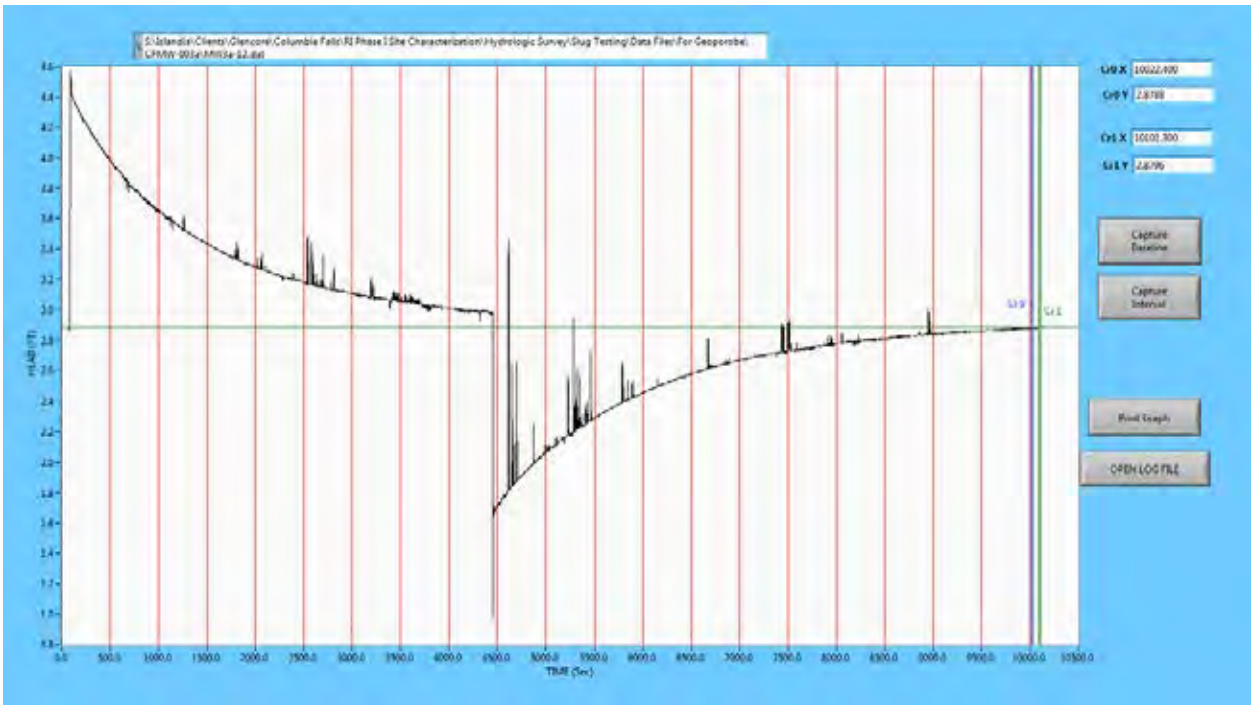
START DATE: 7/11/2017
START TIME: 2:23 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW003-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-003
2 Foot Displacement
Test #2





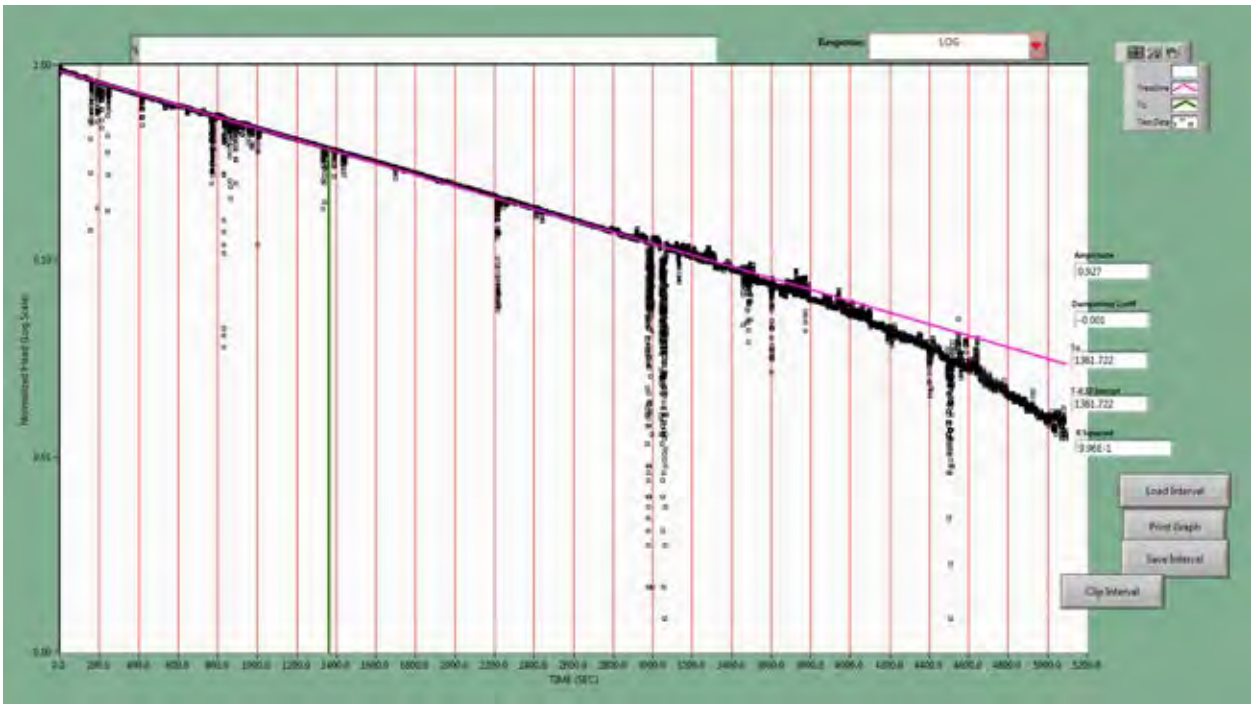
CFMW-003a
1 Foot Displacement
Test #1

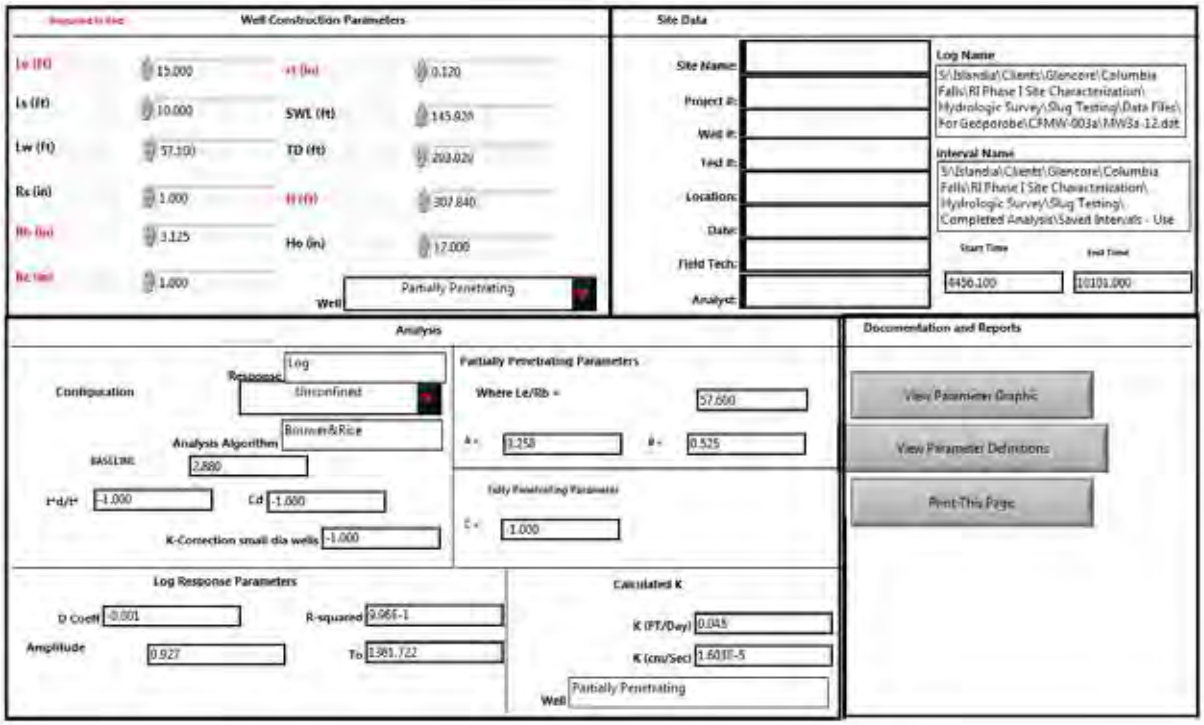


SITE INFORMATION -- SLUG TEST REV. 3.0

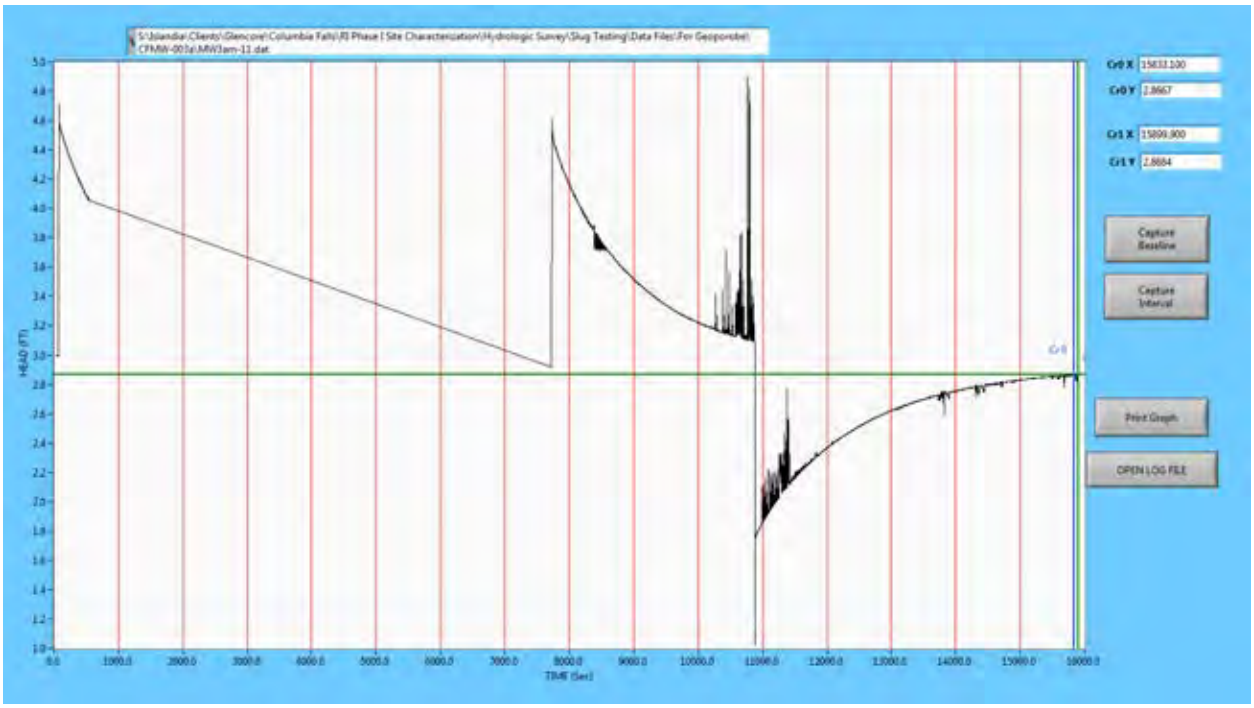
START DATE: 7/24/2017
START TIME: 2:53 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW3A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-003a
1 Foot Displacement
Test #1





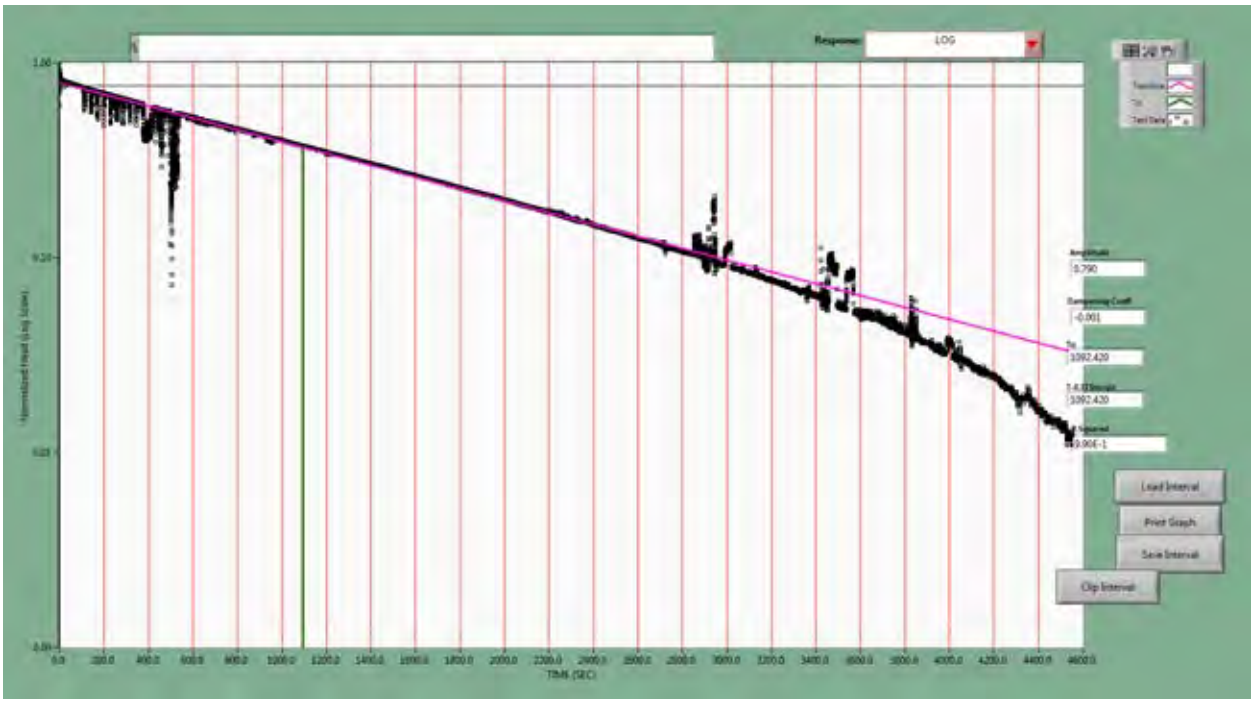
CFMW-003a
1 Foot Displacement
Test #2



SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/24/2017
START TIME: 10:21 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW3AM-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-003a
1 Foot Displacement
Test #2



Well Construction Parameters

Le (ft)	15.000	rf (in)	0.120
Ls (ft)	10.000	SWL (ft)	145.920
Lw (ft)	57.100	TD (ft)	203.020
Rs (in)	1.000	H (ft)	307.840
Rc (in)	3.125	Ho (in)	12.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:
Project #:
Well #:
Test #:
Location:
Date:
Field Tech:
Analyst:

Log Name: S:\Islands\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Slug Testing\Data Files\For Geoprobe\CFMW-003a\MW3am-

Interval Name:

Start Time: 10850.000
End Time: 15899.300

Analysis

Response: Log
Configuration: Unconfined
Analysis Algorithm: Bouwer&Rice
BASELINE: 2.857
Y*a/t*: -1.000
Cd: -1.000
K-Correction small dia wells: -1.000

Partially Penetrating Parameters
Where Le/Rb = 57.600
A = 3.258
B = 0.523

Fully Penetrating Parameter
L = -1.000

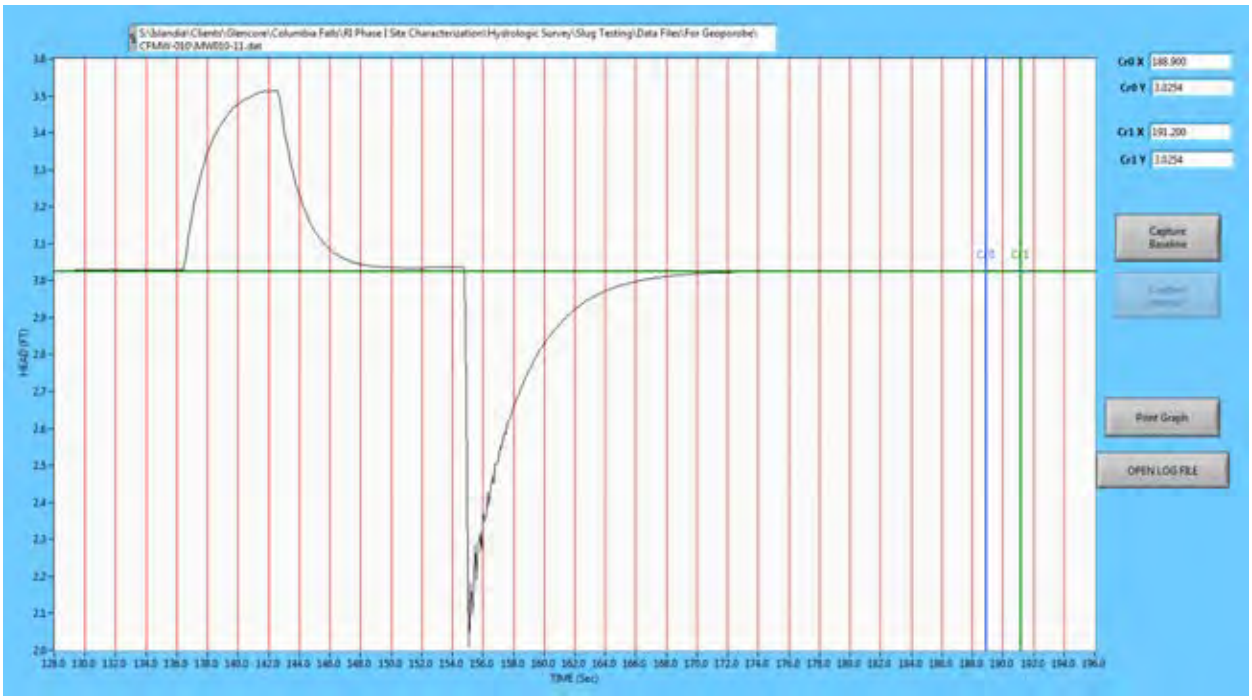
Log Response Parameters
D Coeff: -0.001
R-squared: 9.90E-1
Amplitude: 0.790
To: 1092.420

Calculated K
K (FT/Day): 0.057
K (cm/Sec): 1.988E-5
Well: Partially Penetrating

Documentation and Reports

View Parameter Graphic
View Parameter Definitions
Print This Page

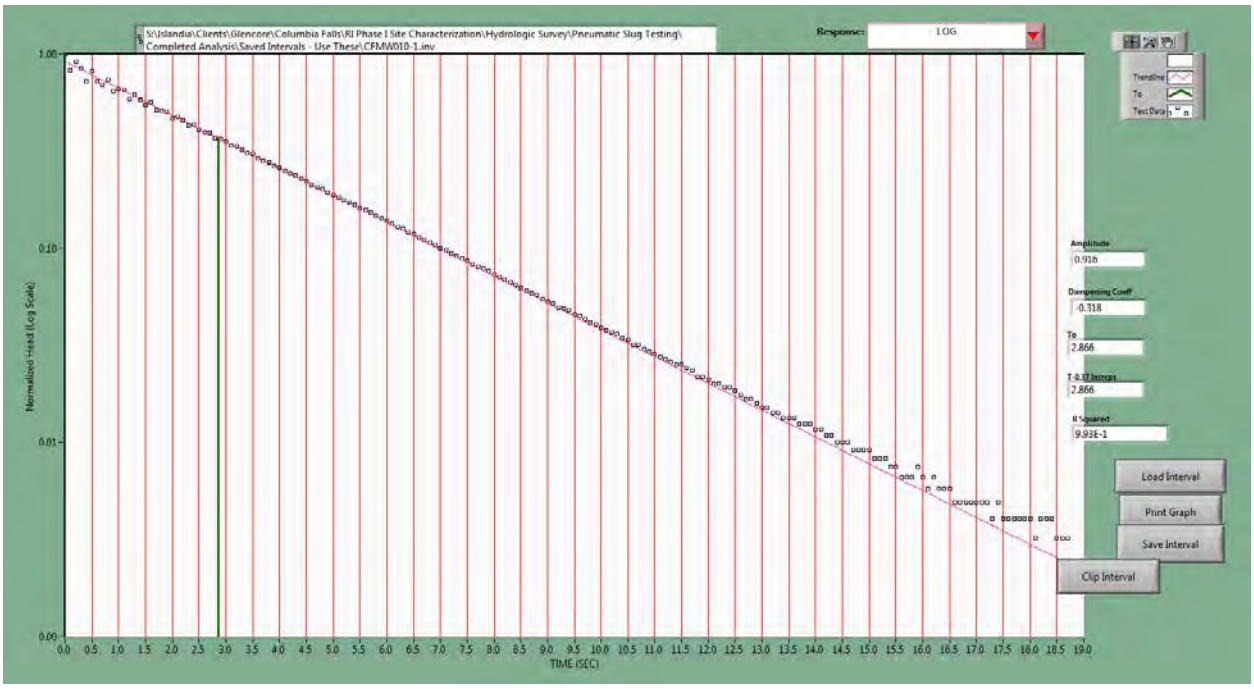
CFMW-010
1 Foot Displacement
Test #1

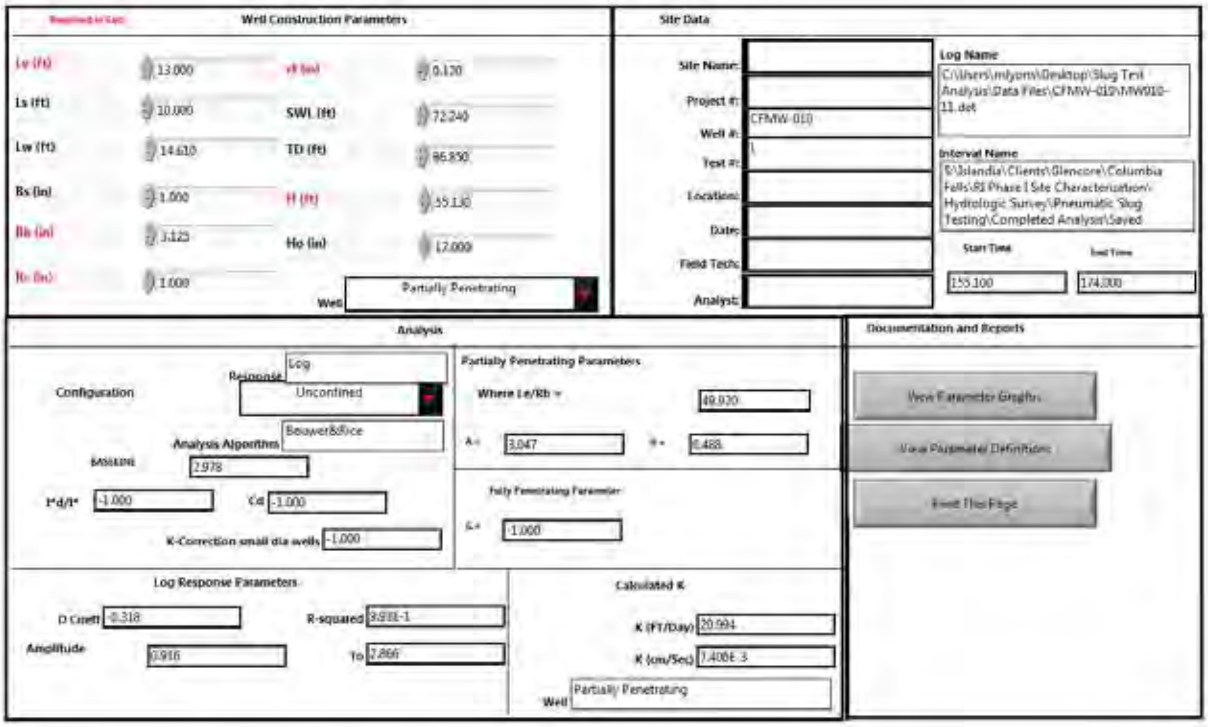


SITE INFORMATION -- SLUG TEST REV. 3.0

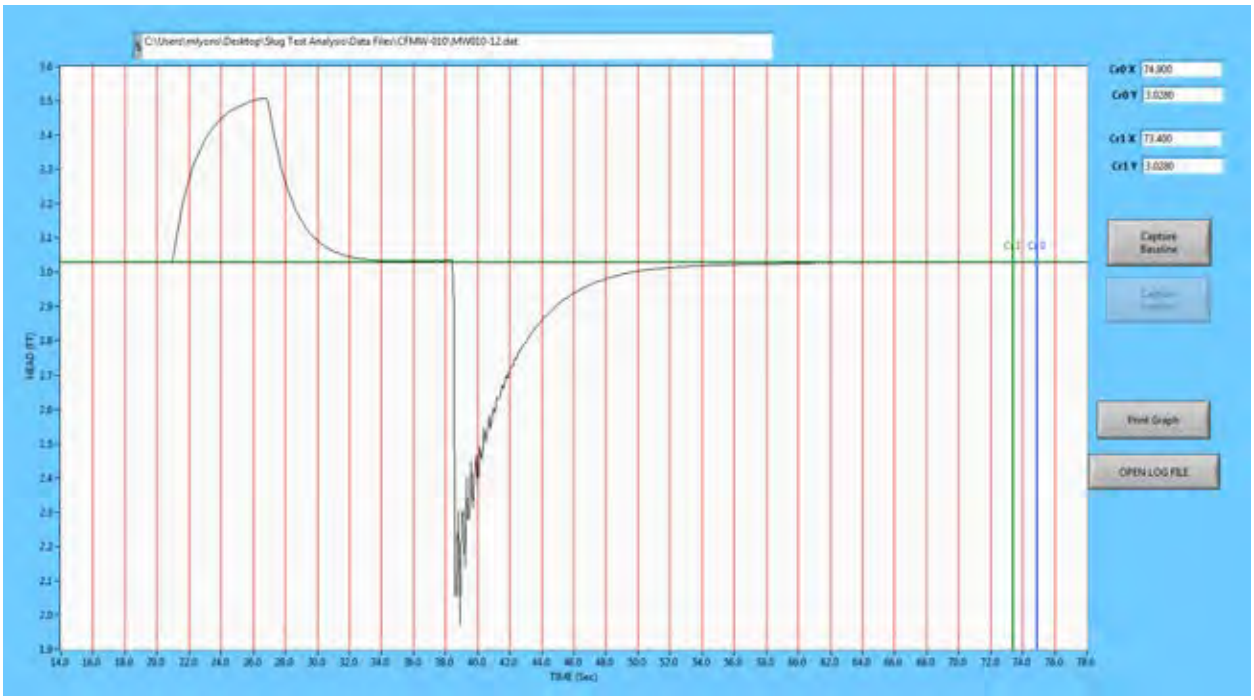
START DATE: 7/11/2017
START TIME: 1:31 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW010-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-010
1 Foot Displacement
Test #1





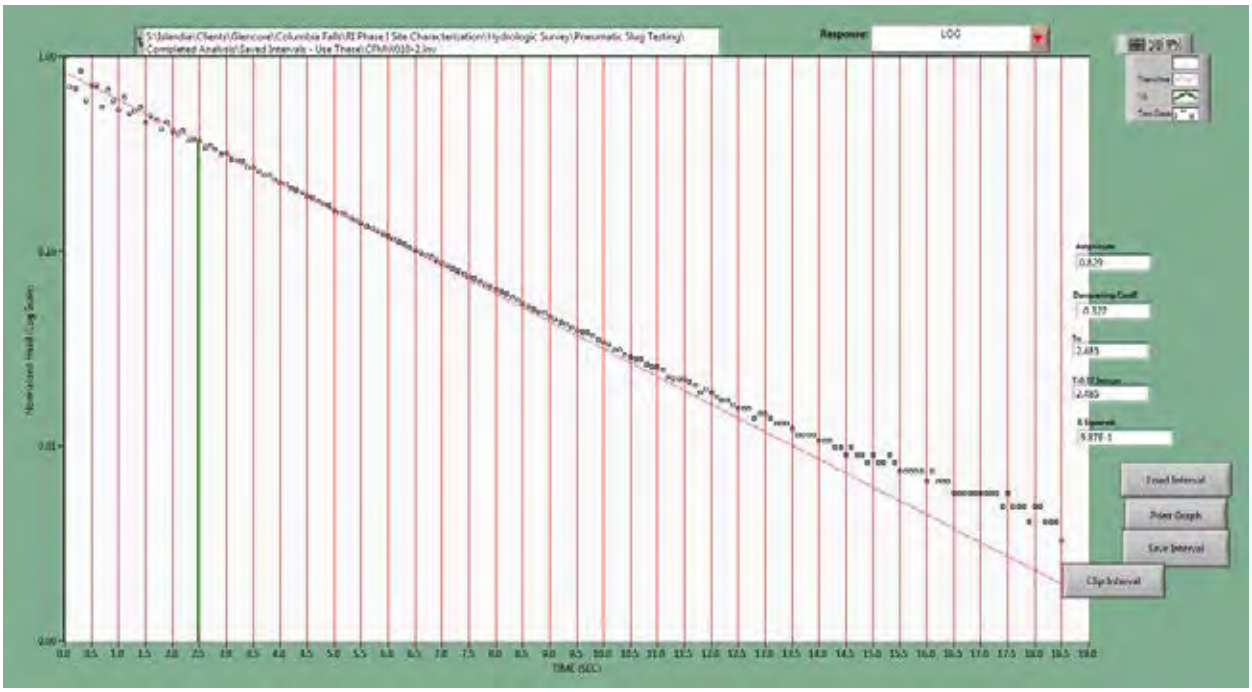
CFMW-010
1 Foot Displacement
Test #2

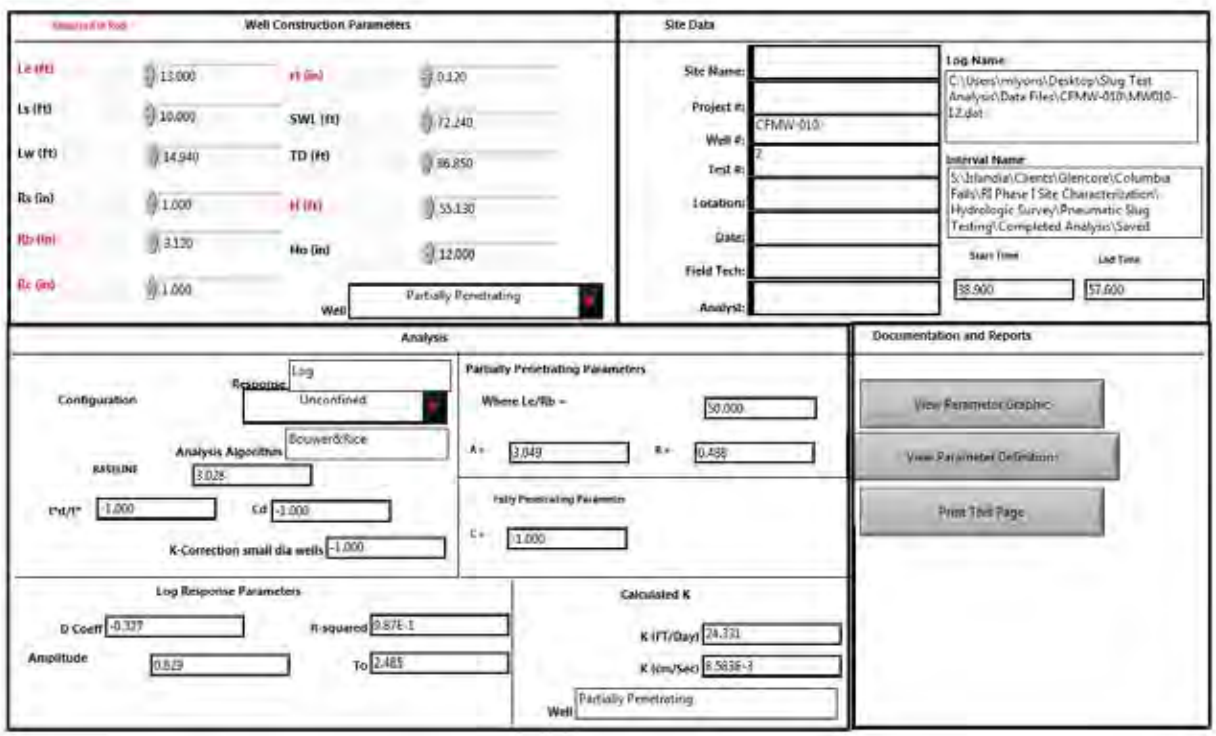


SITE INFORMATION -- SLUG TEST REV. 3.0

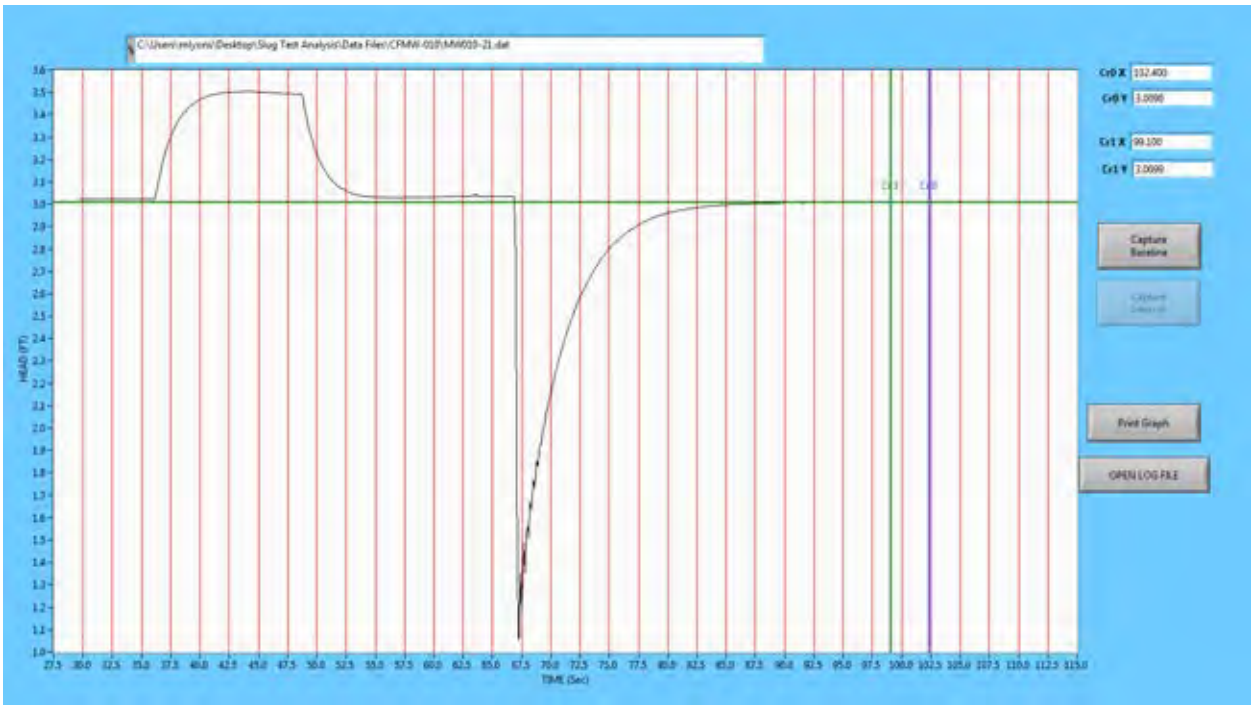
START DATE: 7/11/2017
START TIME: 1:34 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW010-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-010
1 Foot Displacement
Test #2





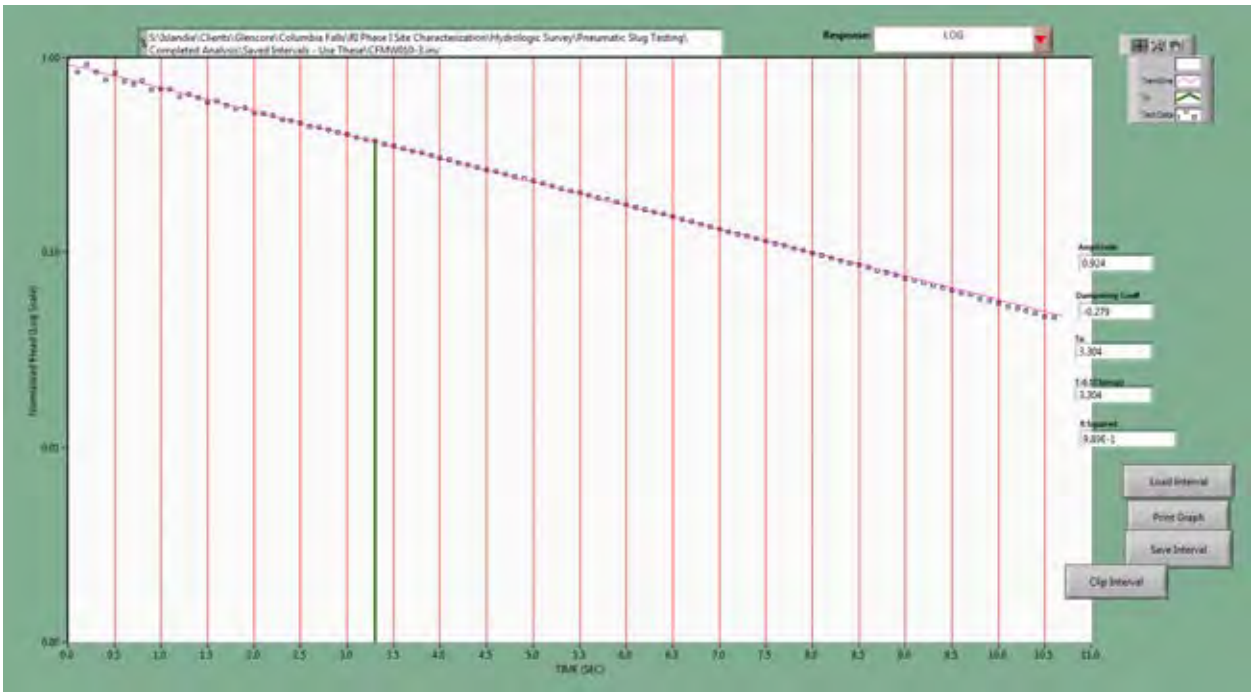
CFMW-010
2 Foot Displacement
Test #1

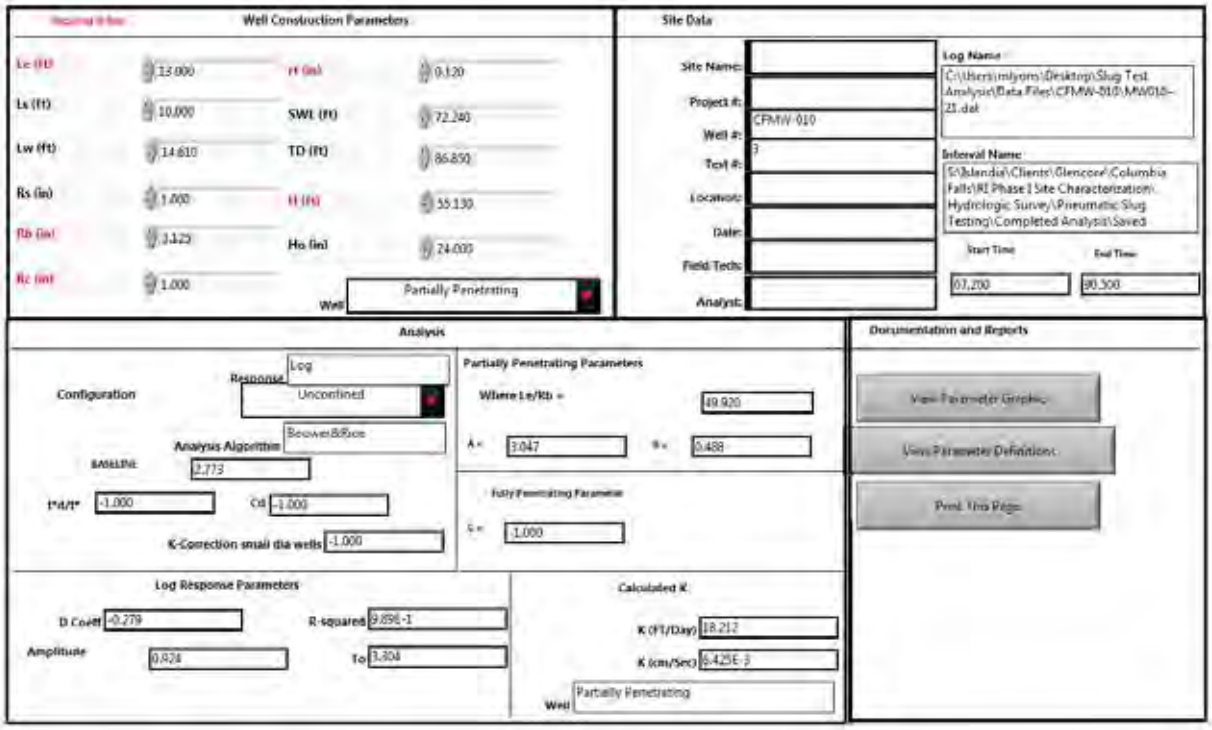


SITE INFORMATION -- SLUG TEST REV. 3.0

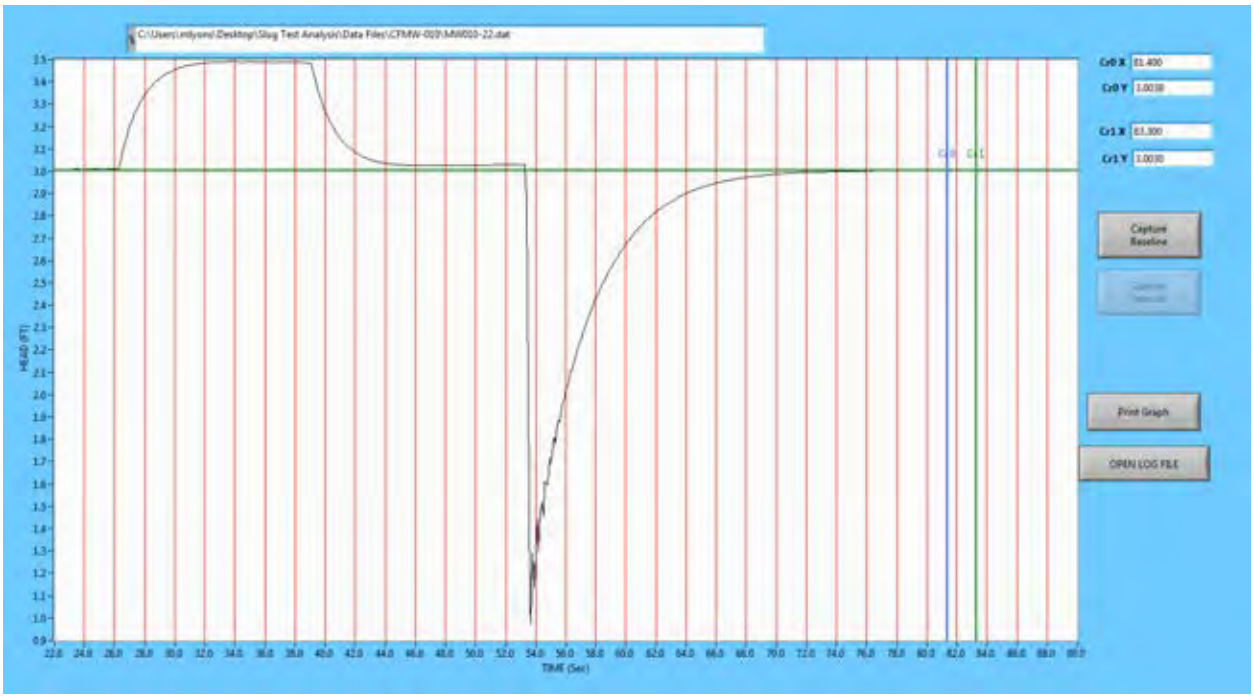
START DATE: 7/11/2017
START TIME: 1:36 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW010-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-010
2 Foot Displacement
Test #1





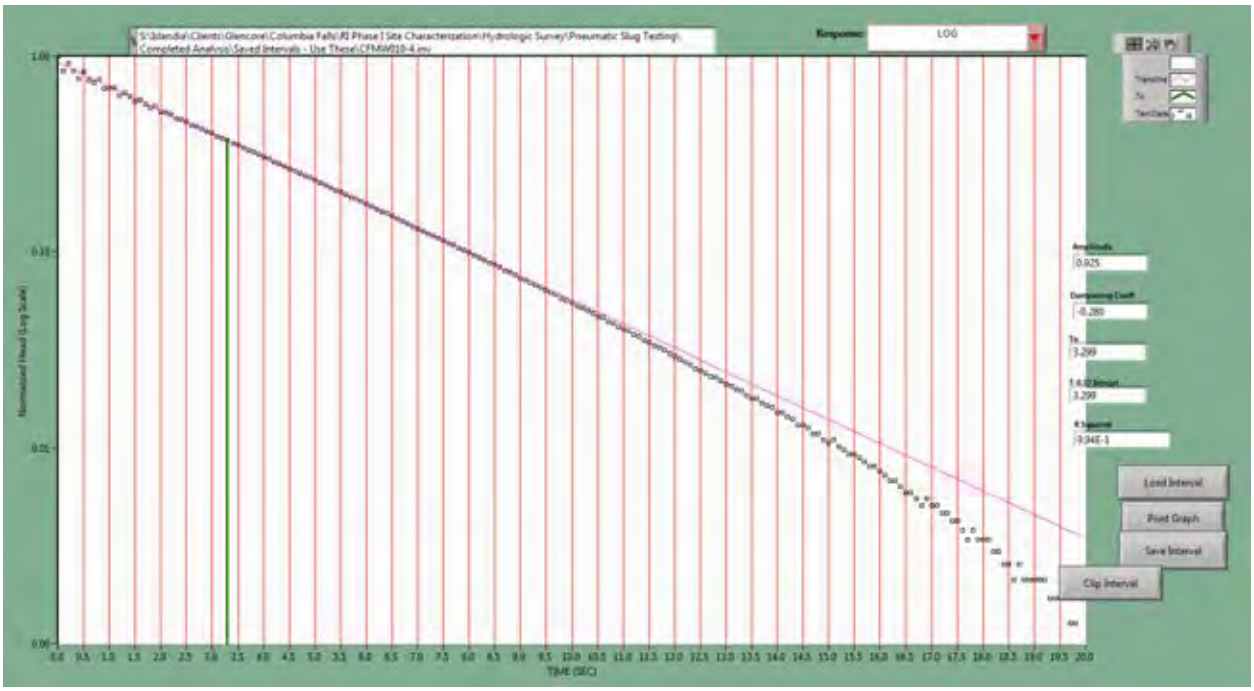
CFMW-010
2 Foot Displacement
Test #2

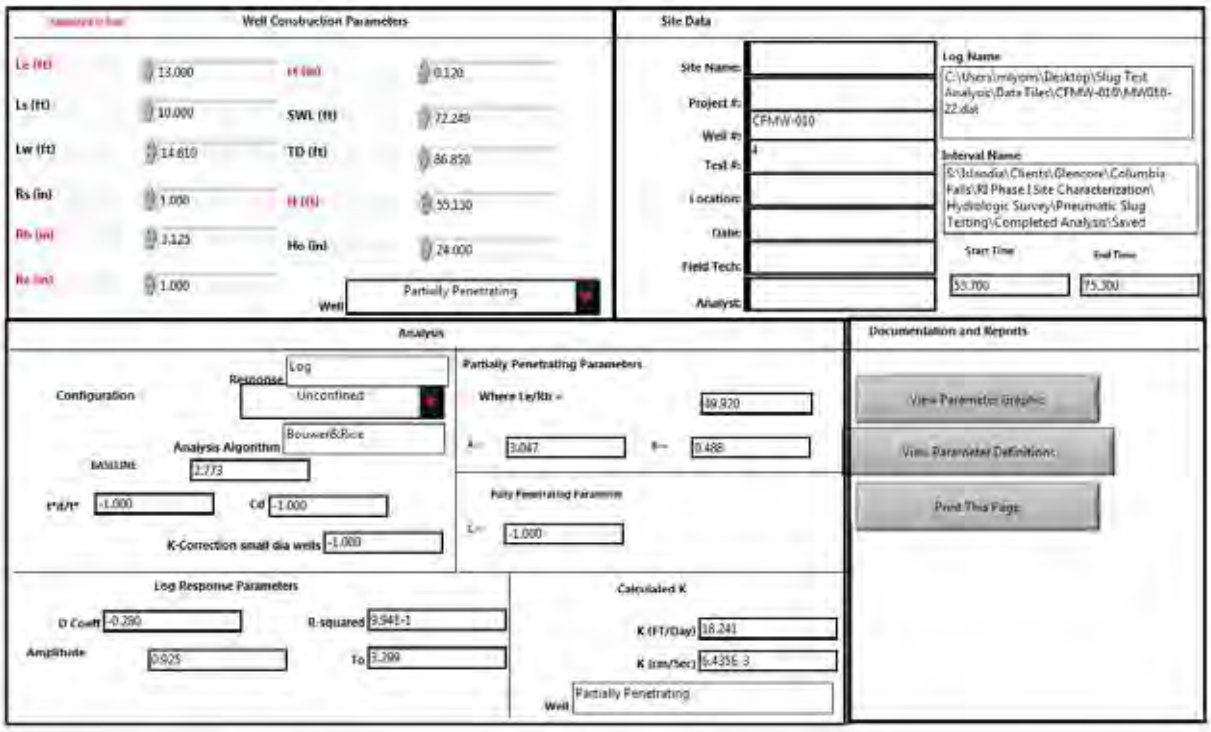


SITE INFORMATION -- SLUG TEST REV. 3.0

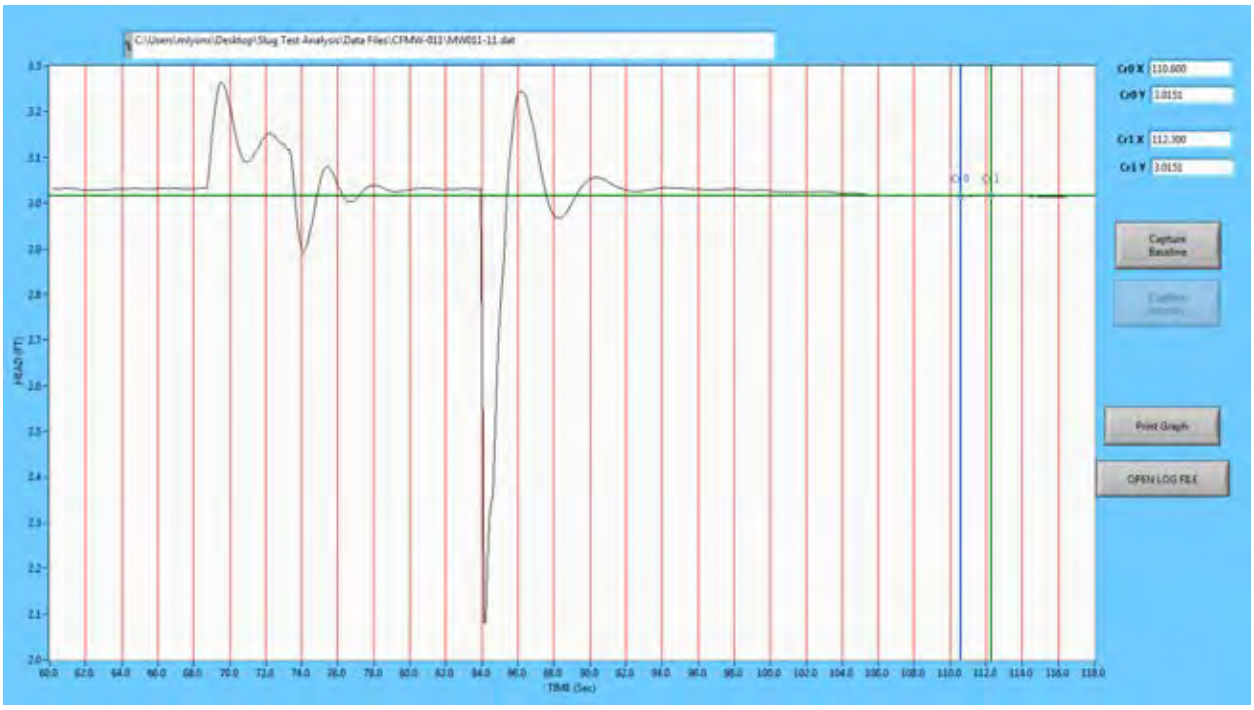
START DATE: 7/11/2017
START TIME: 1:38 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW010-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-010
2 Foot Displacement
Test #2





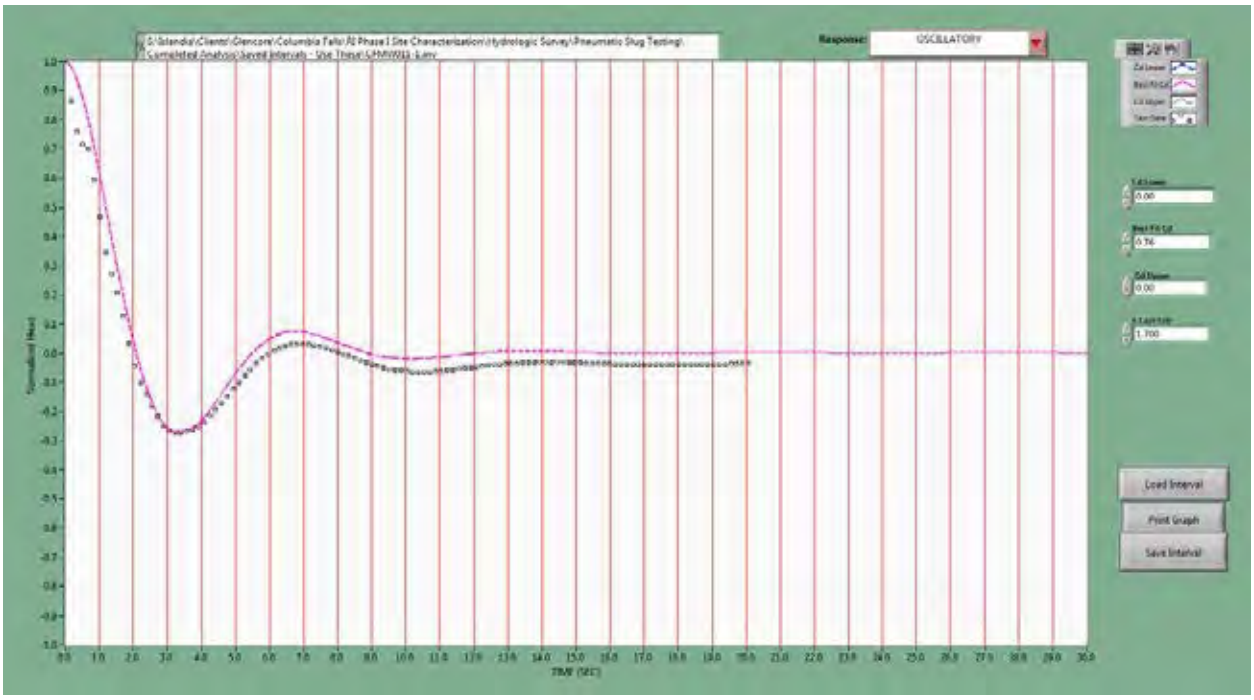
CFMW-011
1 Foot Displacement
Test #1

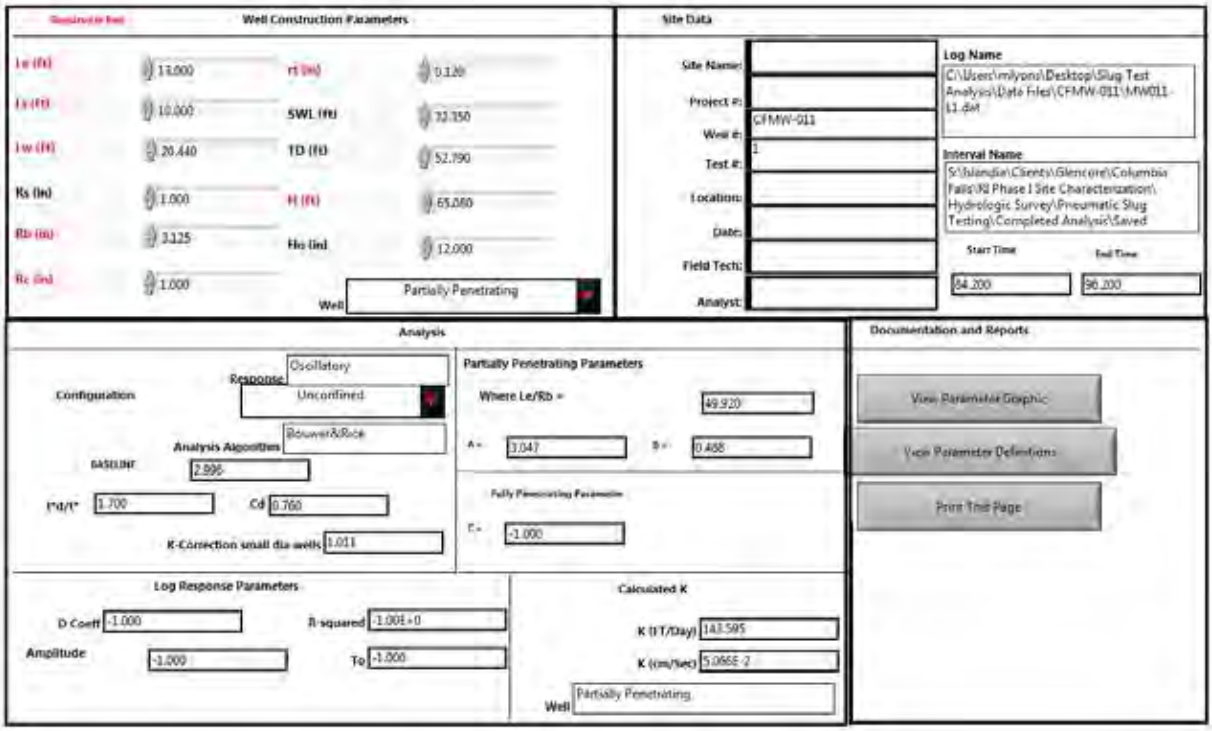


SITE INFORMATION -- SLUG TEST REV. 3.0

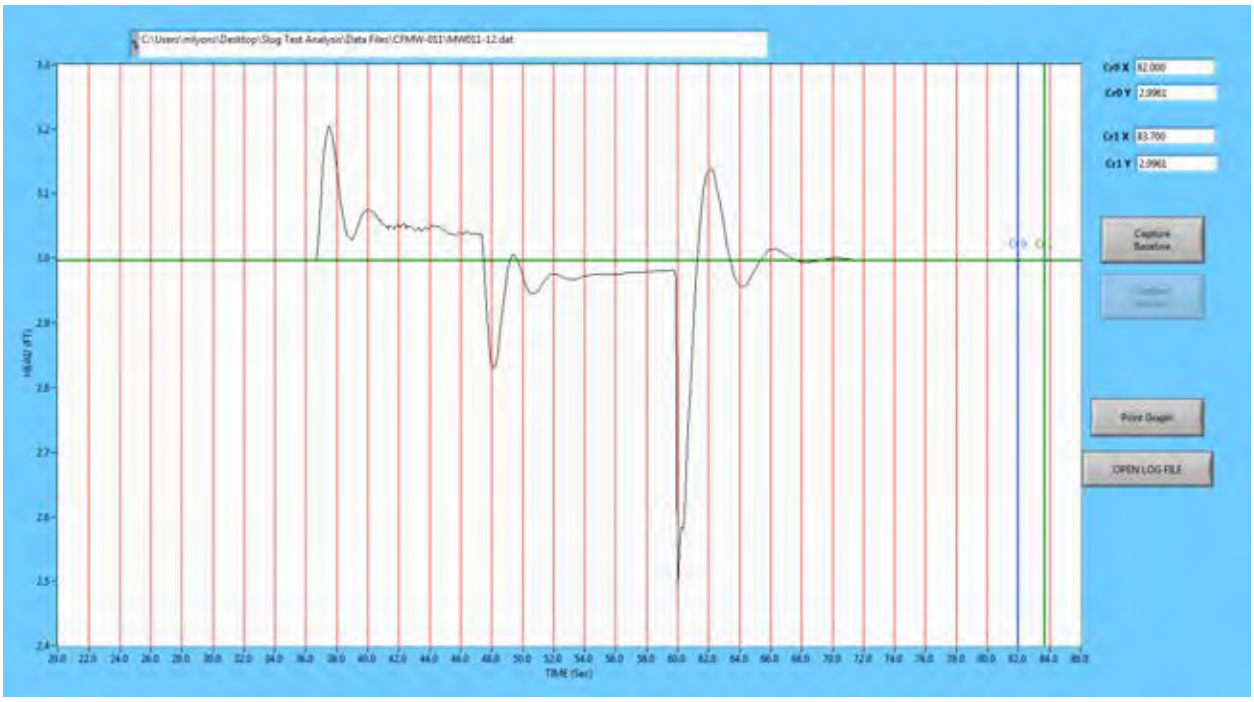
START DATE: 7/17/2017
START TIME: 3:30 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW011-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-011
1 Foot Displacement
Test #1





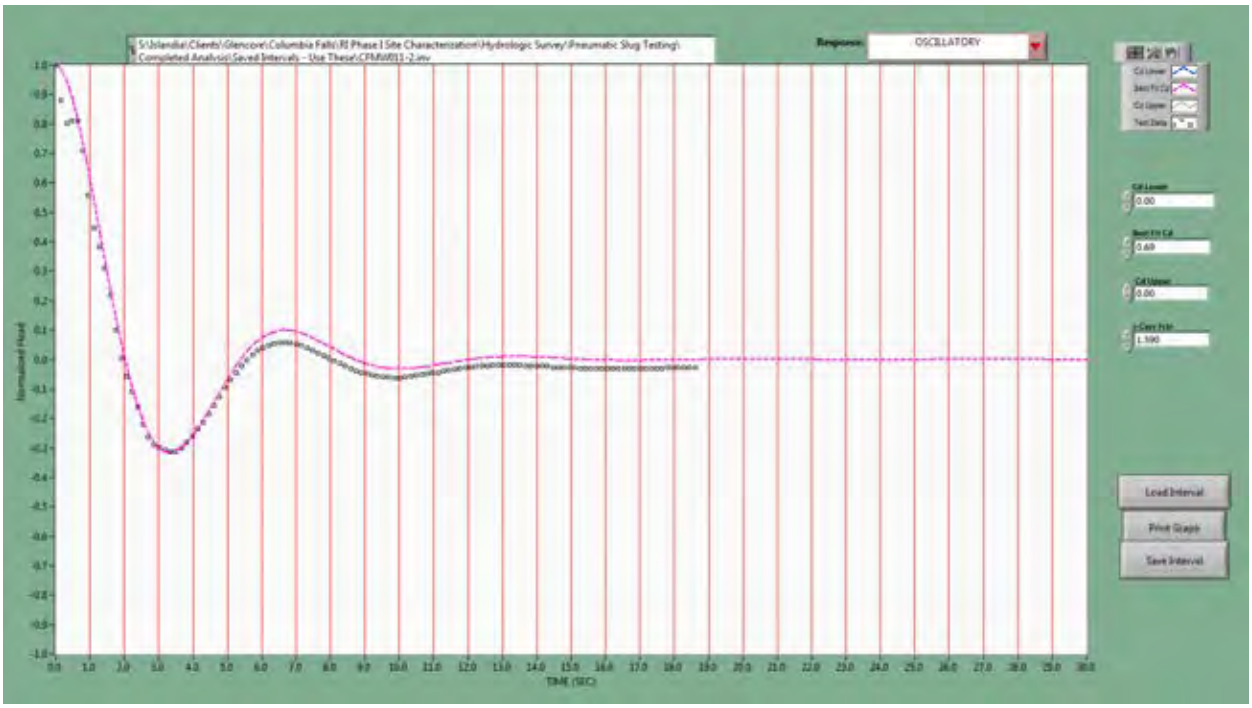
CFMW-011
1 Foot Displacement
Test #2

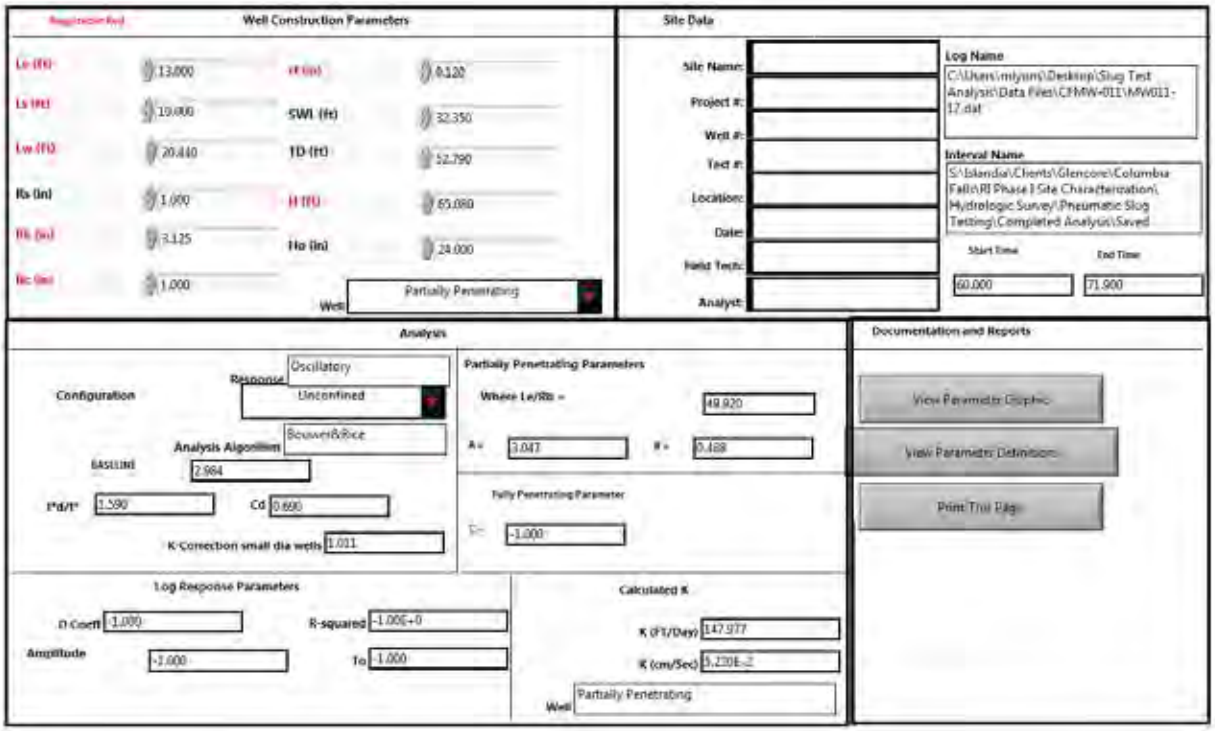


SITE INFORMATION -- SLUG TEST REV. 3.0

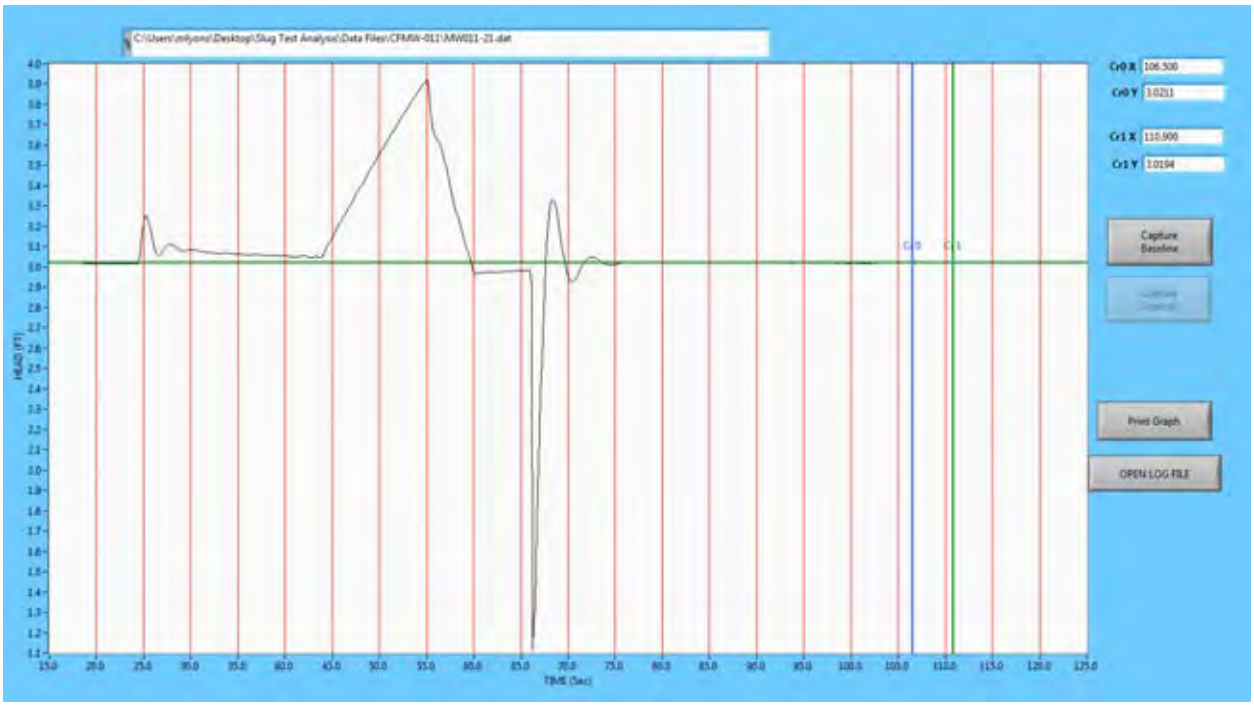
START DATE: 7/17/2017
START TIME: 3:45 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW011-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-011
1 Foot Displacement
Test #2





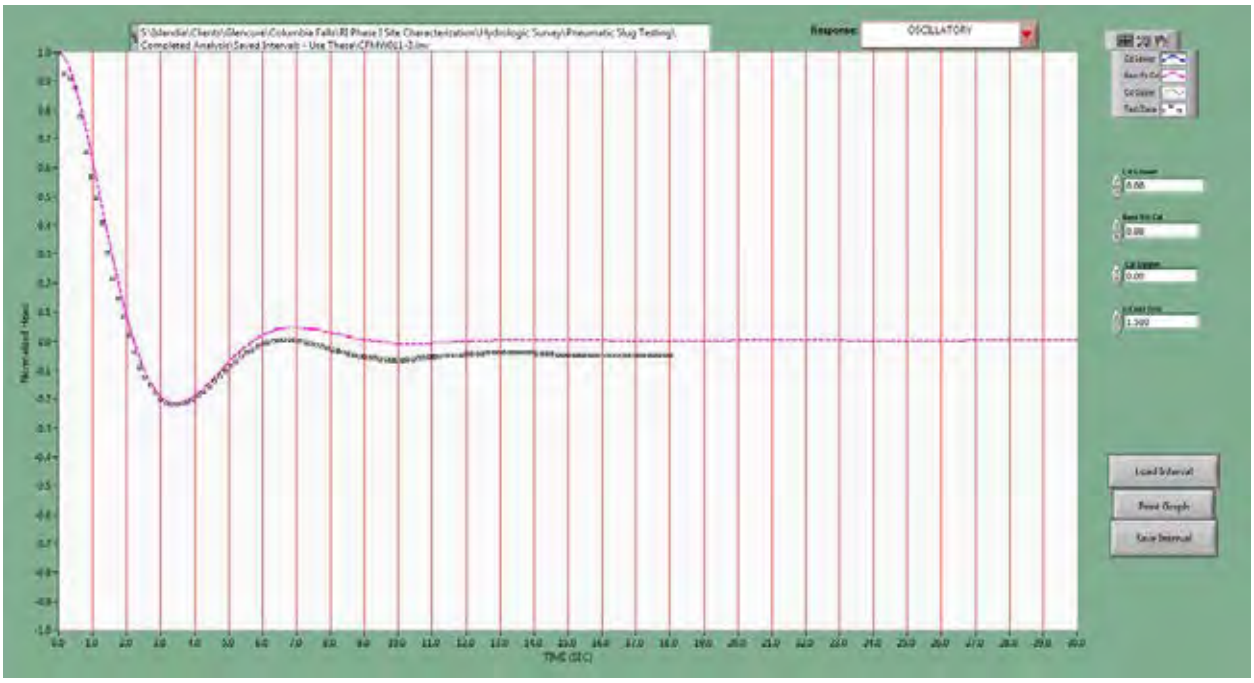
CFMW-011
2 Foot Displacement
Test #1

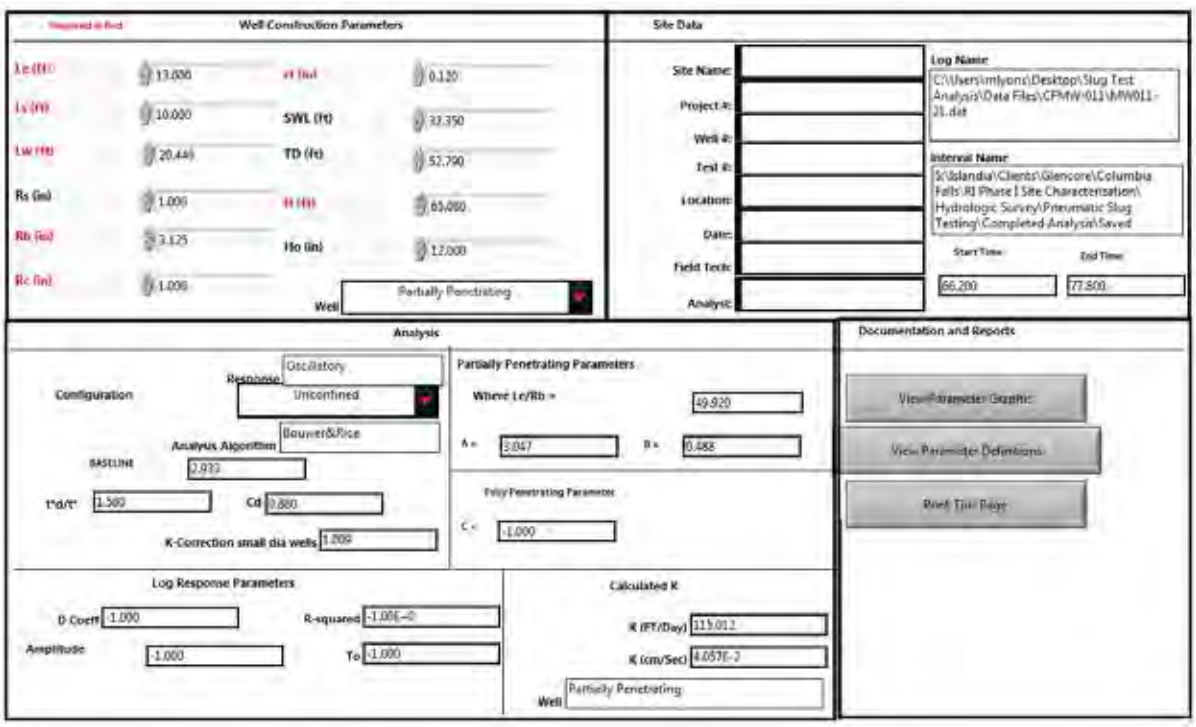


SITE INFORMATION -- SLUG TEST REV. 3.0

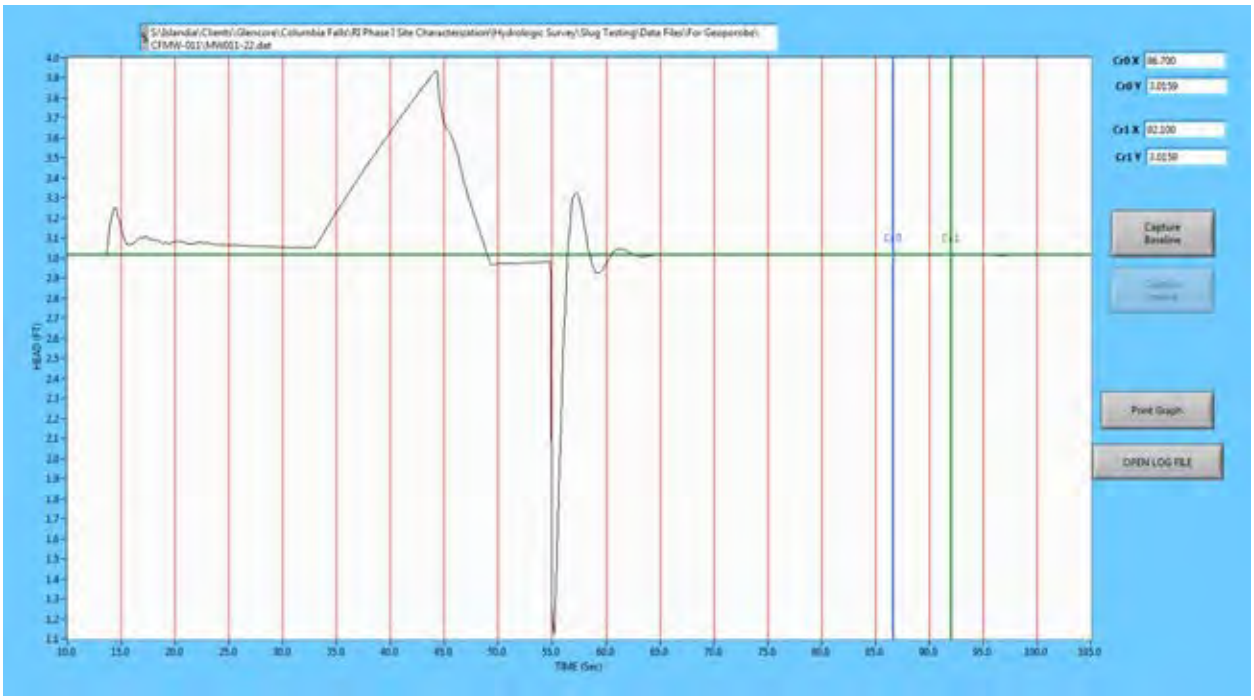
START DATE: 7/18/2017
START TIME: 10:16 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW011-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-011
2 Foot Displacement
Test #1





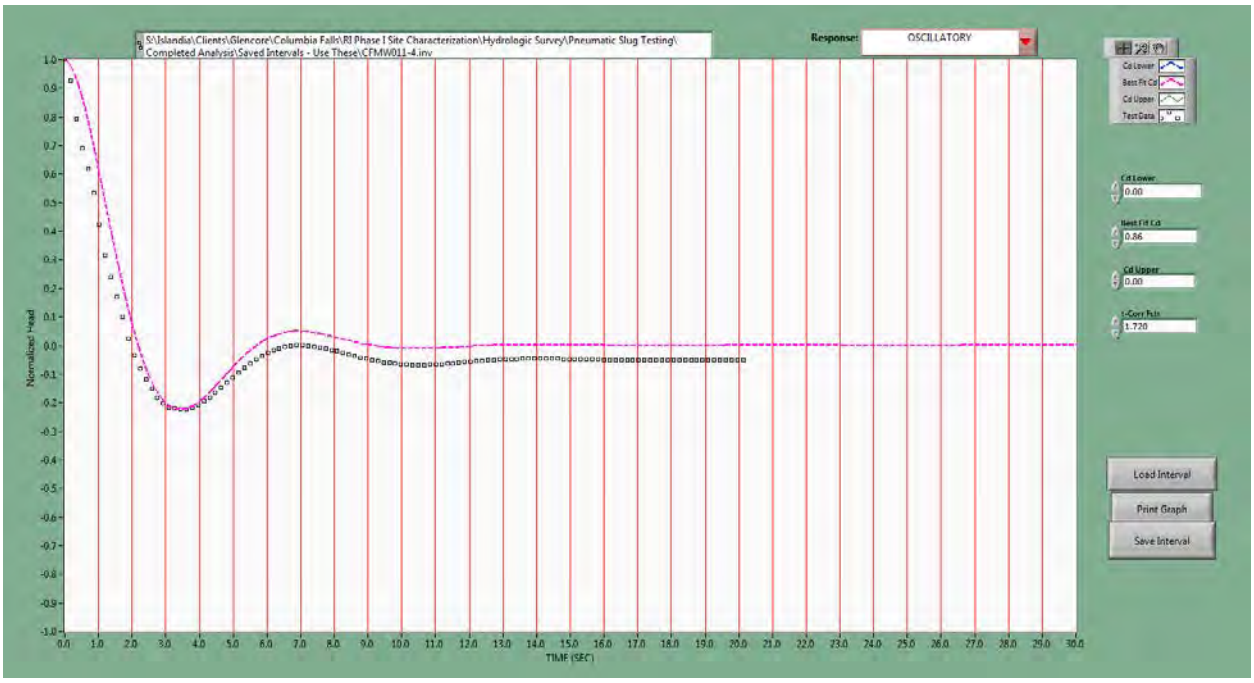
CFMW-011
2 Foot Displacement
Test #2

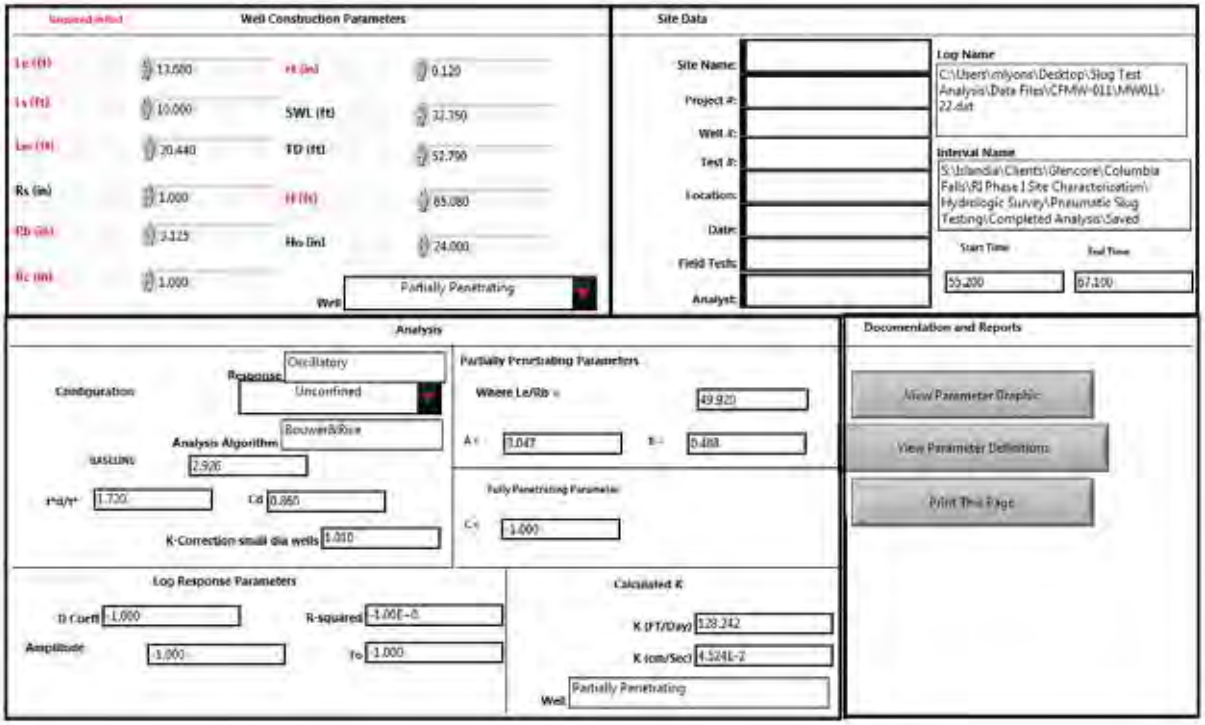


SITE INFORMATION -- SLUG TEST REV. 3.0

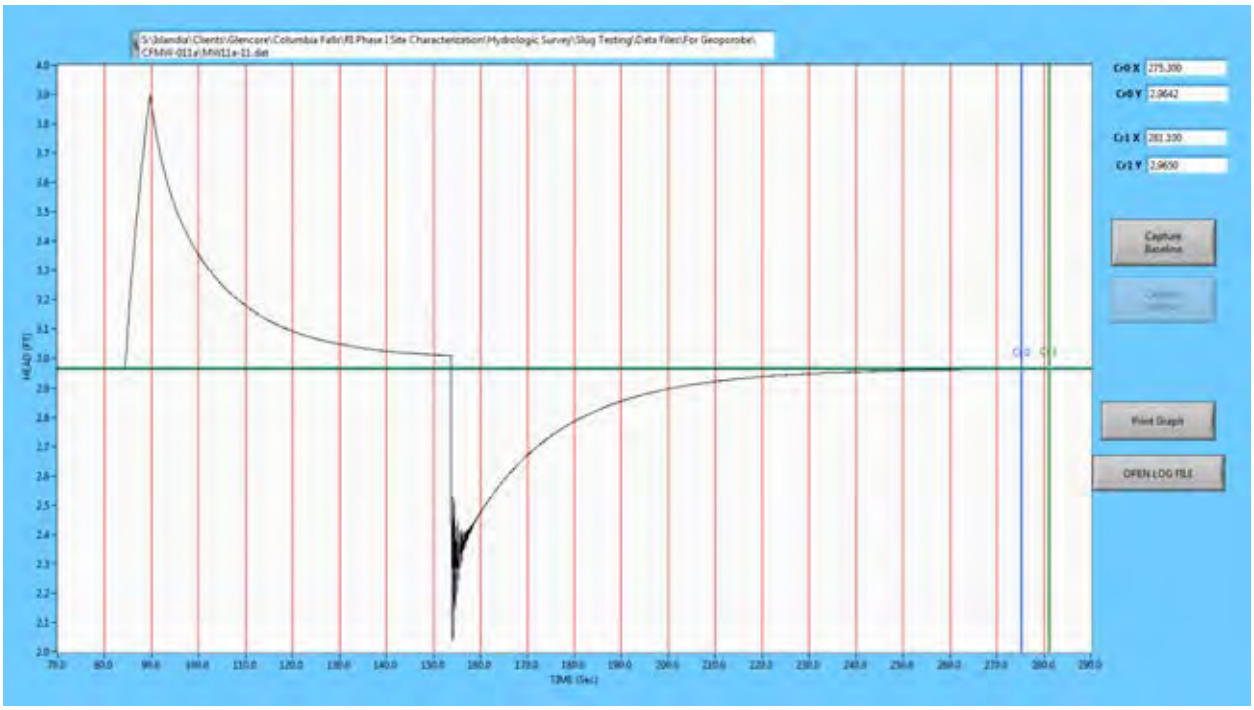
START DATE: 7/18/2017
START TIME: 10:18 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW011-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-011
2 Foot Displacement
Test #2





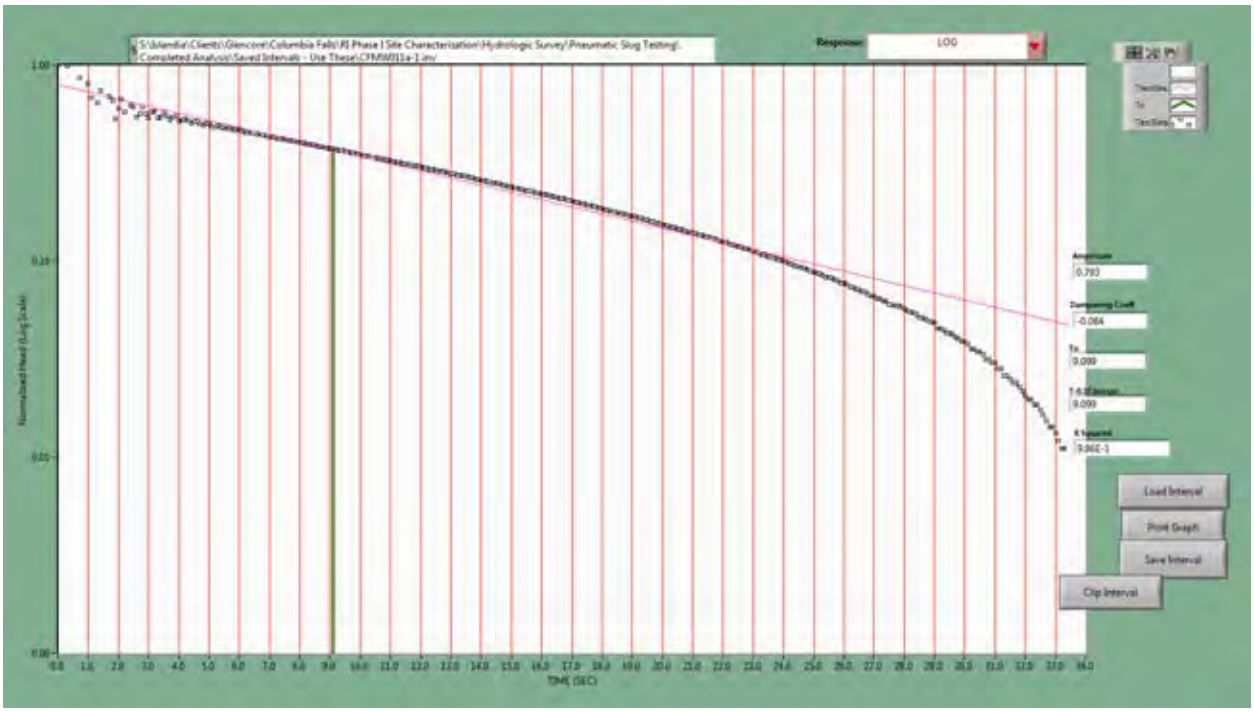
CFMW-011a
1 Foot Displacement
Test #1

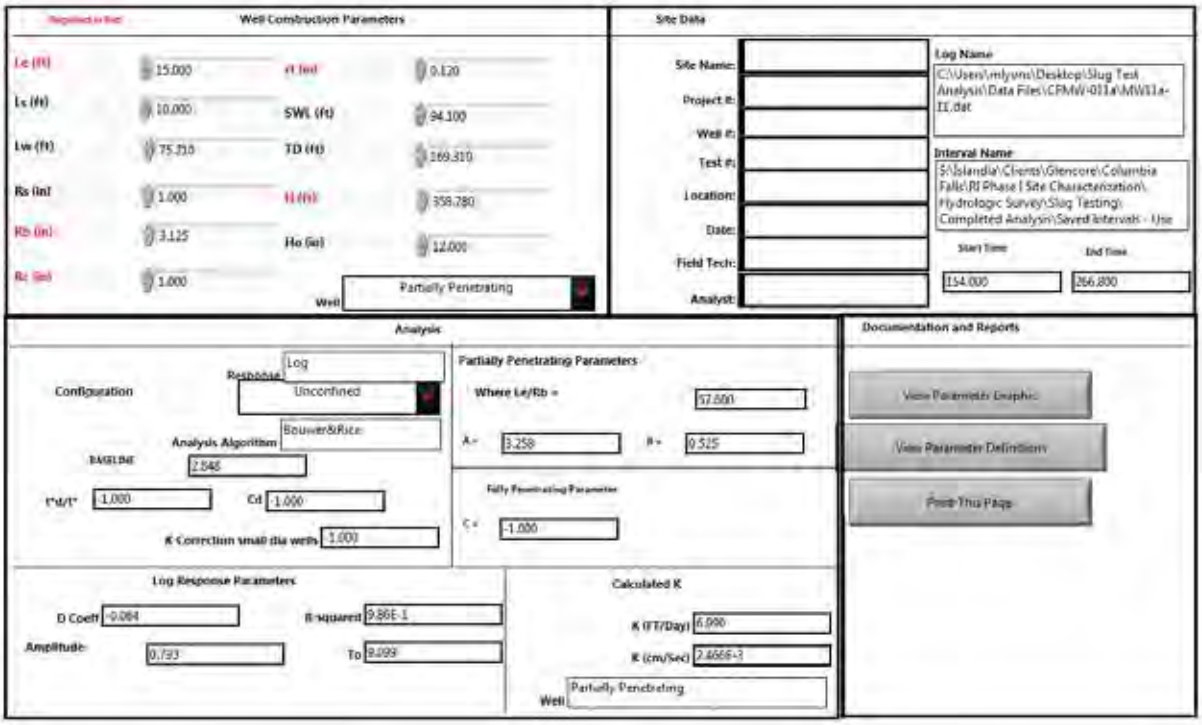


SITE INFORMATION -- SLUG TEST REV. 3.0

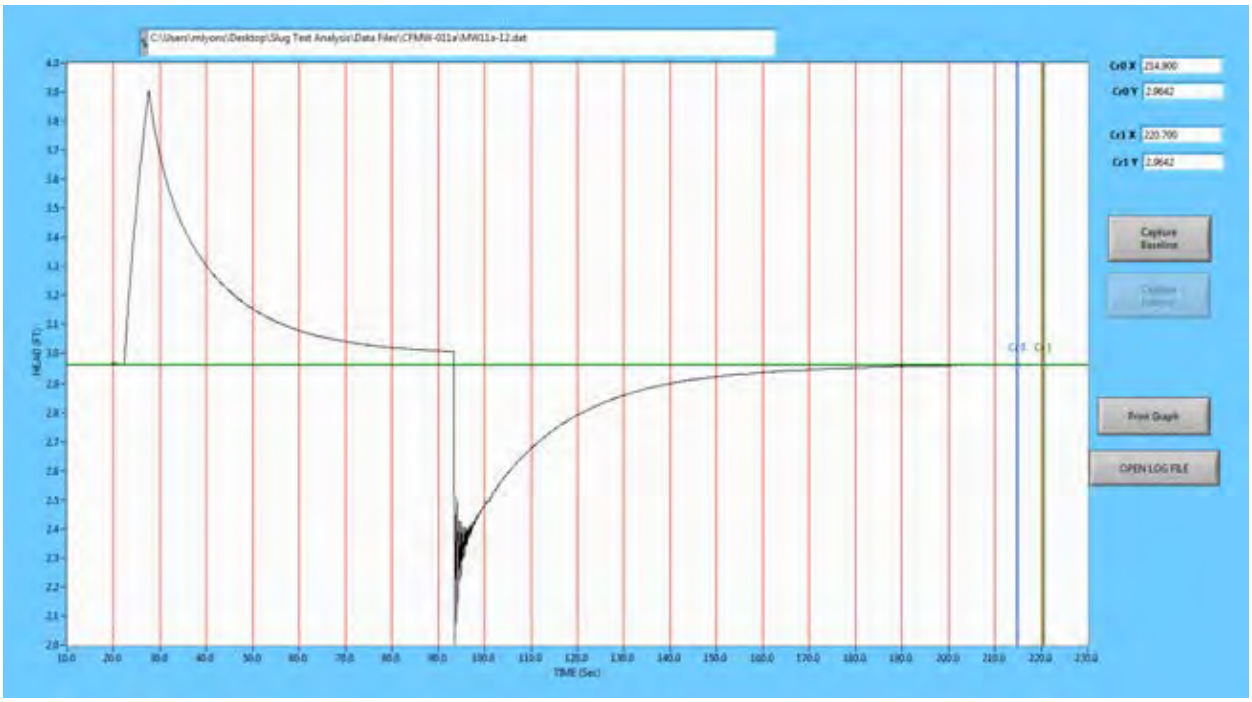
START DATE: 7/18/2017
START TIME: 9:34 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW11A-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-011a
1 Foot Displacement
Test #1





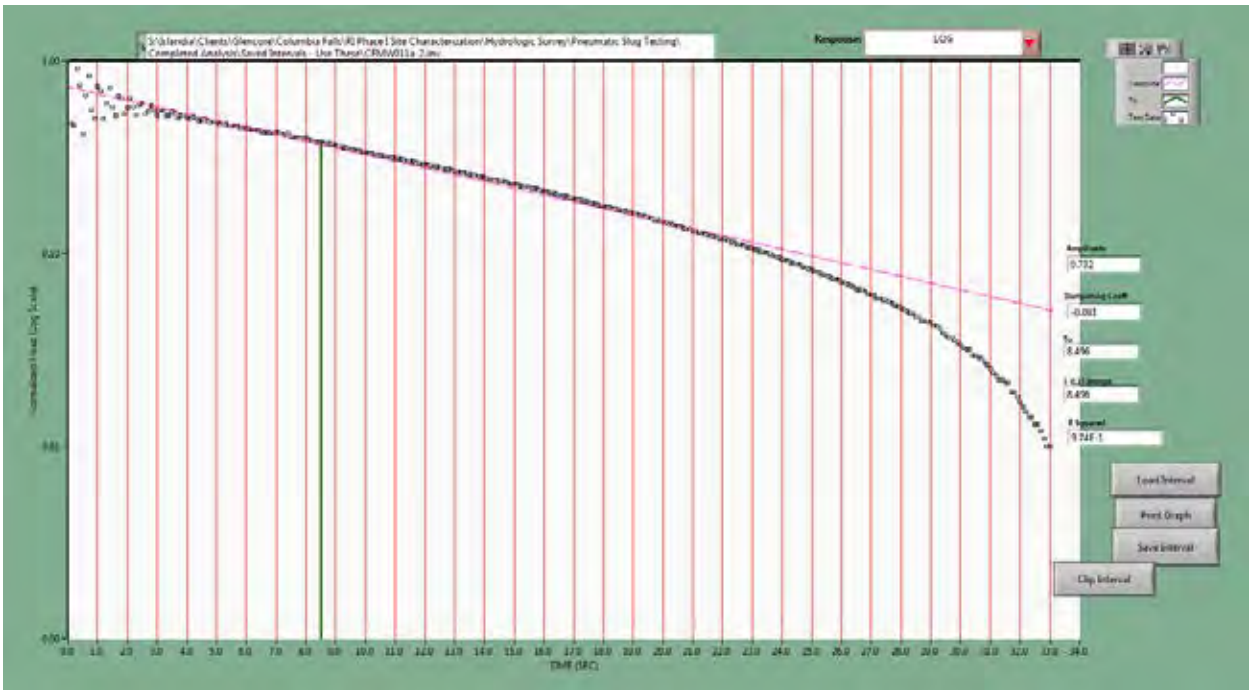
CFMW-011a
1 Foot Displacement
Test #2

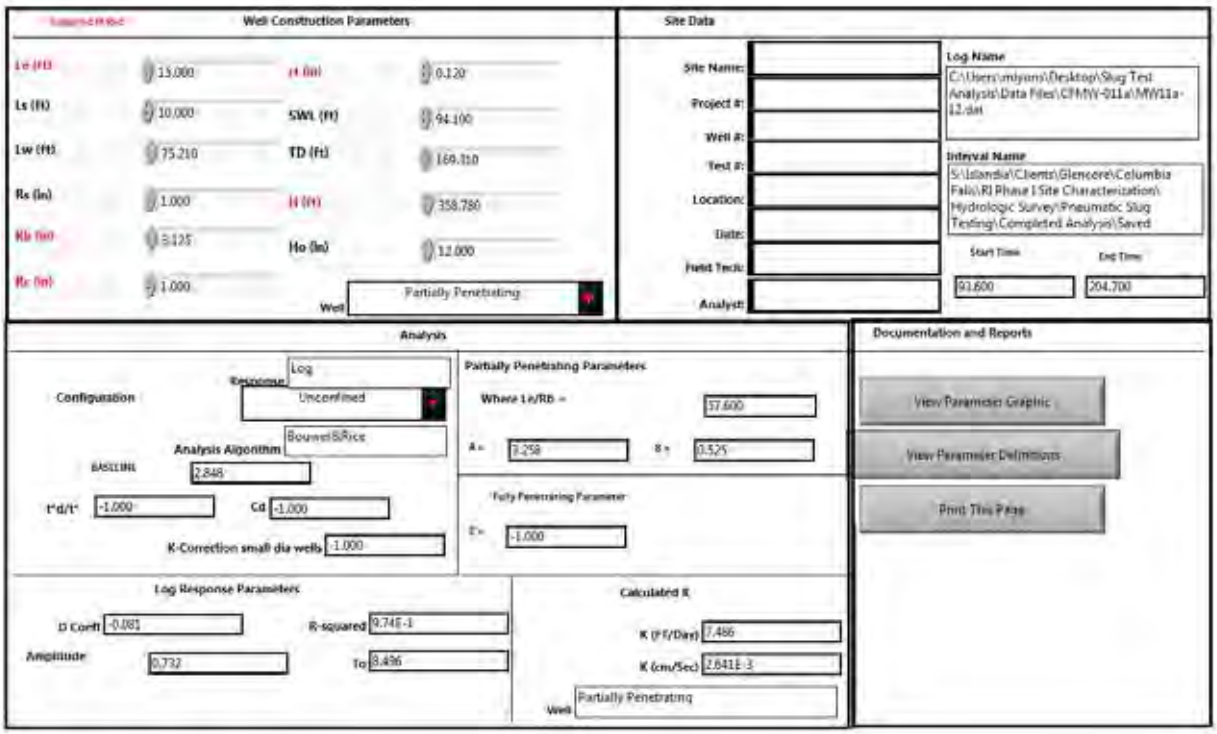


SITE INFORMATION -- SLUG TEST REV. 3.0

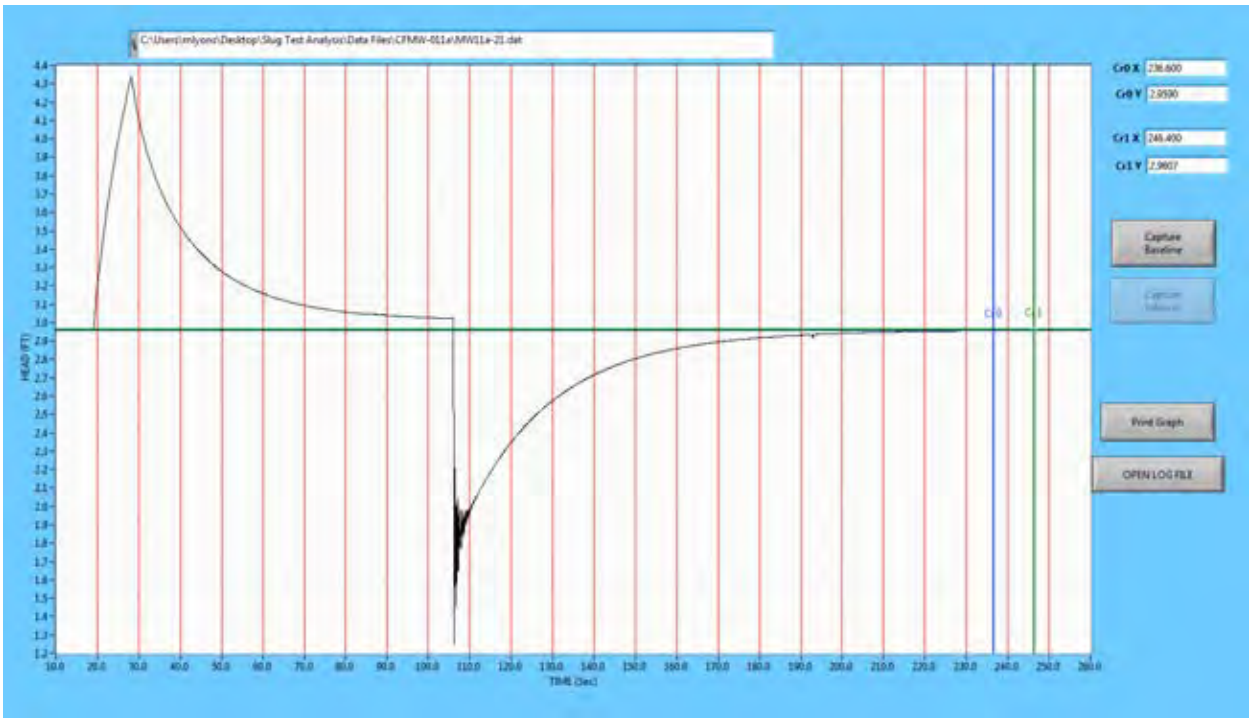
START DATE: 7/18/2017
START TIME: 9:39 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW11A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-011a
1 Foot Displacement
Test #2





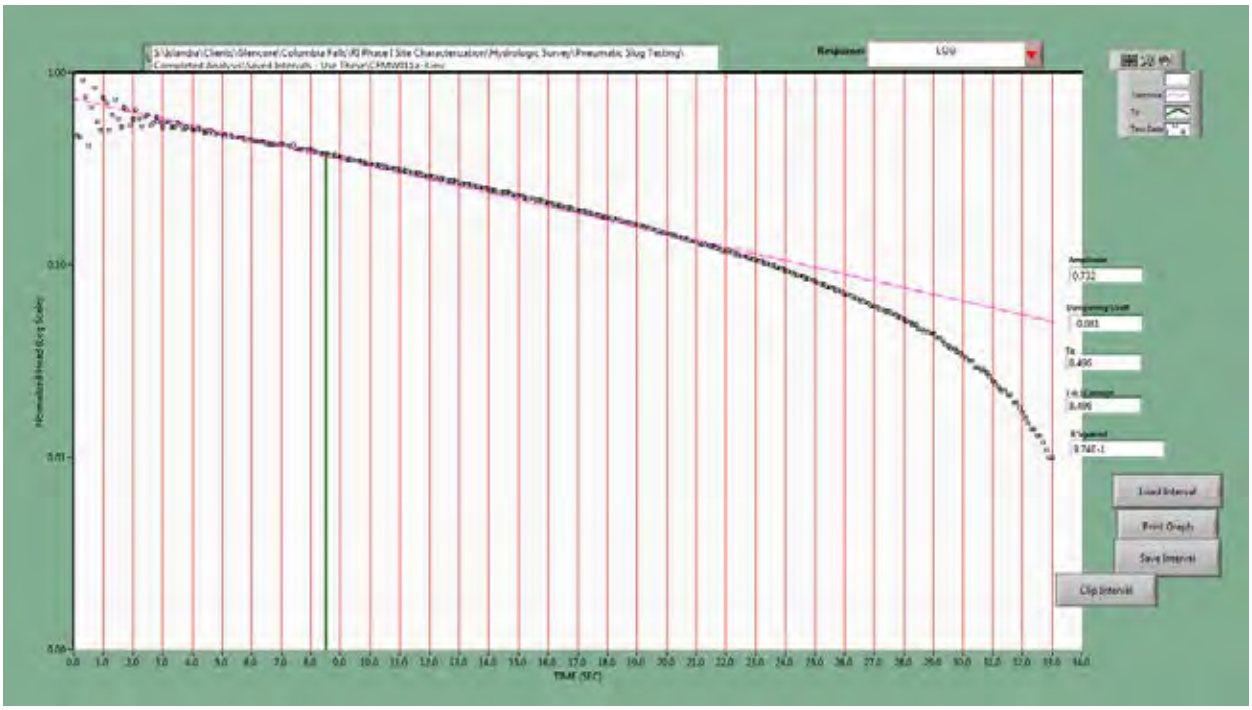
CFMW-011a
2 Foot Displacement
Test #1

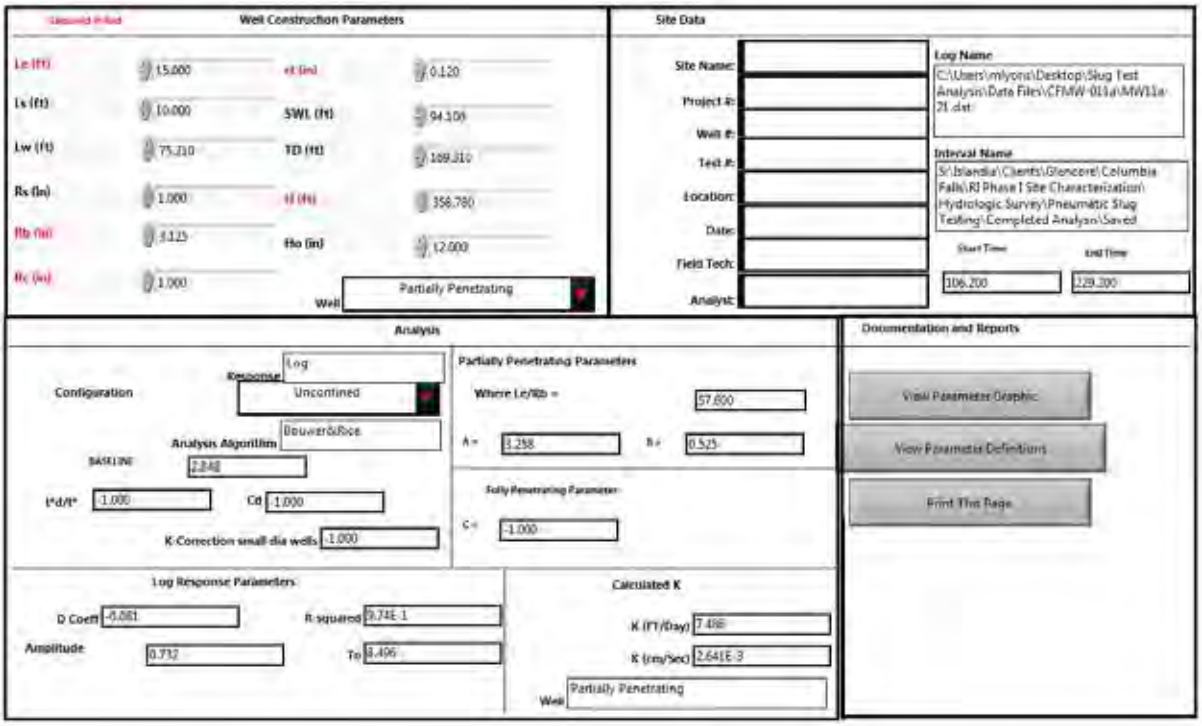


SITE INFORMATION -- SLUG TEST REV. 3.0

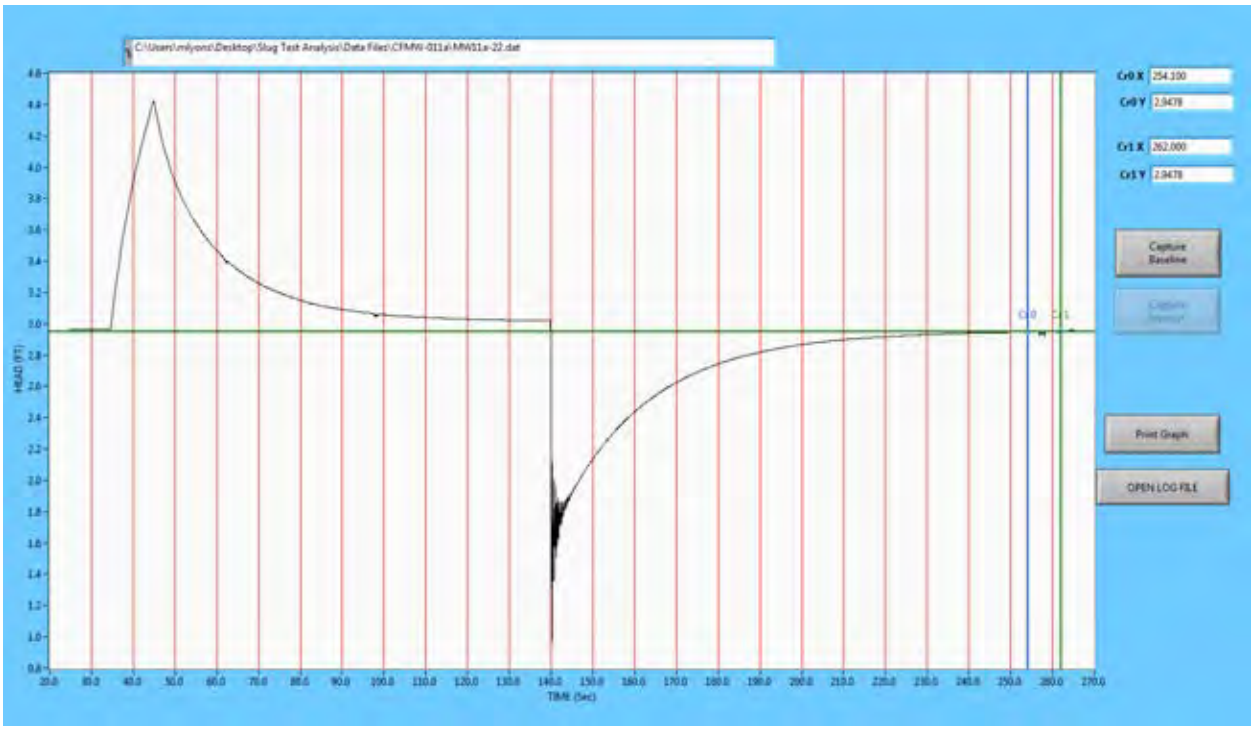
START DATE: 7/18/2017
START TIME: 9:43 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW11A-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-011a
2 Foot Displacement
Test #1





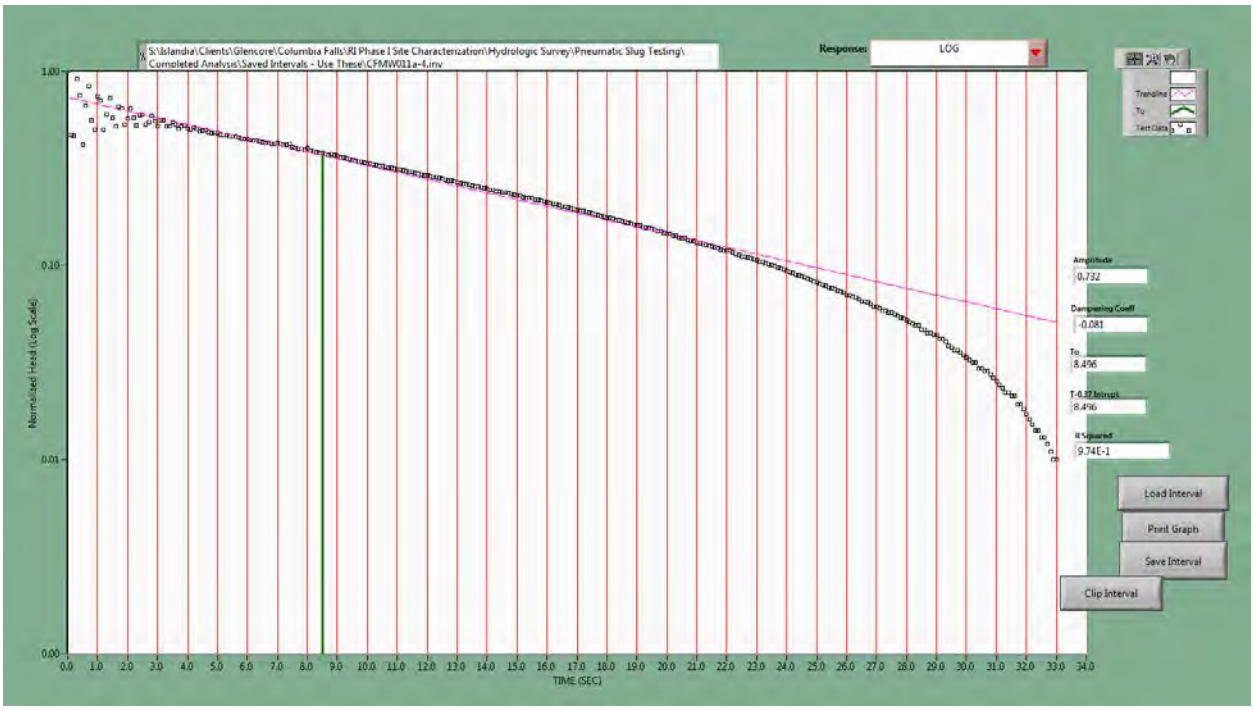
CFMW-011a
2 Foot Displacement
Test #2

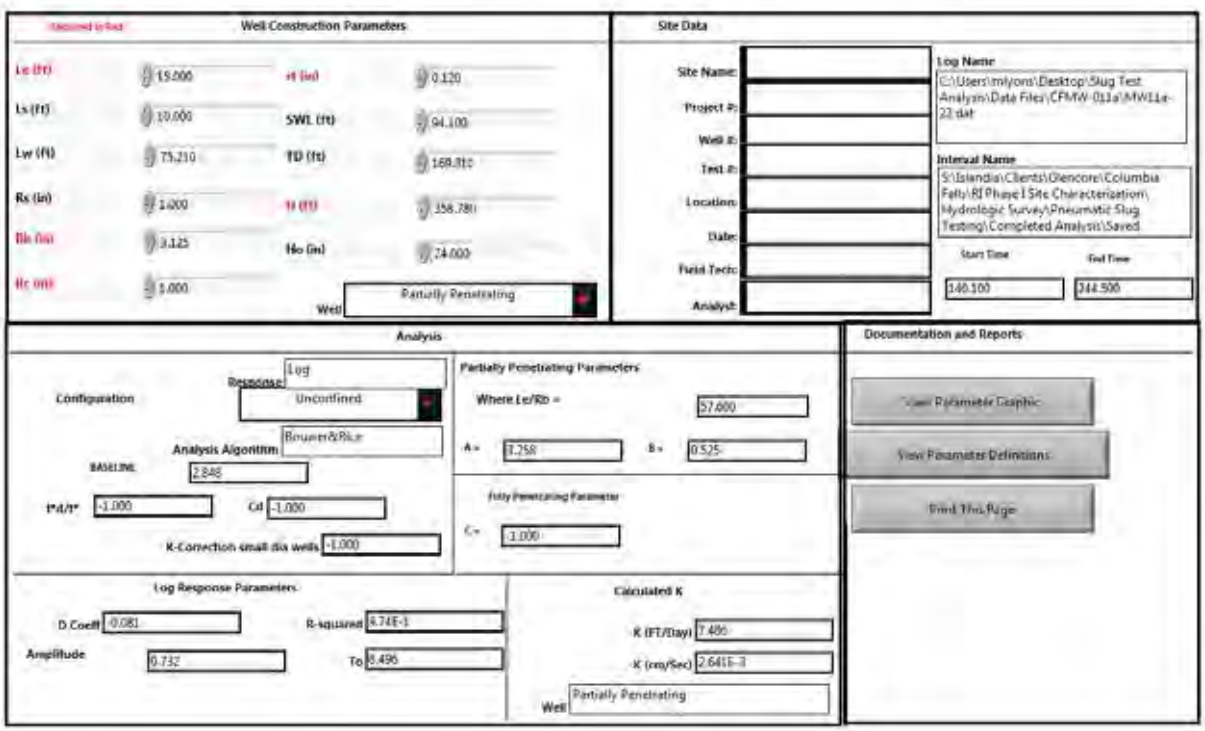


SITE INFORMATION -- SLUG TEST REV. 3.0

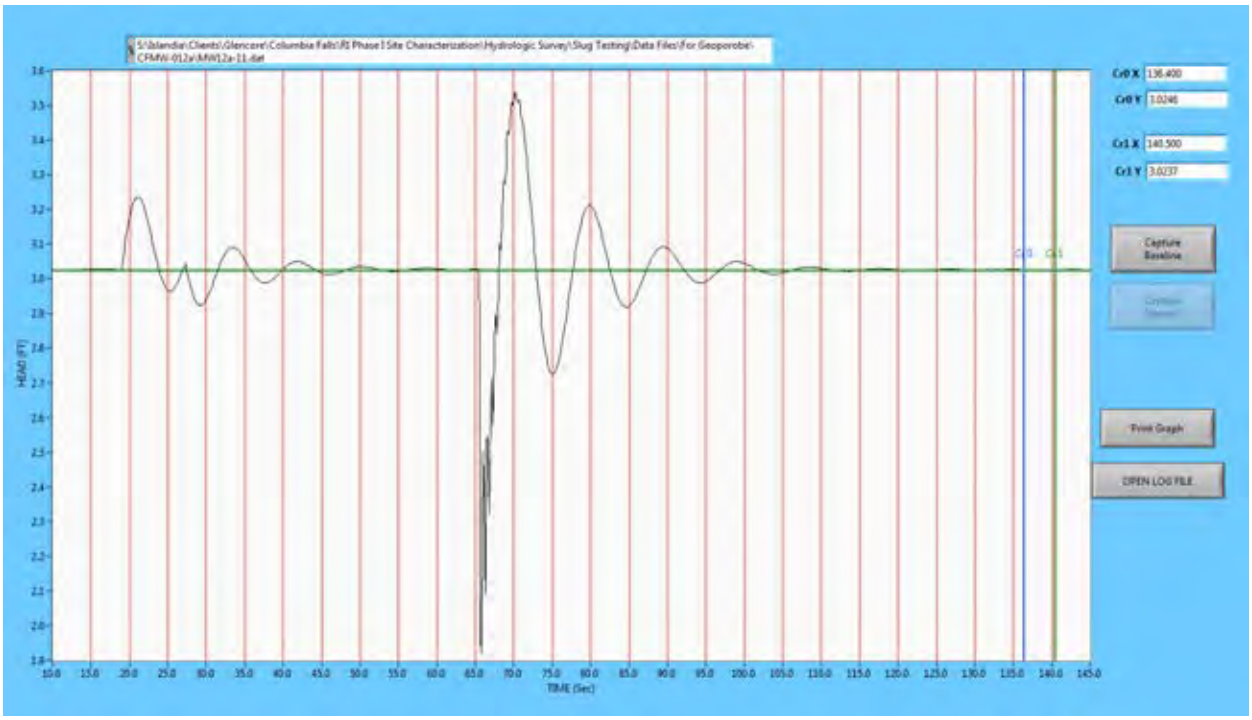
START DATE: 7/18/2017
START TIME: 9:47 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW11A-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-011a
2 Foot Displacement
Test #2





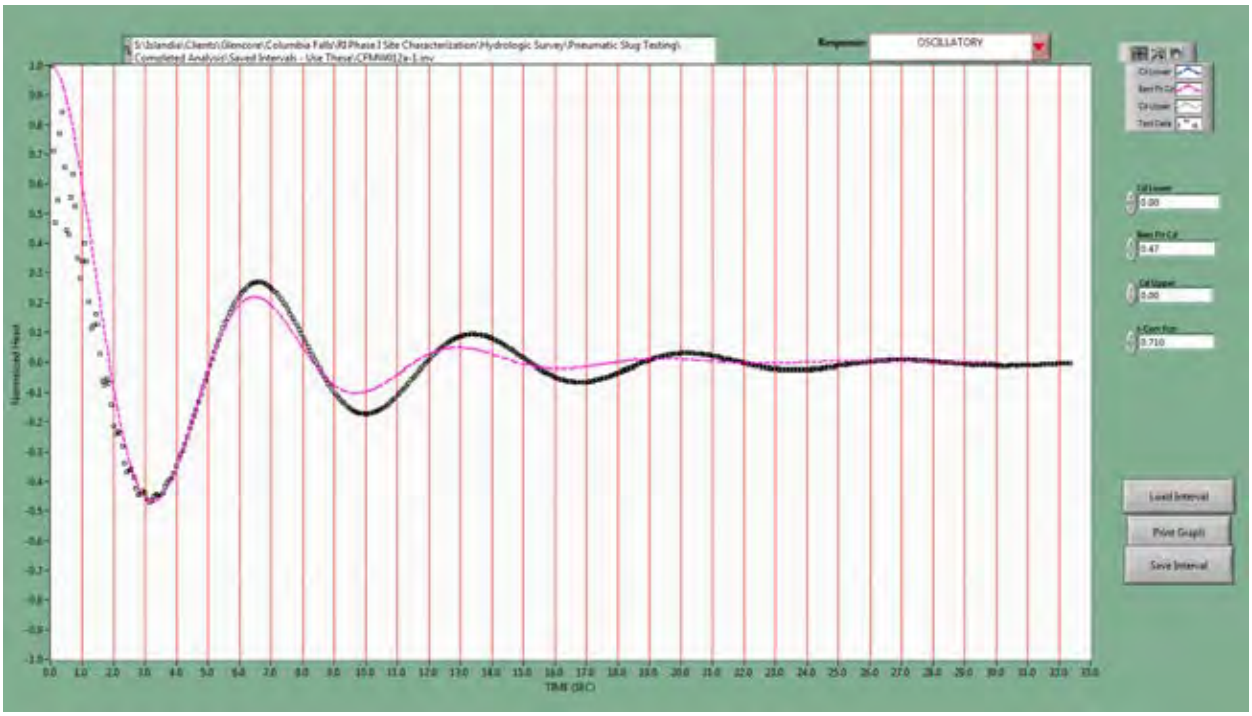
CFMW-012a
1 Foot Displacement
Test #1

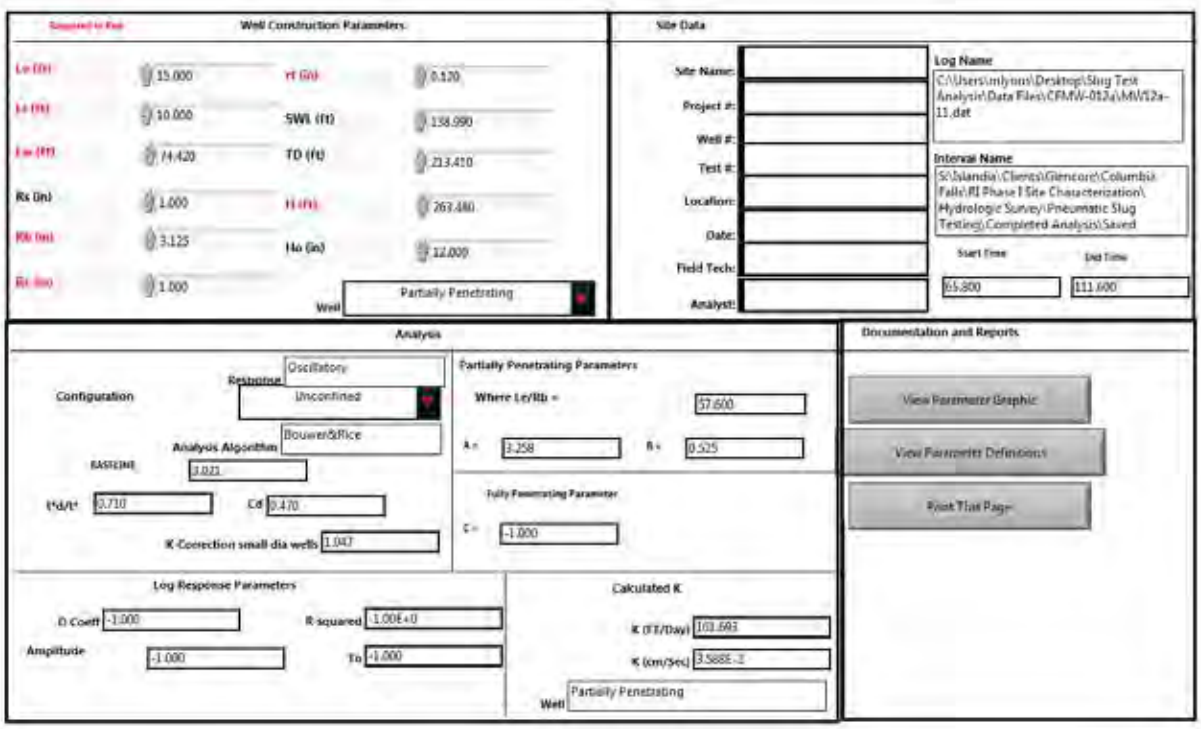


SITE INFORMATION -- SLUG TEST REV. 3.0

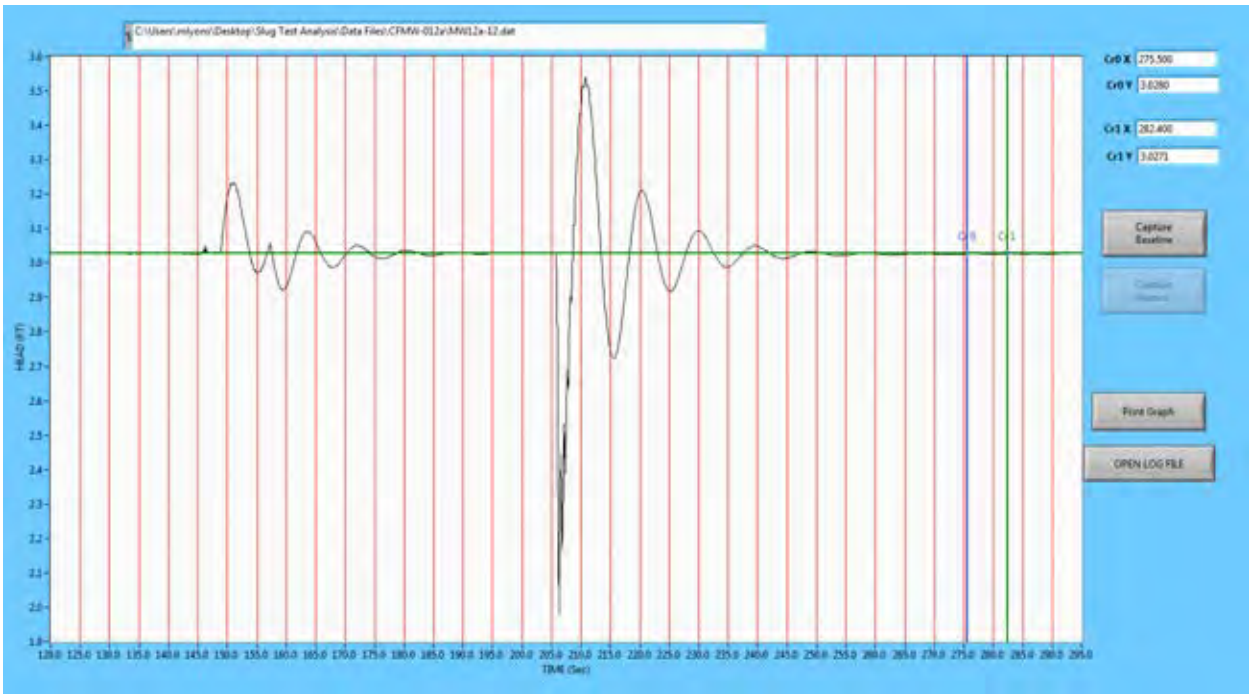
START DATE: 7/18/2017
START TIME: 11:06 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW12A-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-012a
1 Foot Displacement
Test #1





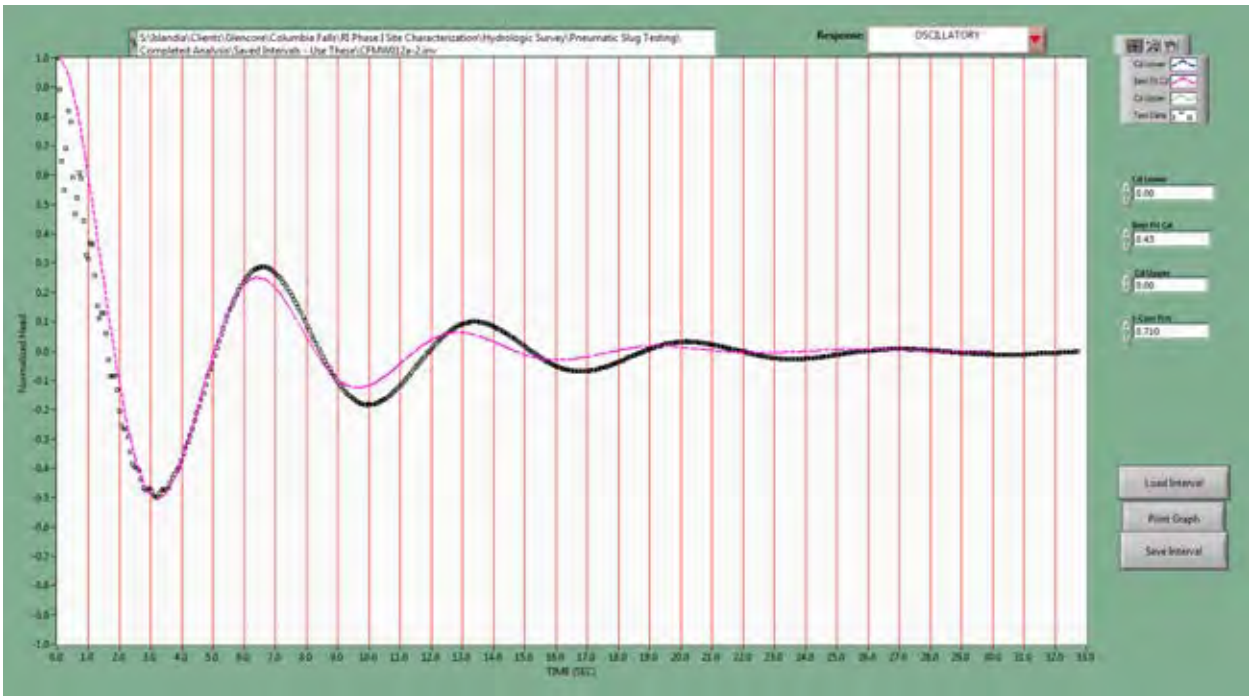
CFMW-012a
1 Foot Displacement
Test #2

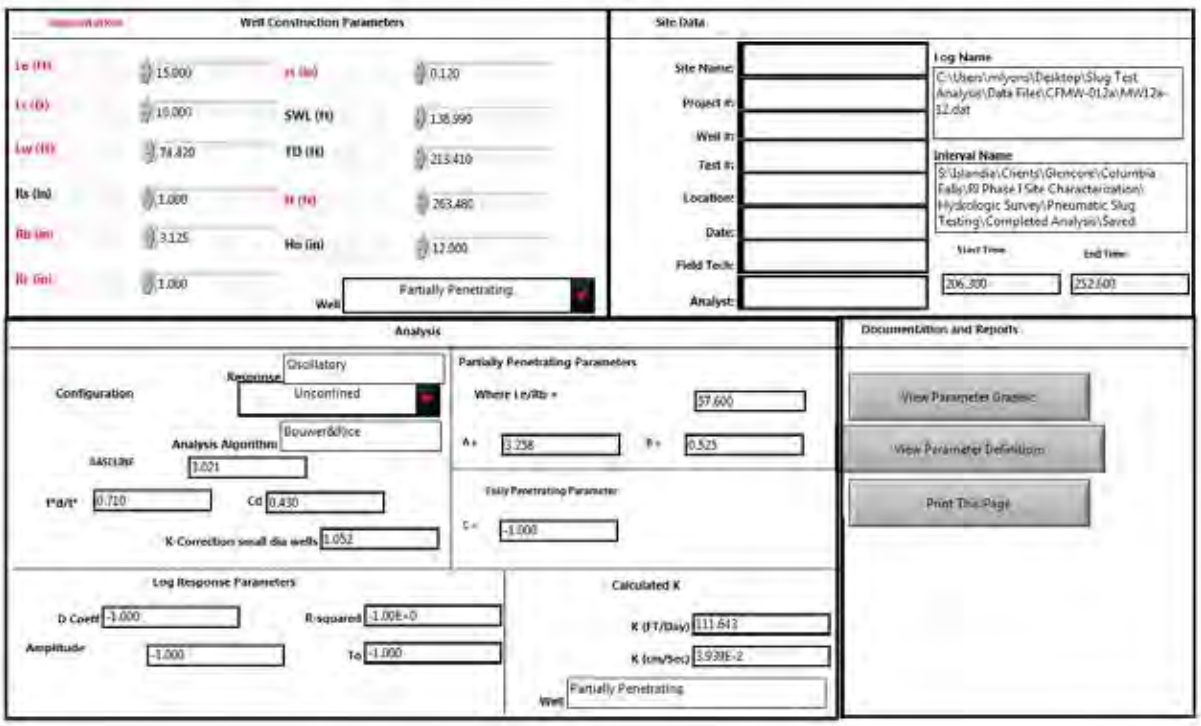


SITE INFORMATION -- SLUG TEST REV. 3.0

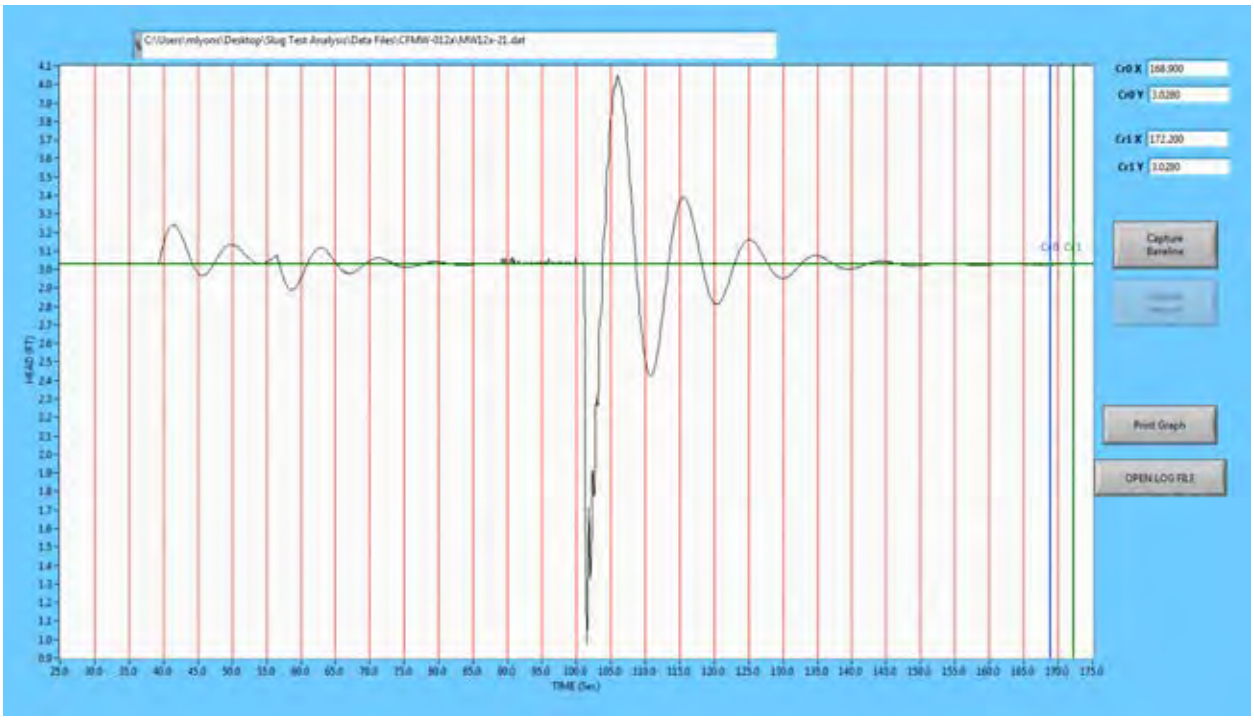
START DATE: 7/18/2017
START TIME: 11:10 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW12A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-012a
1 Foot Displacement
Test #2





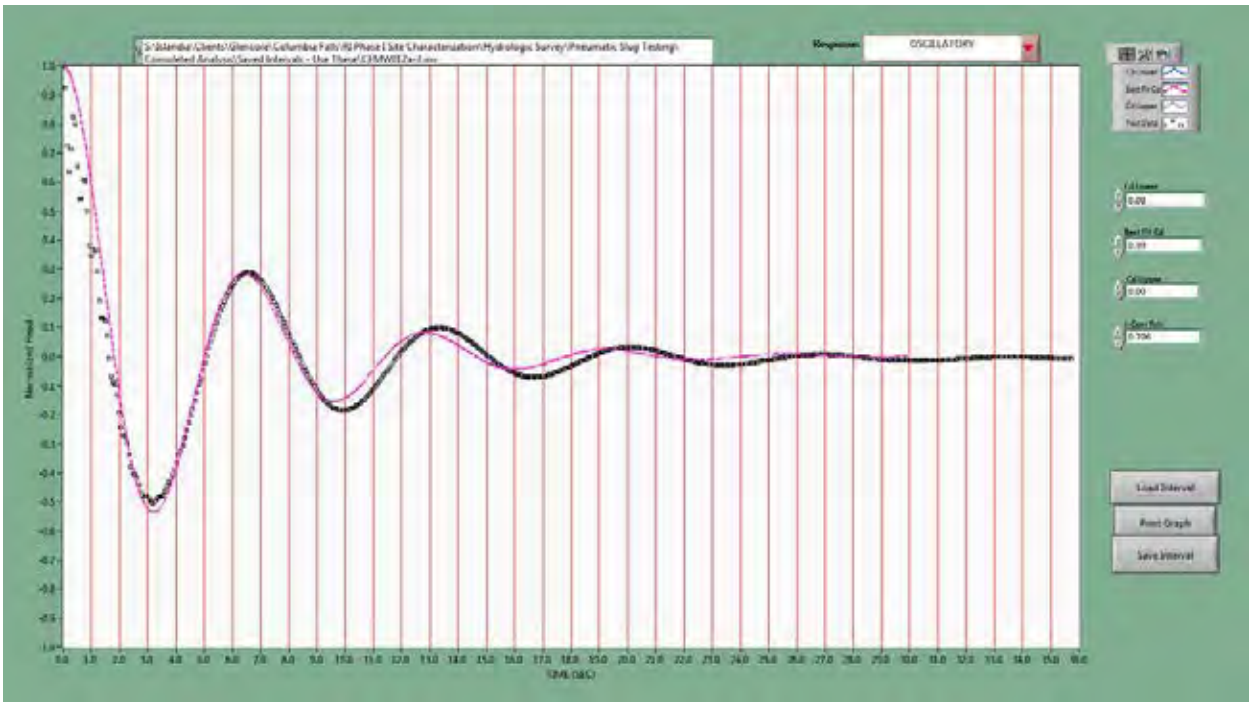
CFMW-012a
2 Foot Displacement
Test #1

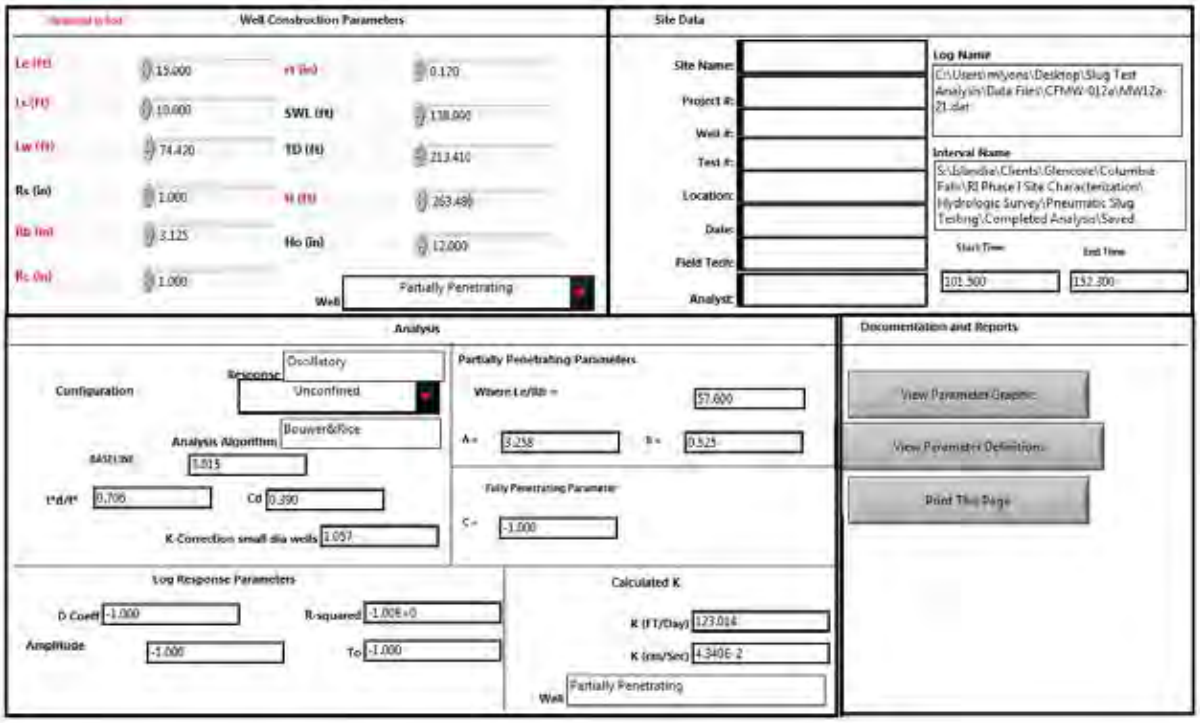


SITE INFORMATION -- SLUG TEST REV. 3.0

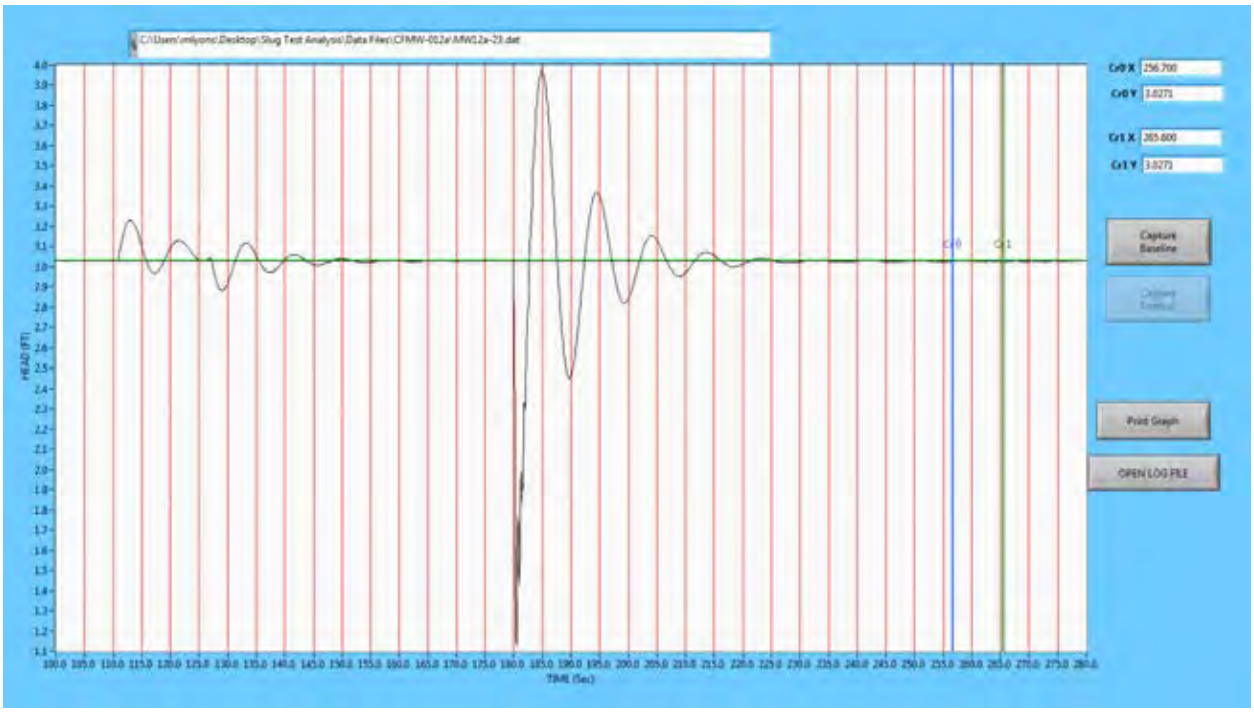
START DATE: 7/18/2017
START TIME: 10:53 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW12A-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-012a
2 Foot Displacement
Test #1





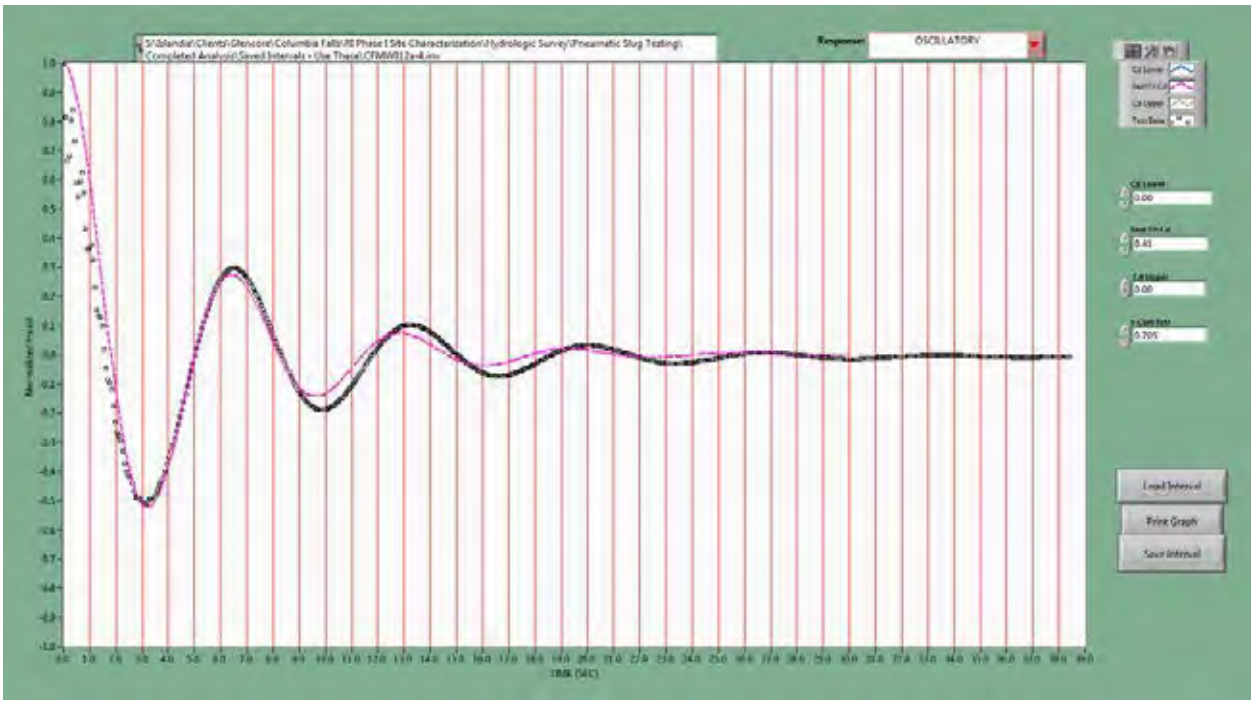
CFMW-012a
2 Foot Displacement
Test #2

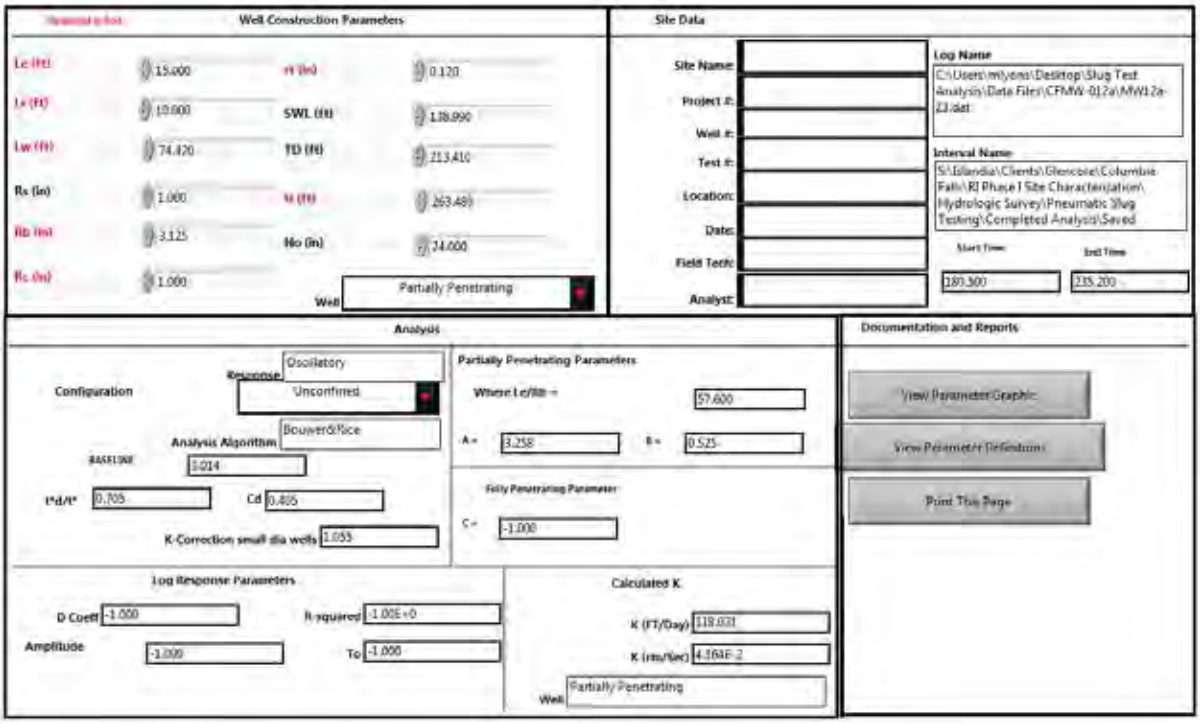


SITE INFORMATION -- SLUG TEST REV. 3.0

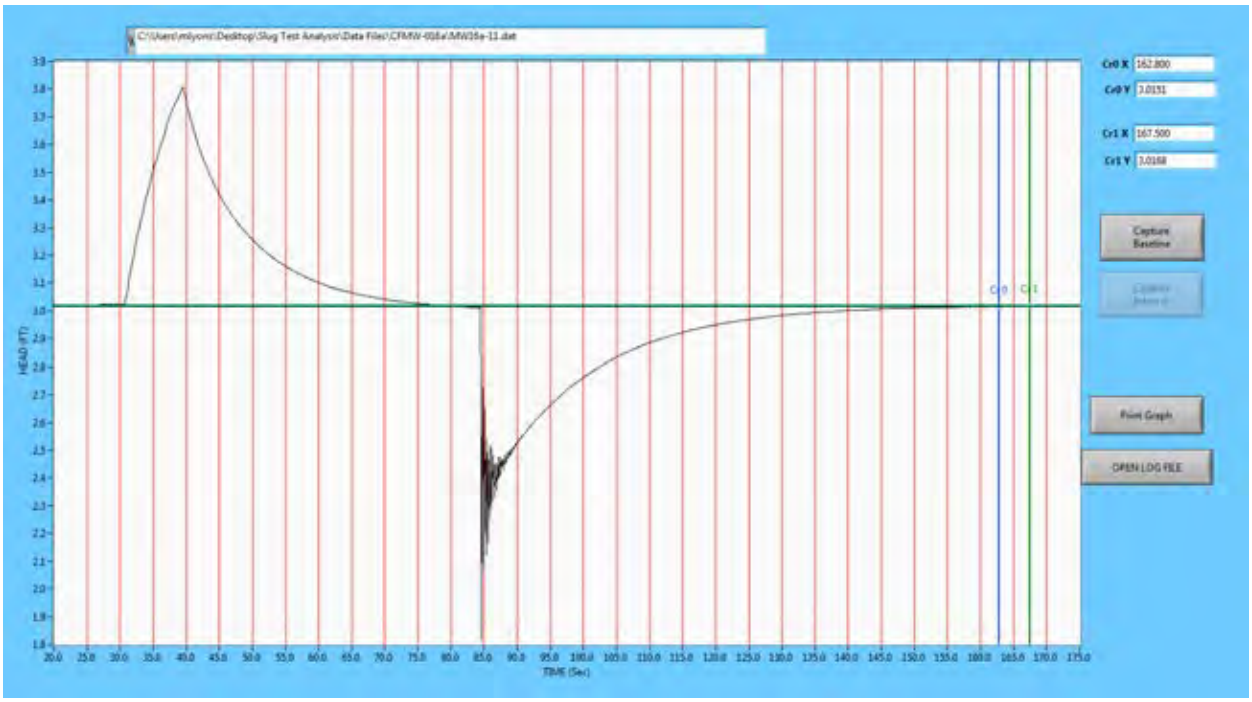
START DATE: 7/18/2017
START TIME: 11:02 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW12A-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-012a
2 Foot Displacement
Test #2





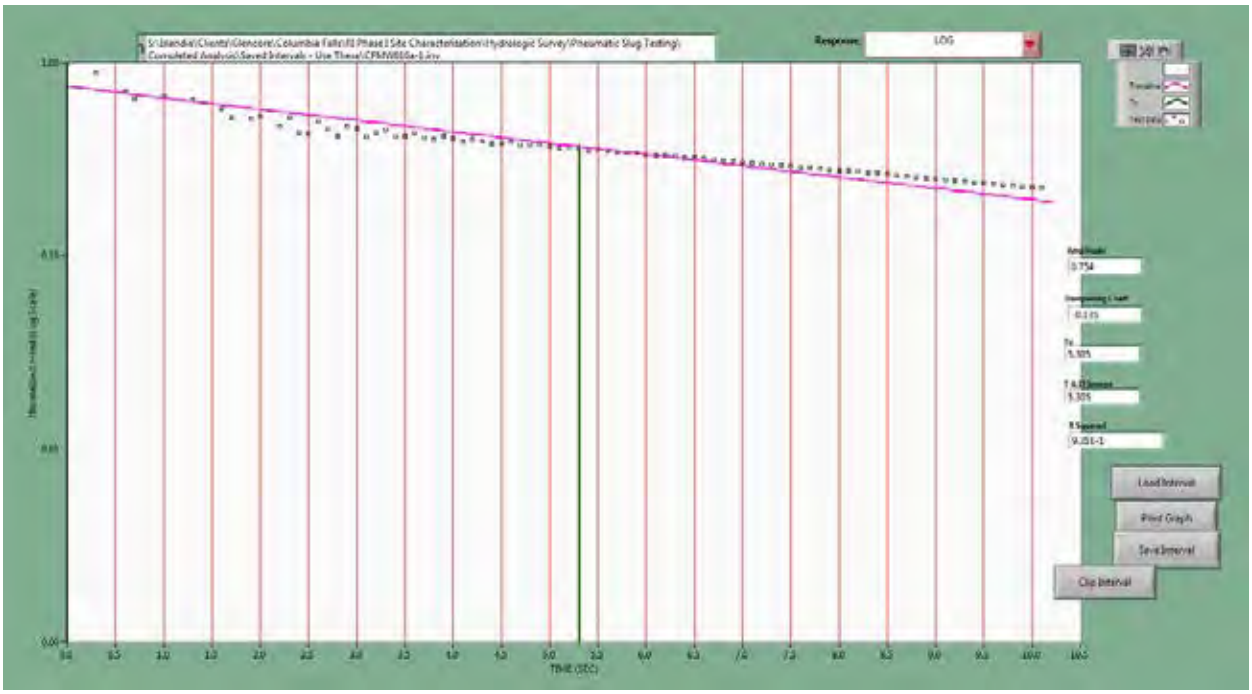
CFMW-016a
1 Foot Displacement
Test #1

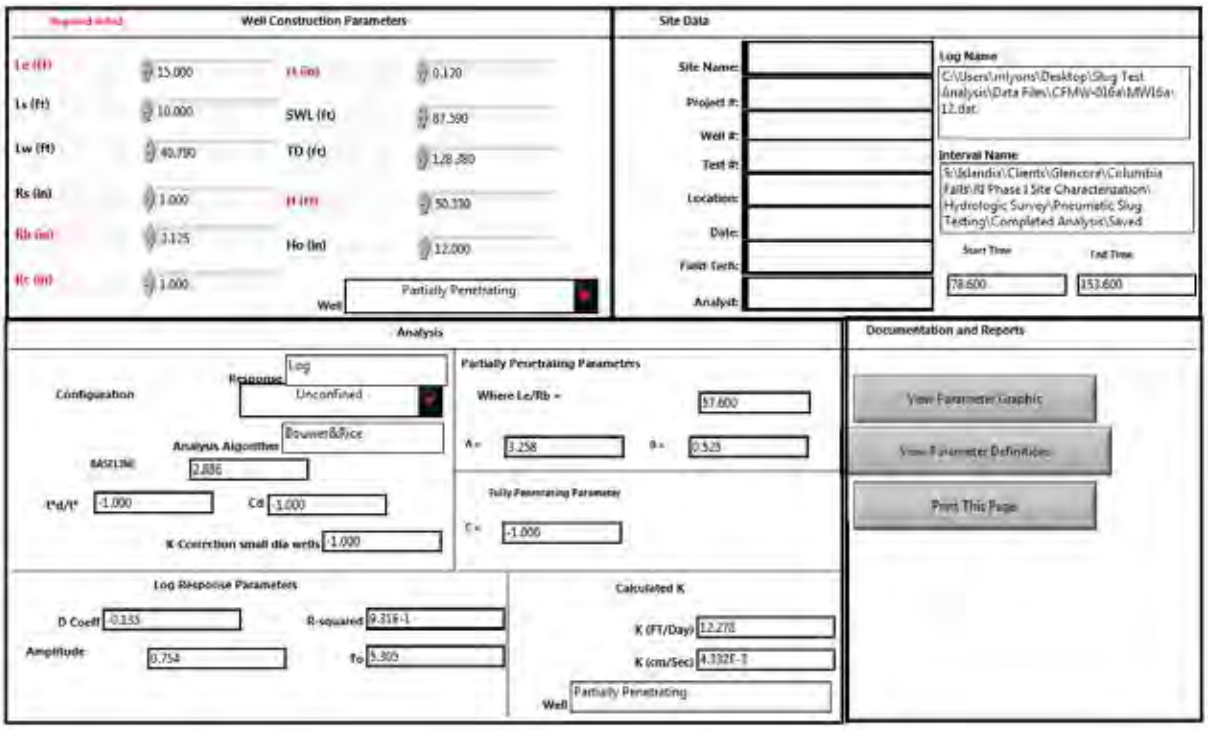


SITE INFORMATION -- SLUG TEST REV. 3.0

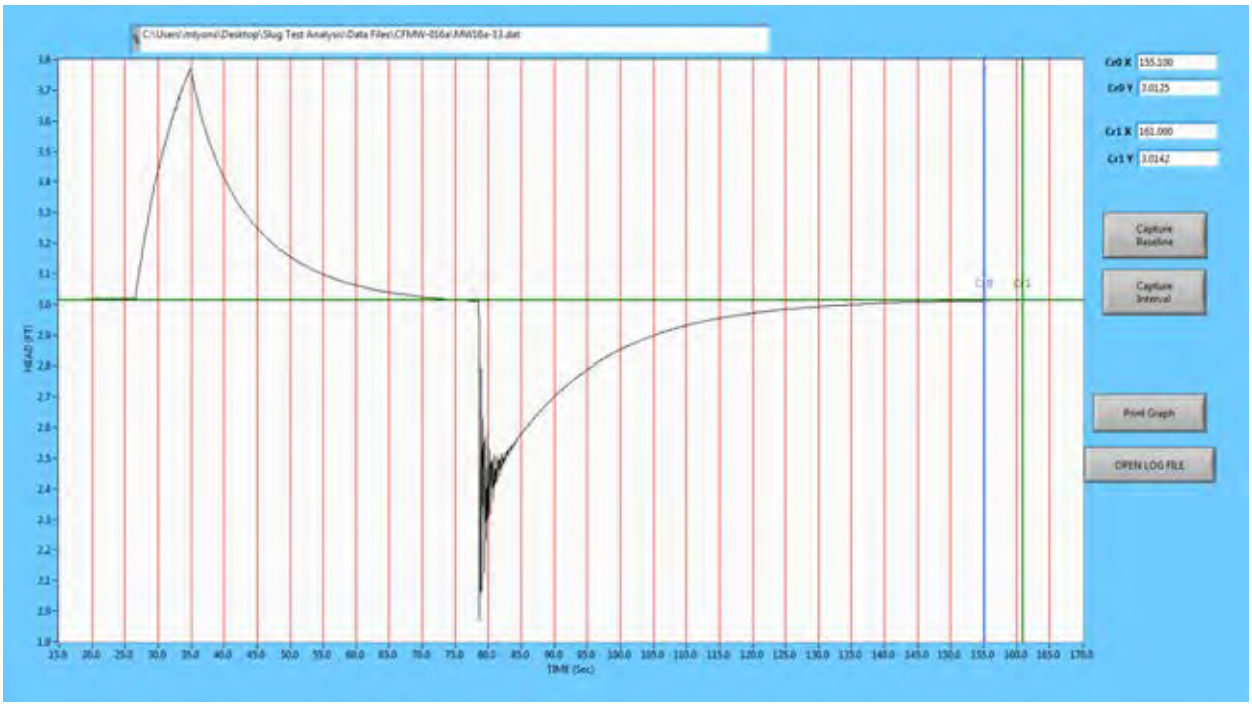
START DATE: 7/17/2017
START TIME: 11:40 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW16A-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-016a
1 Foot Displacement
Test #1





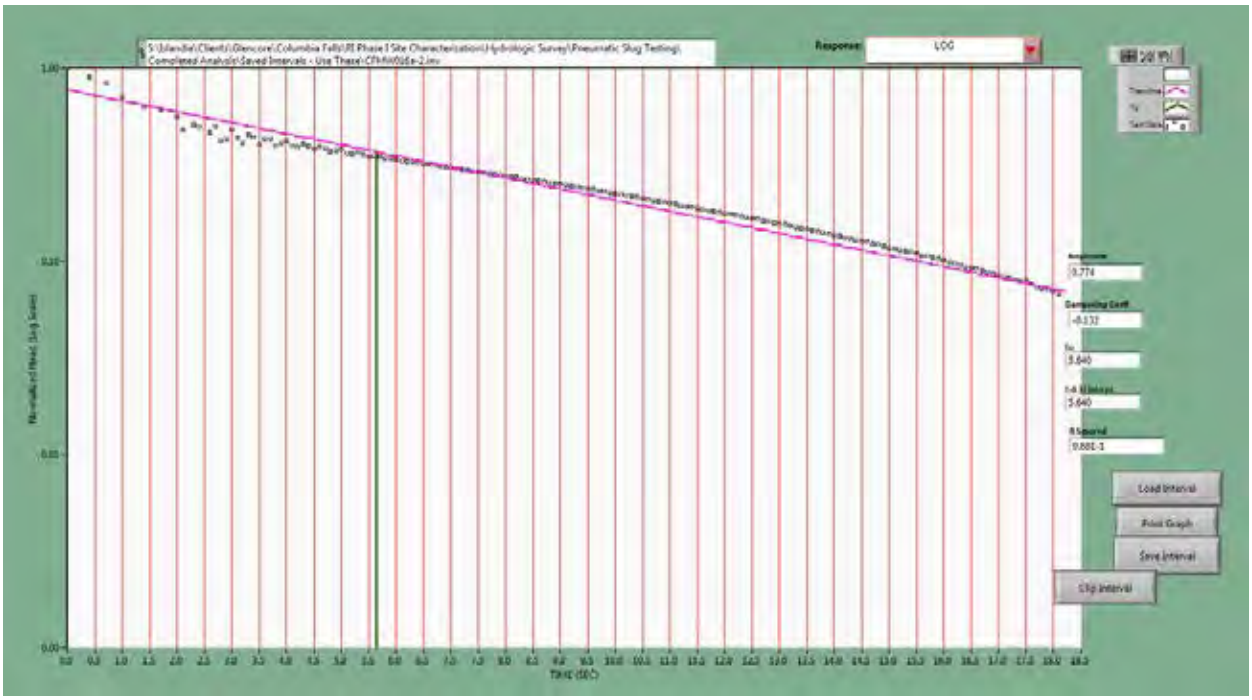
CFMW-016a
1 Foot Displacement
Test #2

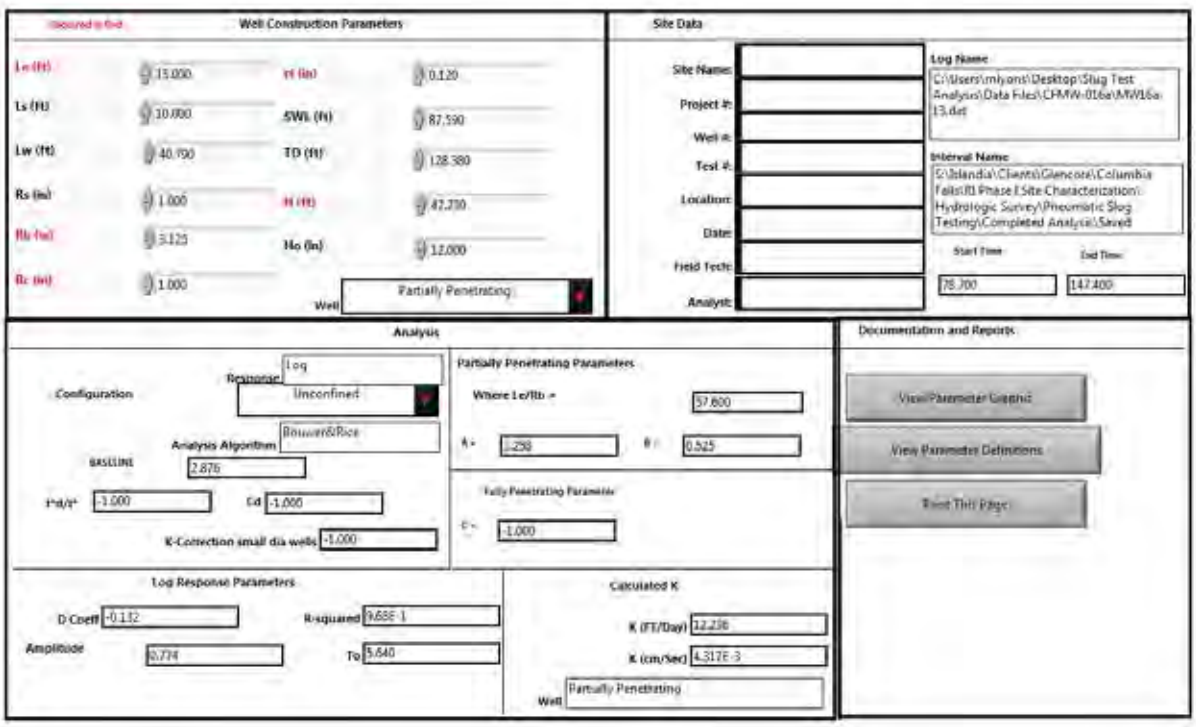


SITE INFORMATION -- SLUG TEST REV. 3.0

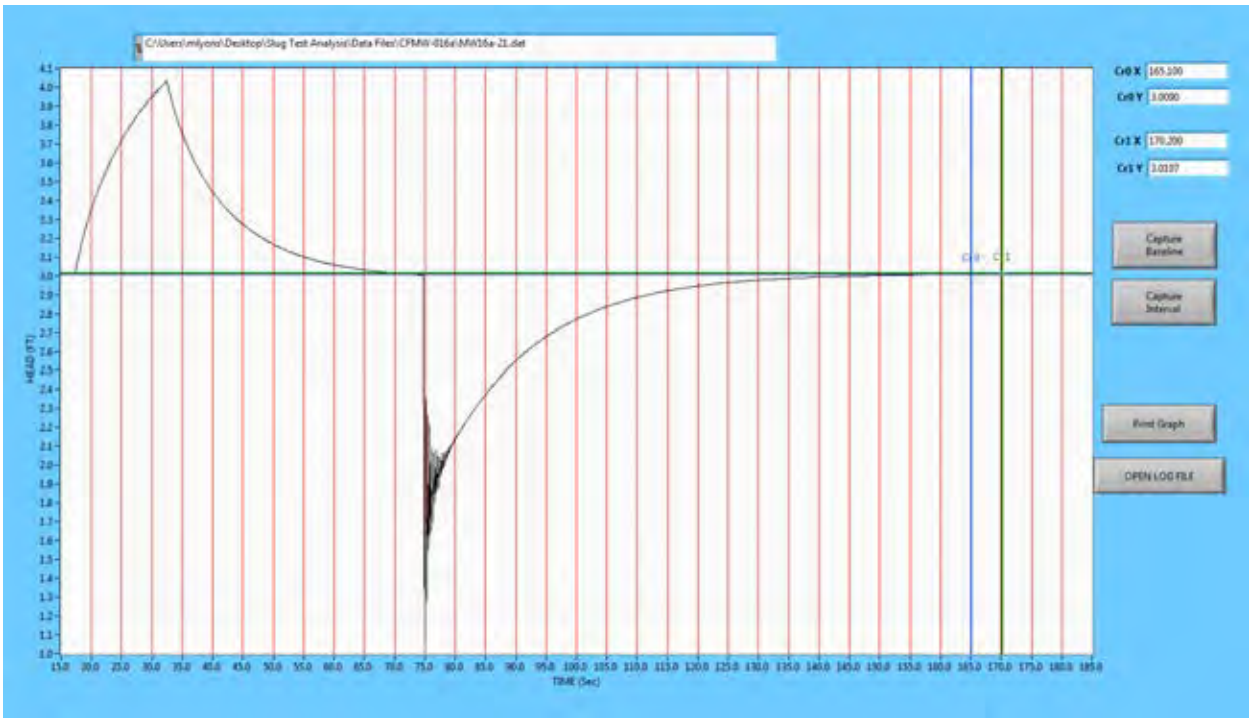
START DATE: 7/17/2017
START TIME: 11:46 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW16A-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-016a
1 Foot Displacement
Test #2





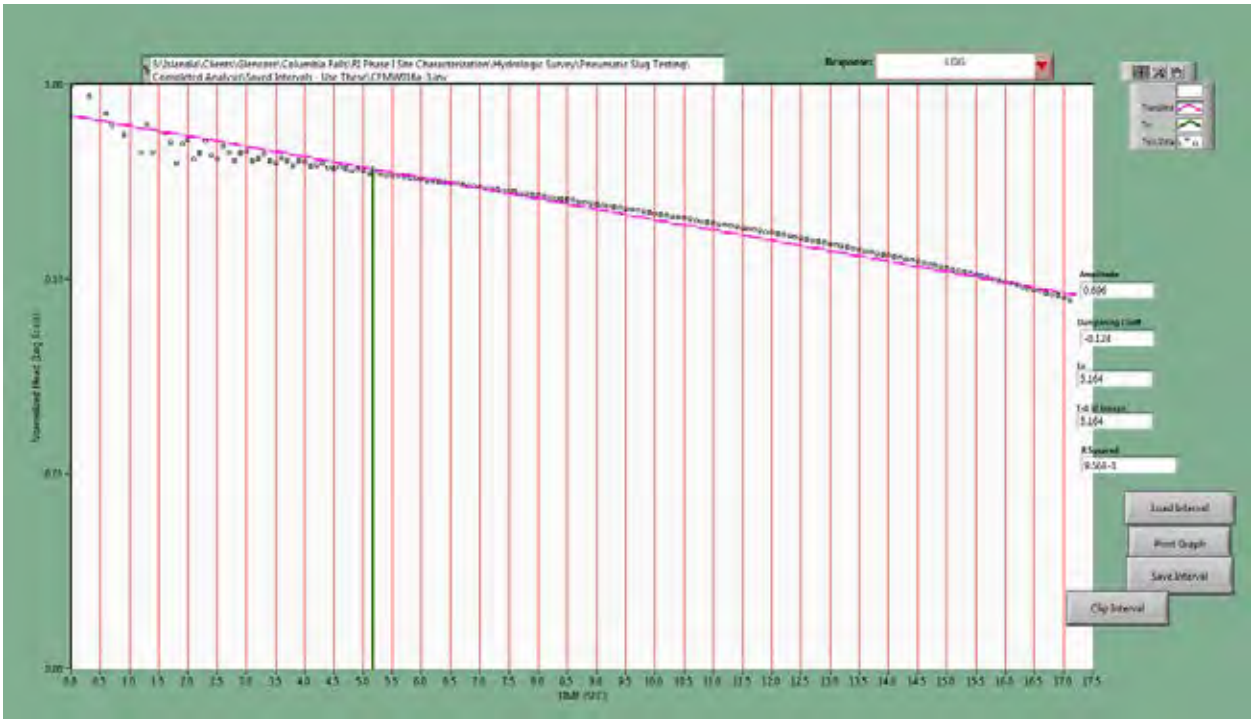
CFMW-016a
2 Foot Displacement
Test #1

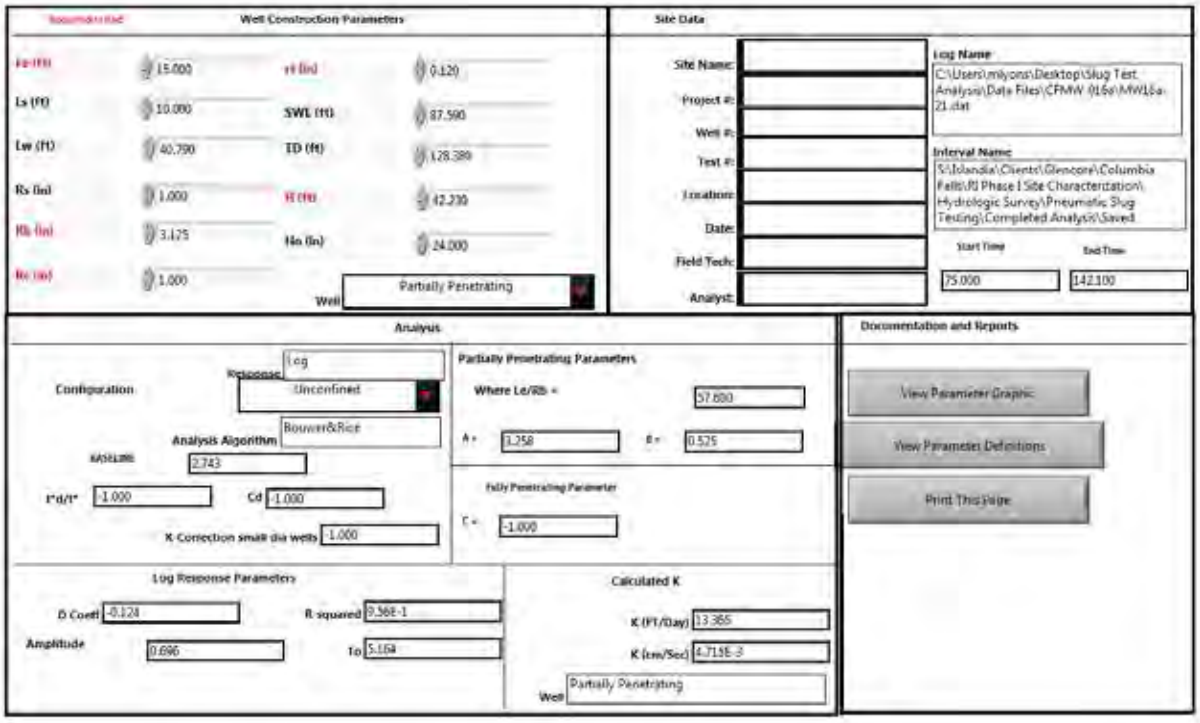


SITE INFORMATION -- SLUG TEST REV. 3.0

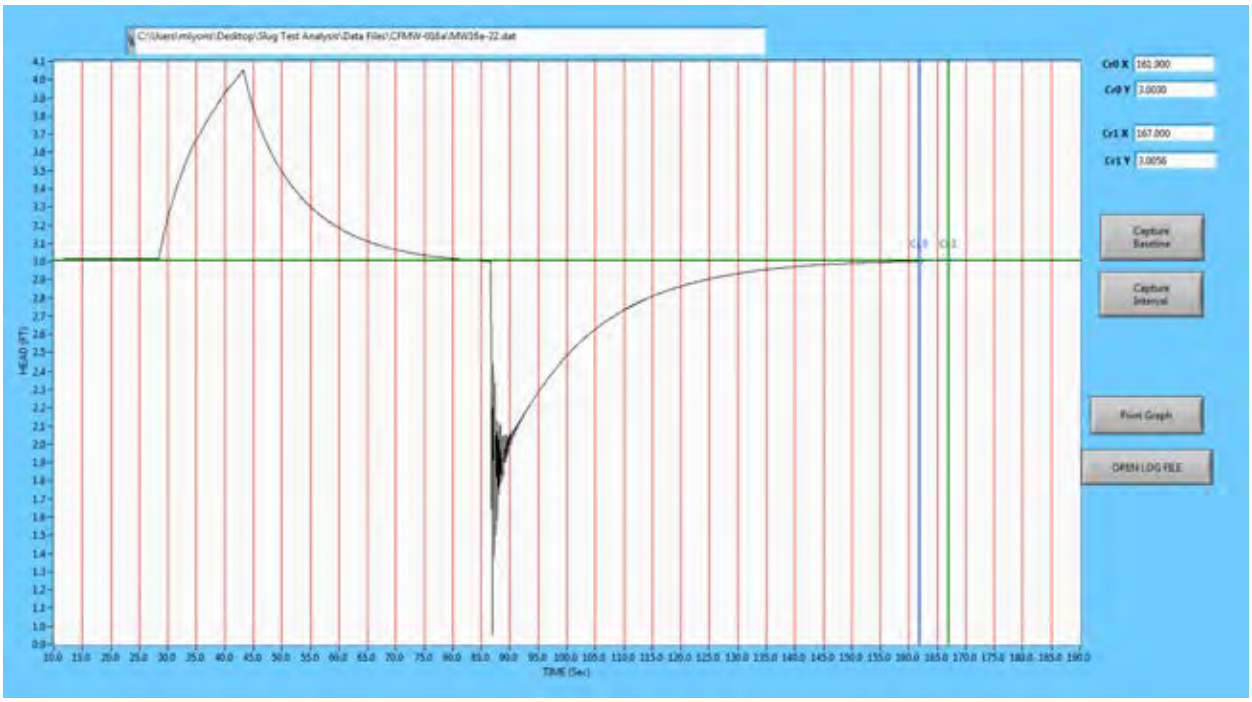
START DATE: 7/17/2017
START TIME: 11:49 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW16A-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-016a
2 Foot Displacement
Test #1





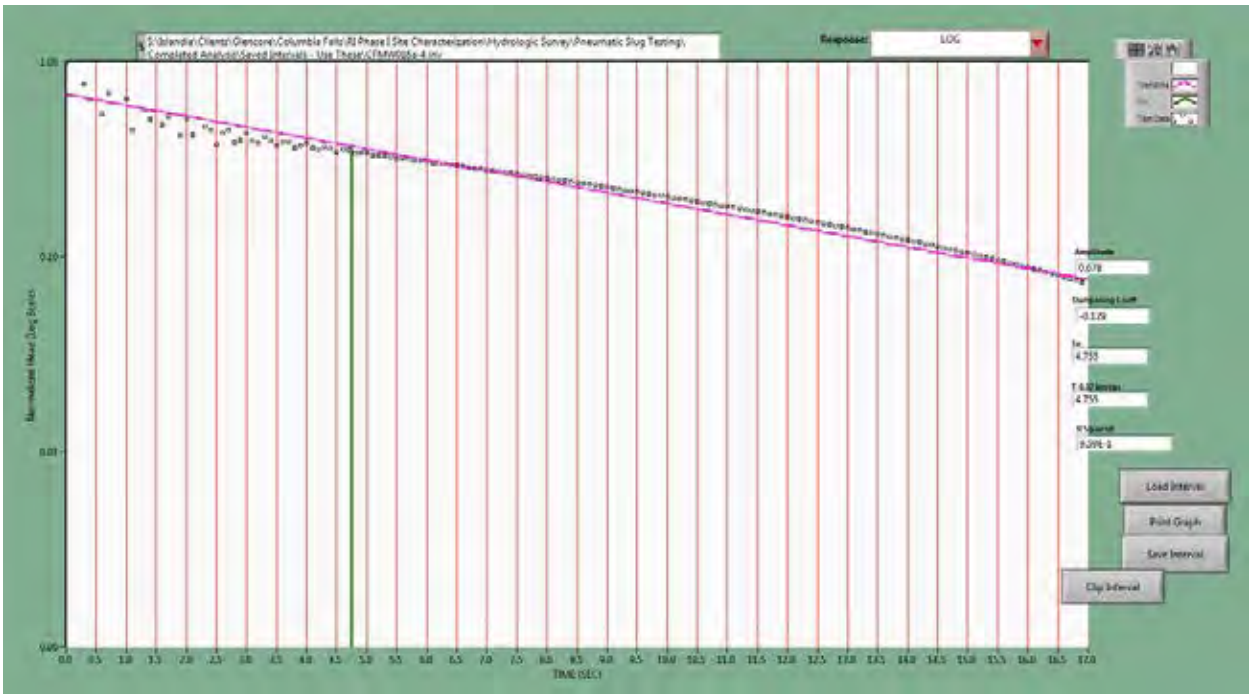
CFMW-016a
2 Foot Displacement
Test #2

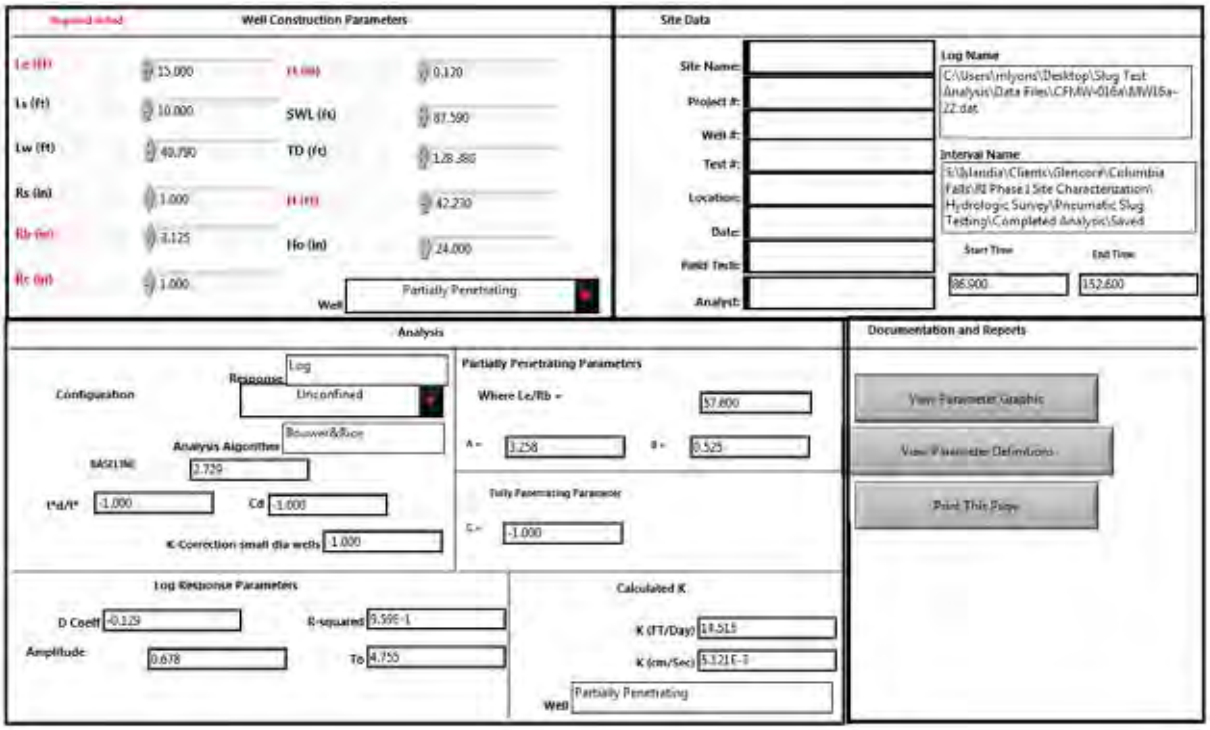


SITE INFORMATION -- SLUG TEST REV. 3.0

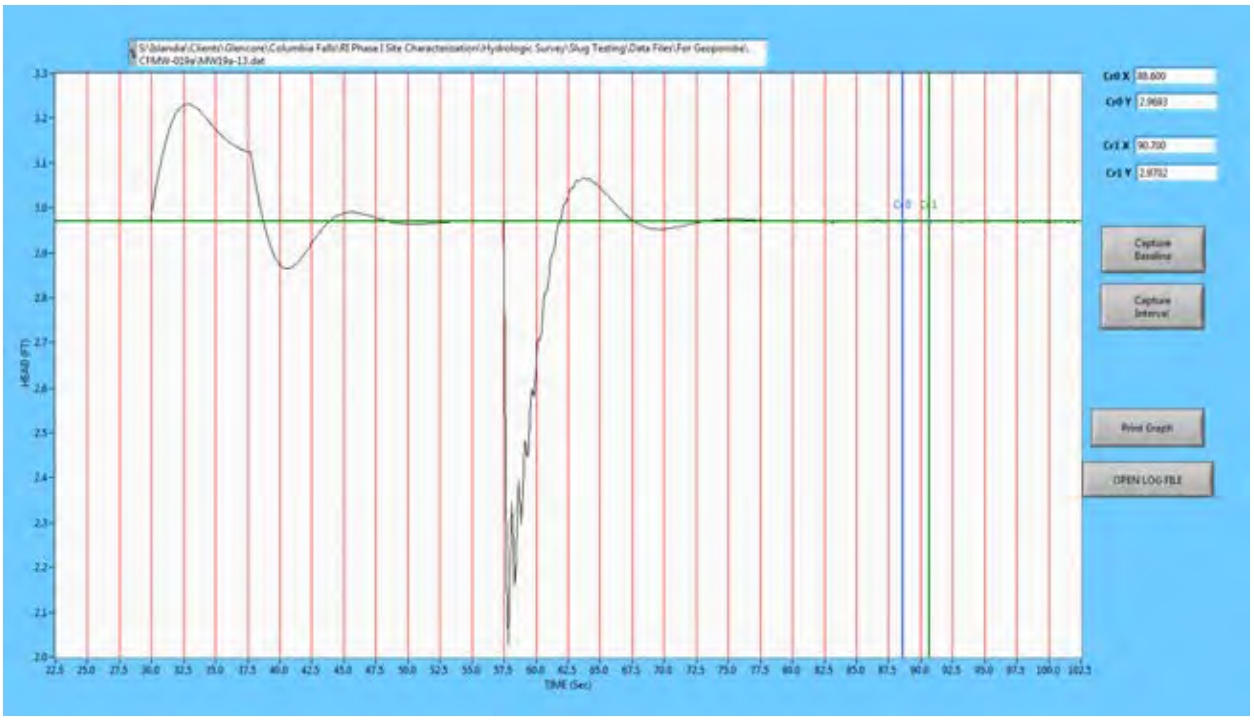
START DATE: 7/17/2017
START TIME: 11:52 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW16A-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-016a
2 Foot Displacement
Test #2





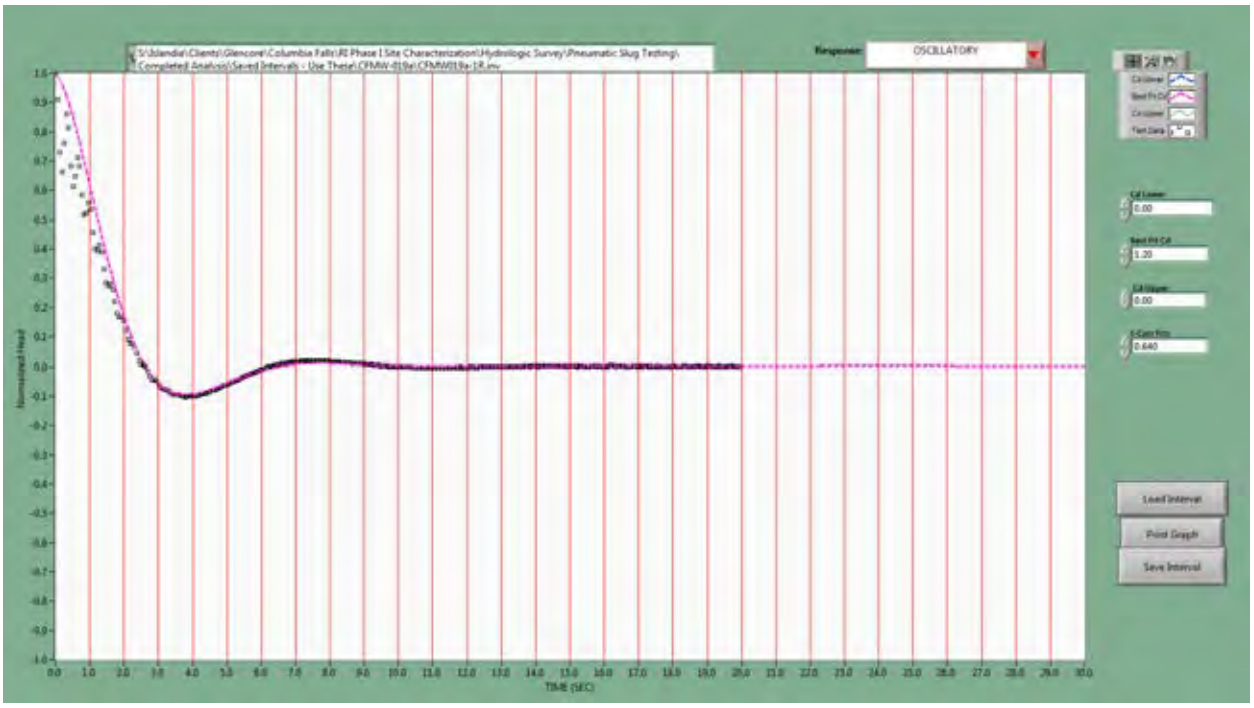
CFMW-019a
1 Foot Displacement
Test #1



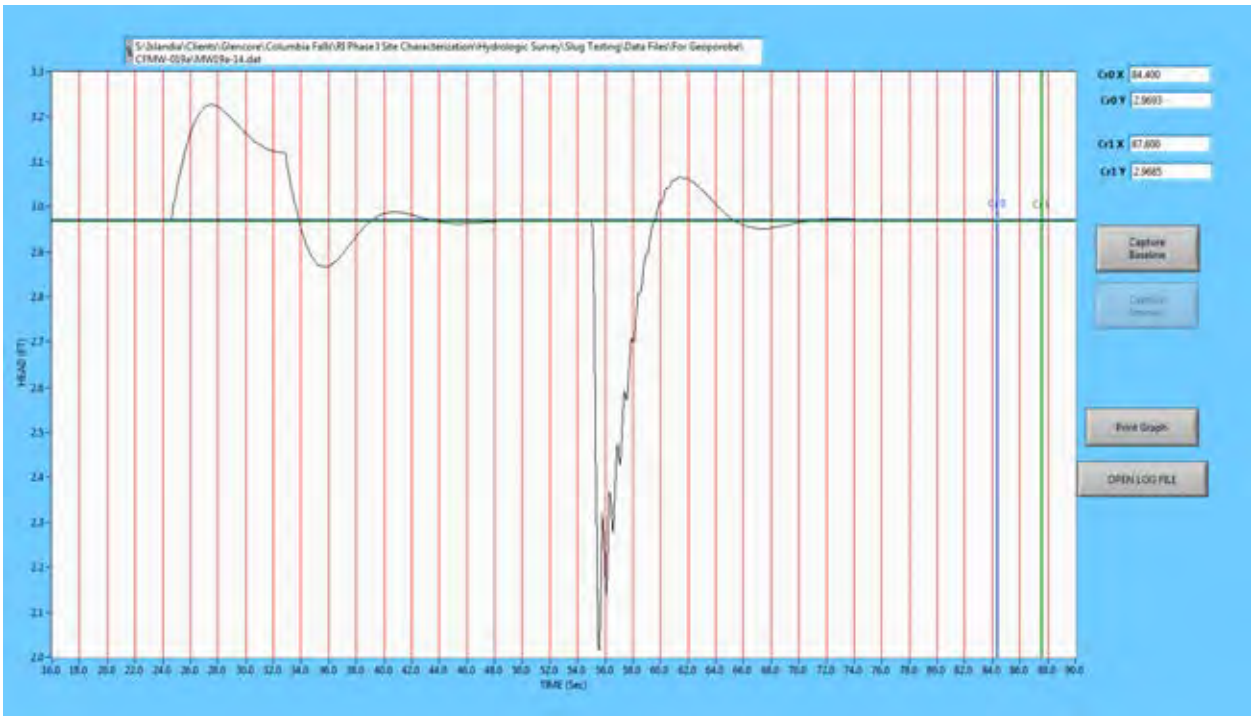
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/17/2017
START TIME: 2:55 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW19A-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-019a
1 Foot Displacement
Test #1



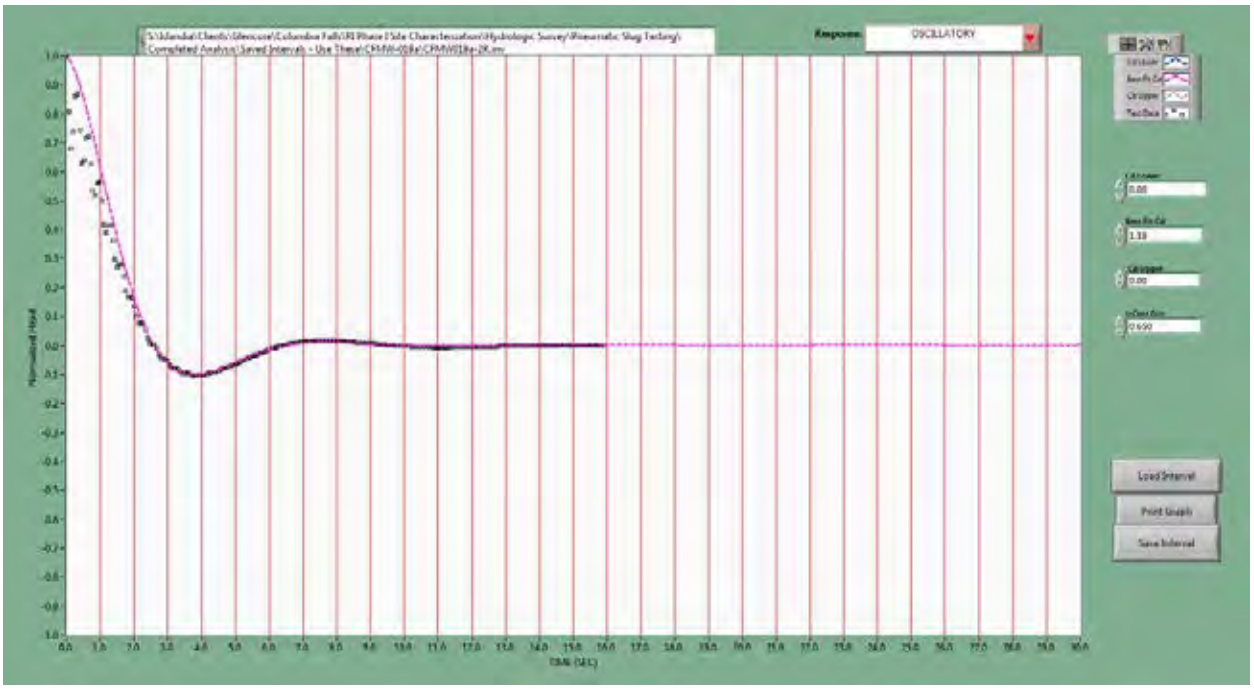
CFMW-019a
1 Foot Displacement
Test #2

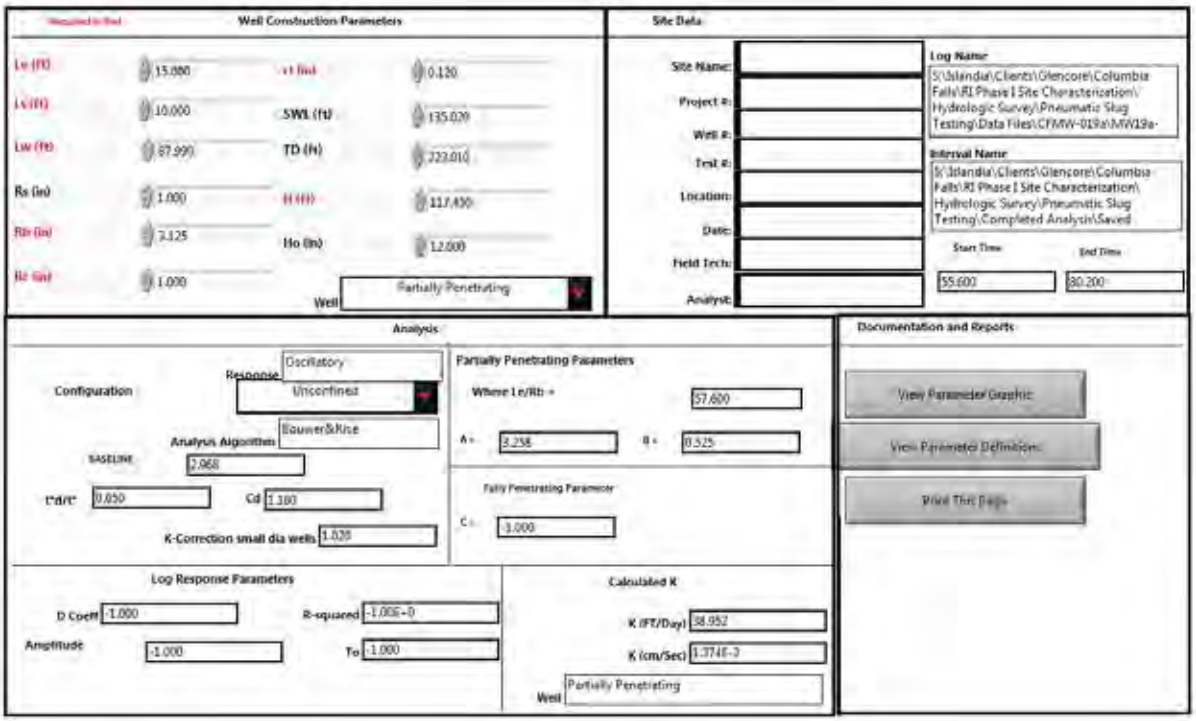


SITE INFORMATION -- SLUG TEST REV. 3.0

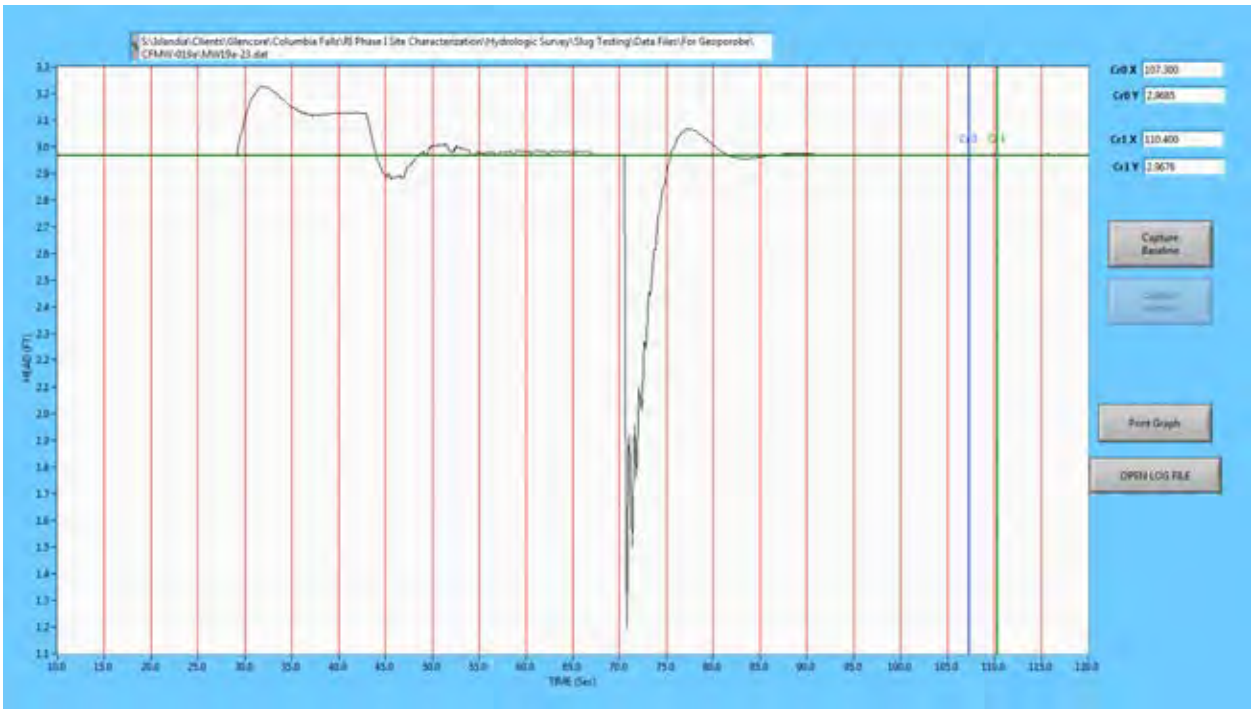
START DATE: 7/17/2017
START TIME: 2:56 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW19A-14.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-019a
1 Foot Displacement
Test #2





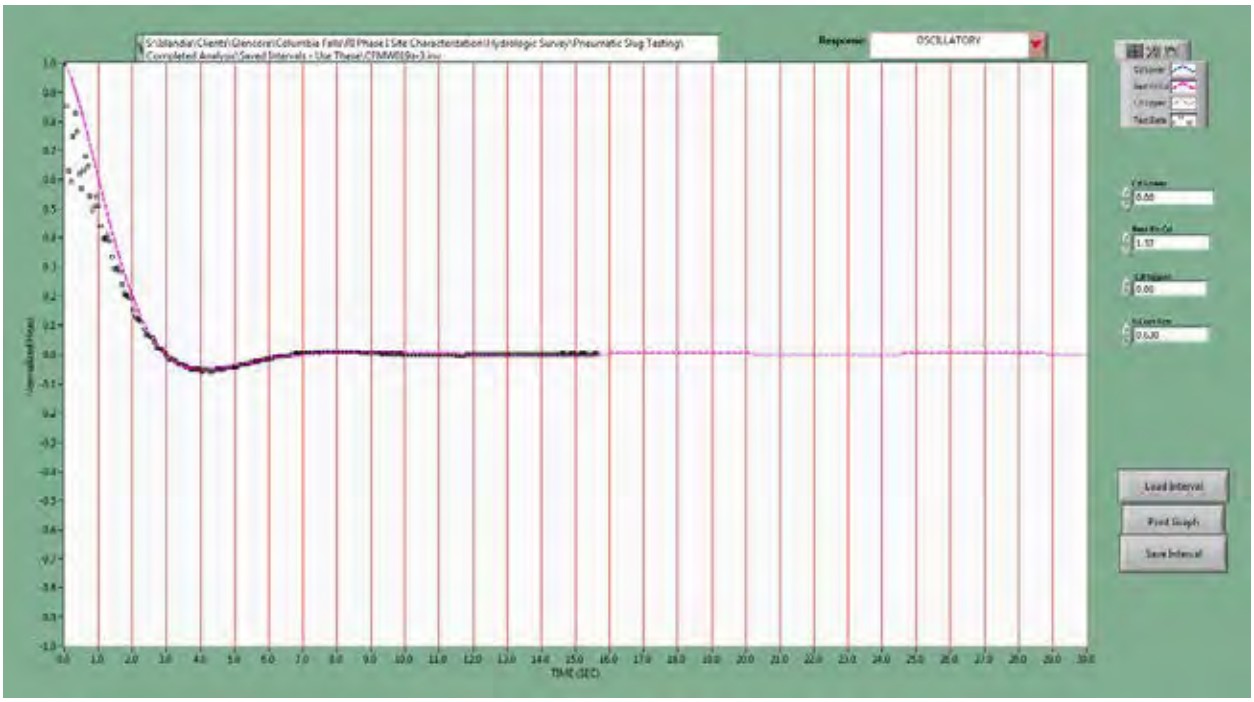
CFMW-019a
2 Foot Displacement
Test #1

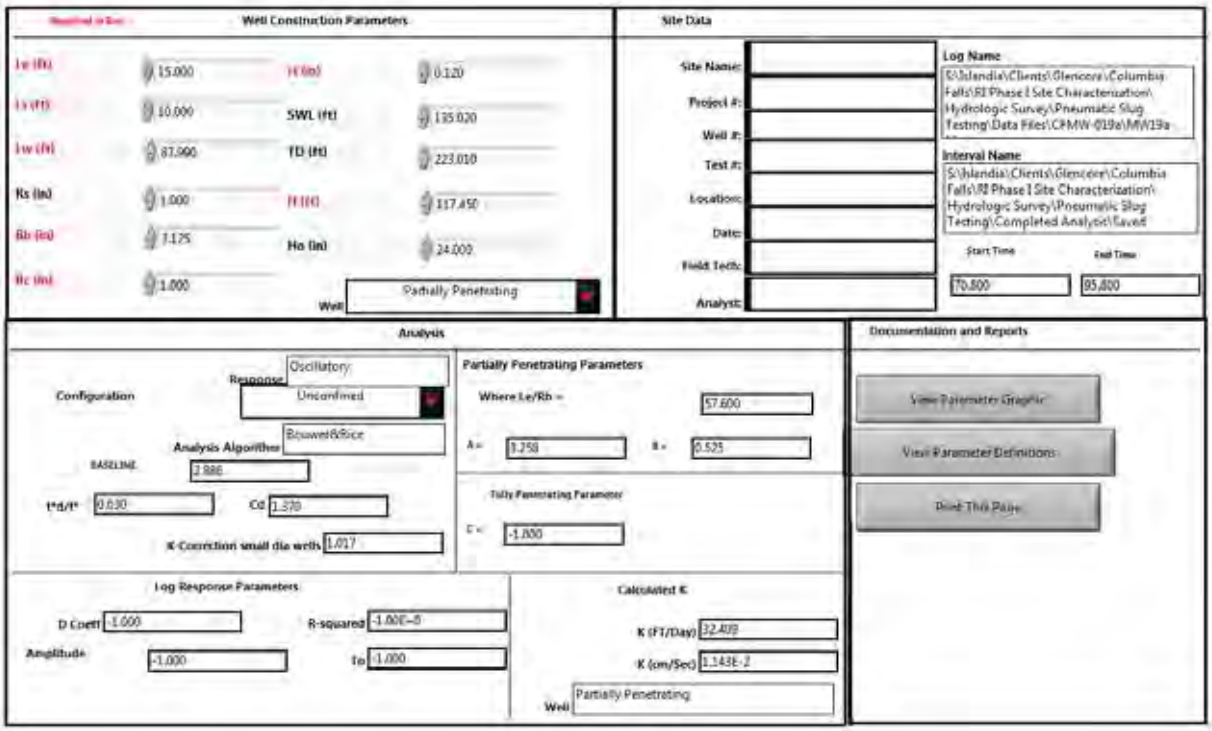


SITE INFORMATION -- SLUG TEST REV. 3.0

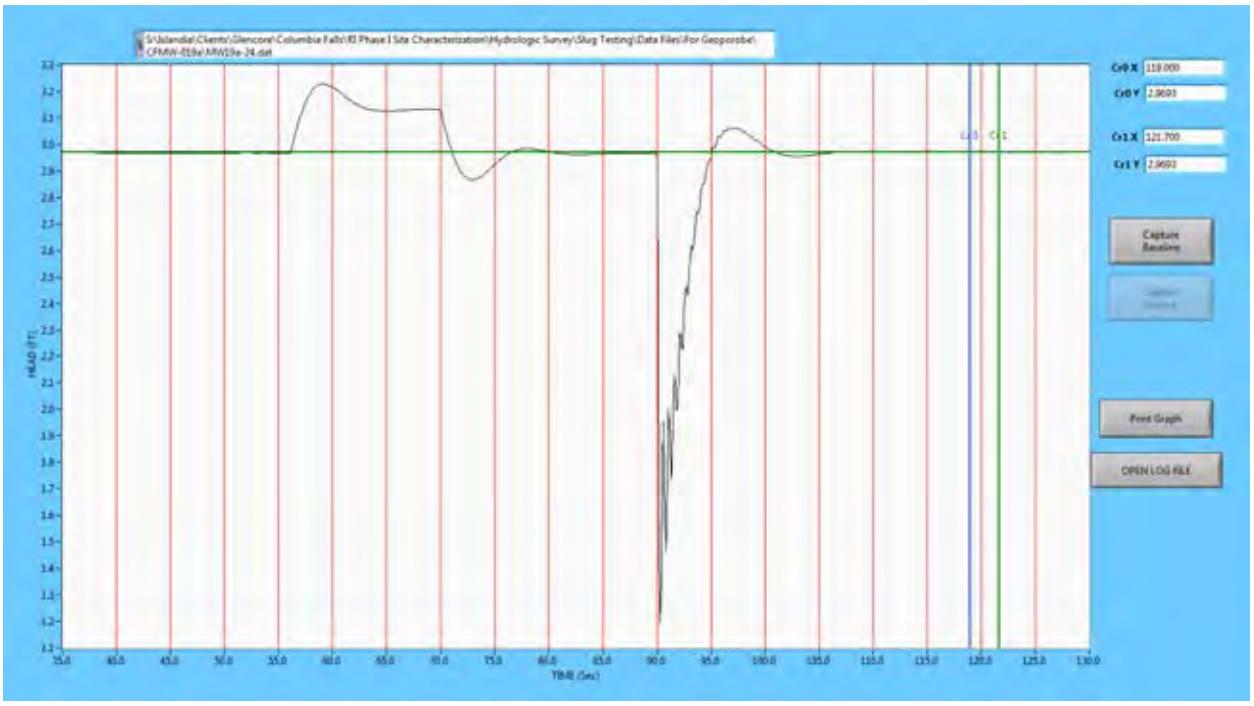
START DATE: 7/17/2017
START TIME: 2:58 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW19A-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-019a
2 Foot Displacement
Test #1





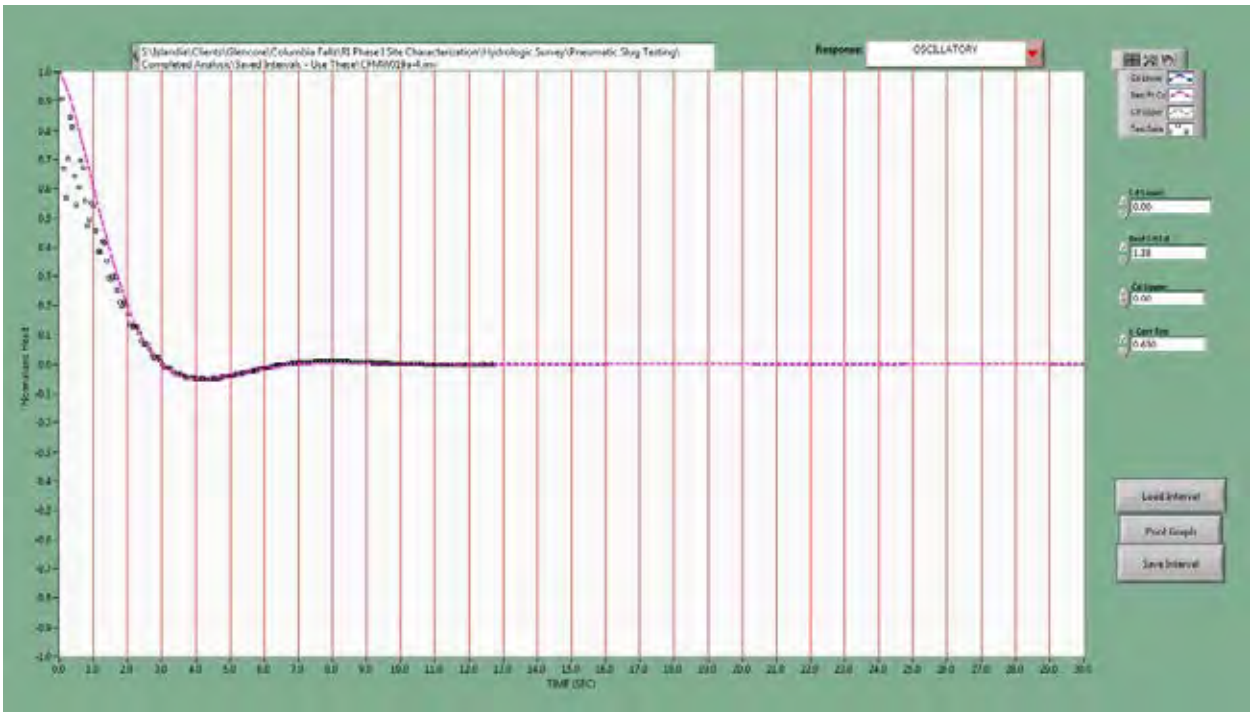
CFMW-019a
2 Foot Displacement
Test #2

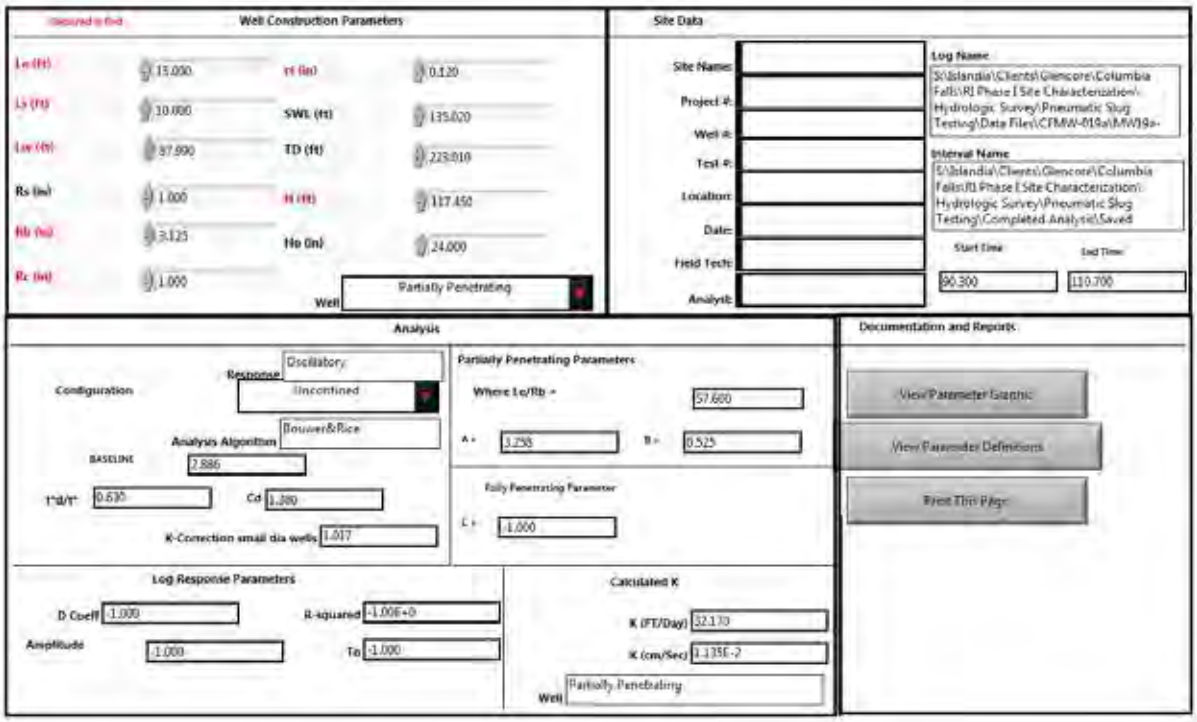


SITE INFORMATION -- SLUG TEST REV. 3.0

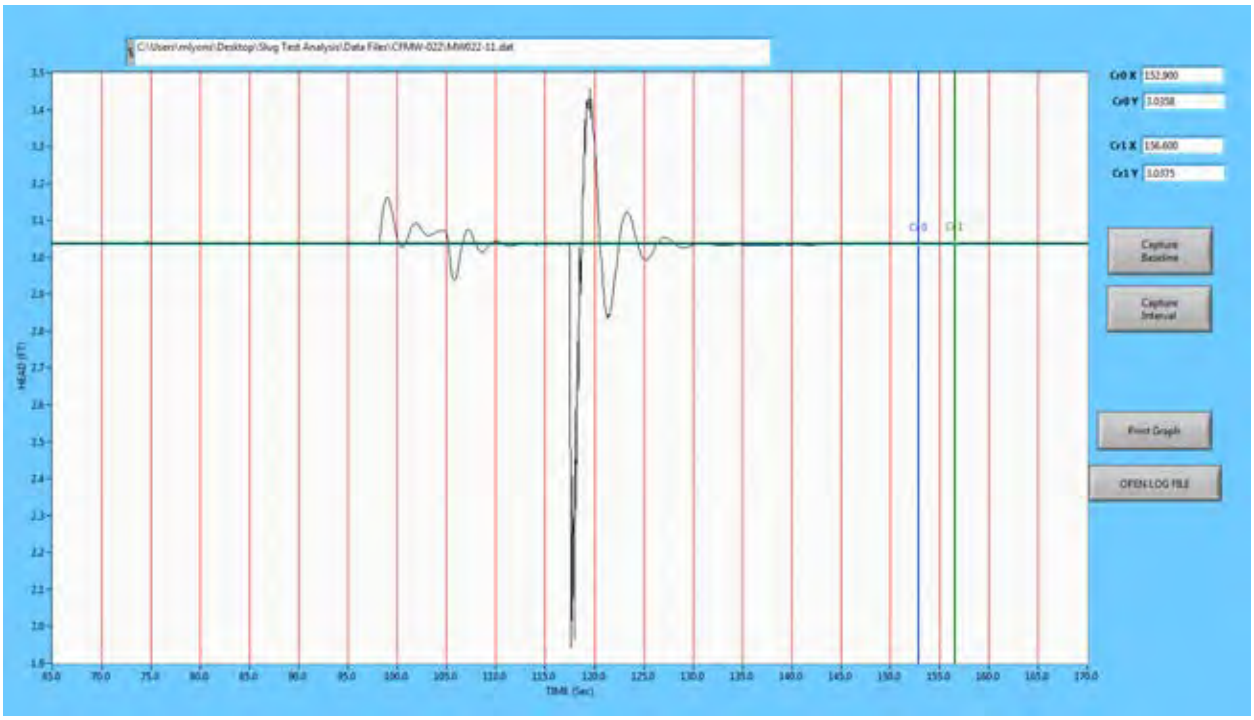
START DATE: 7/17/2017
START TIME: 3:04 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW19A-24.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-019a
2 Foot Displacement
Test #2





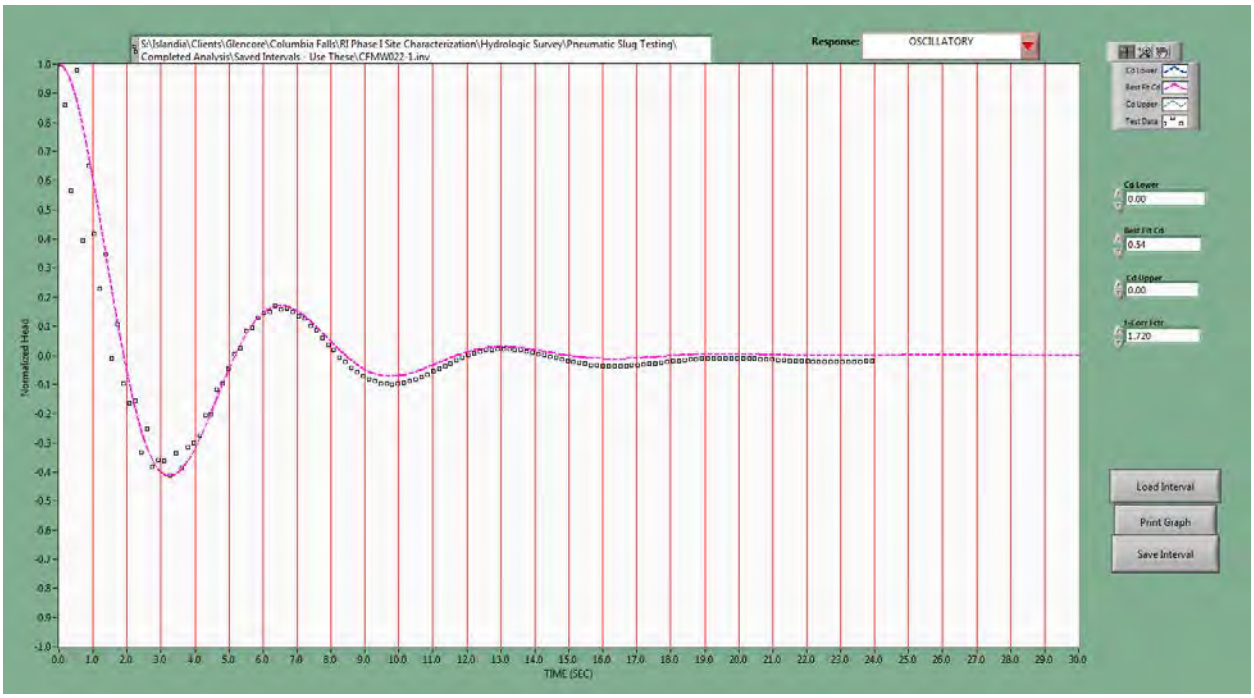
CFMW-022
1 Foot Displacement
Test #1

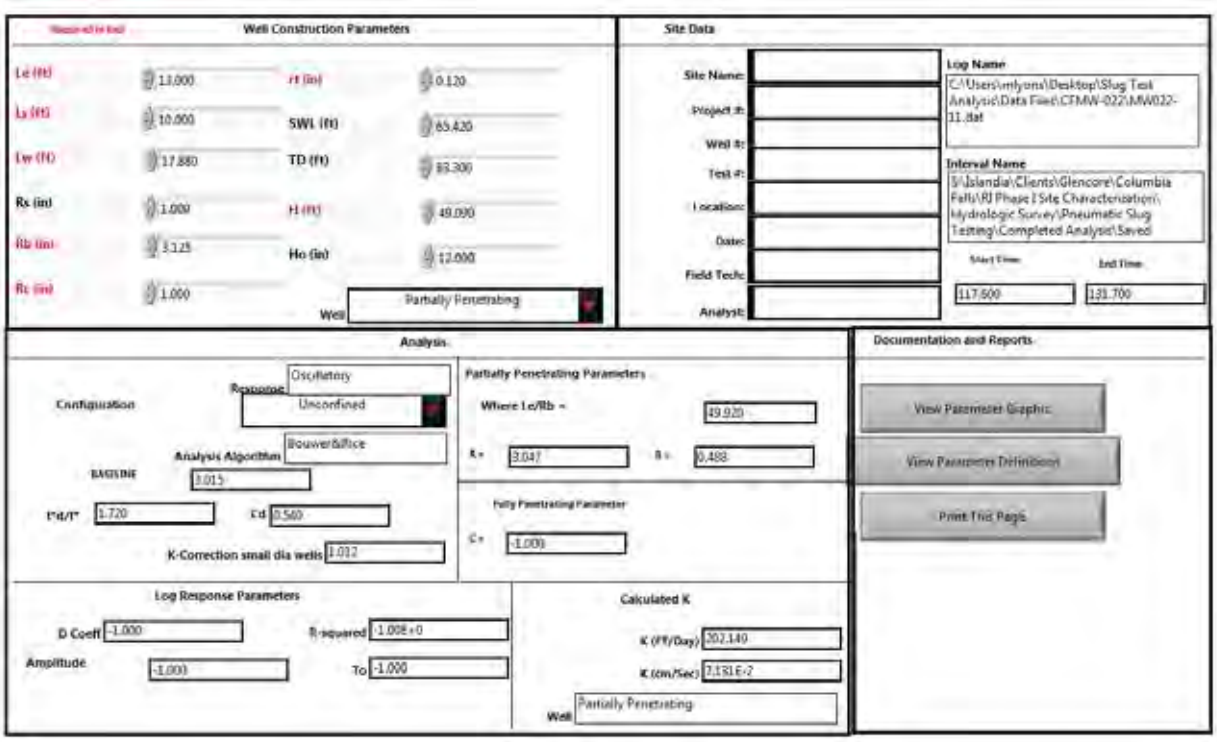


SITE INFORMATION -- SLUG TEST REV. 3.0

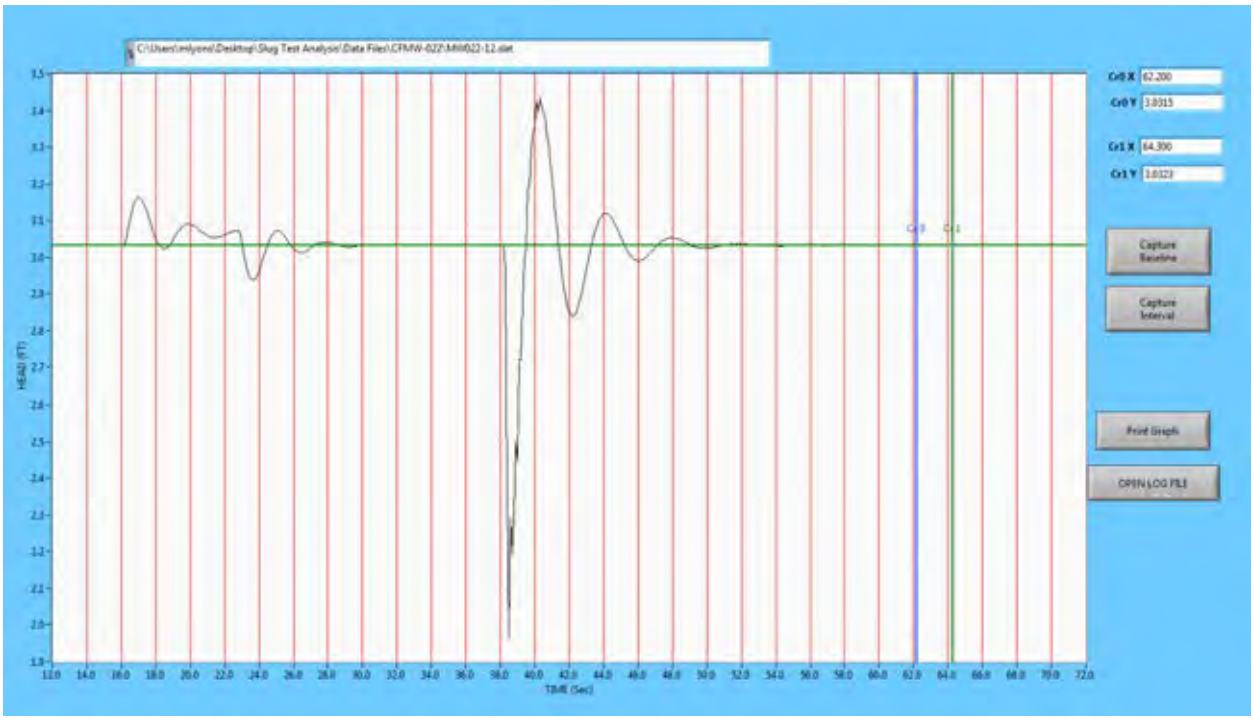
START DATE: 7/14/2017
START TIME: 5:00 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW022-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-022
1 Foot Displacement
Test #1





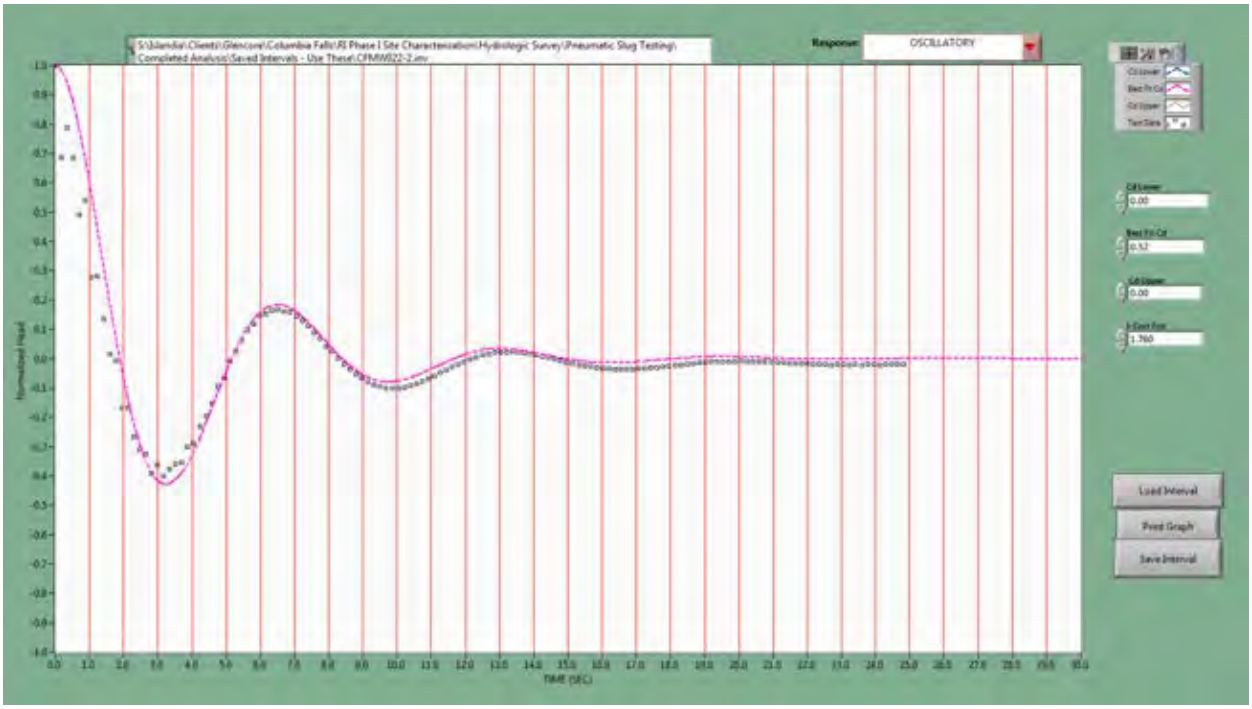
CFMW-022
1 Foot Displacement
Test #2

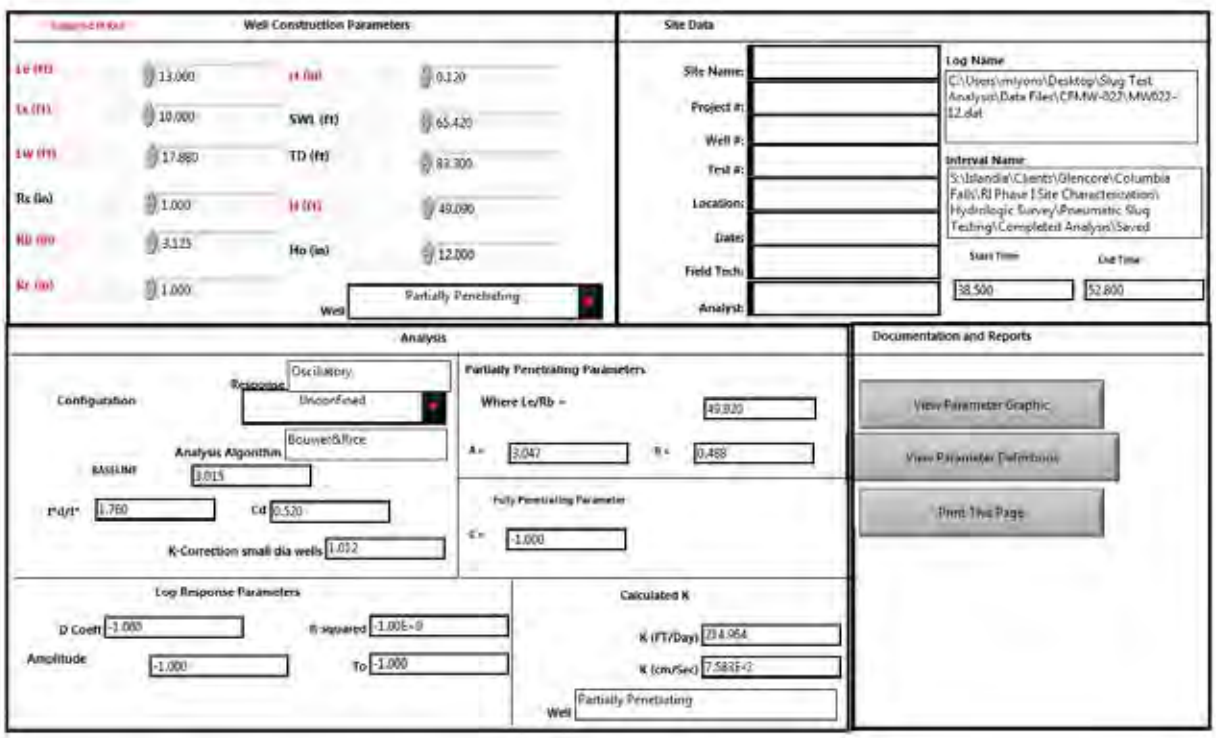


SITE INFORMATION -- SLUG TEST REV. 3.0

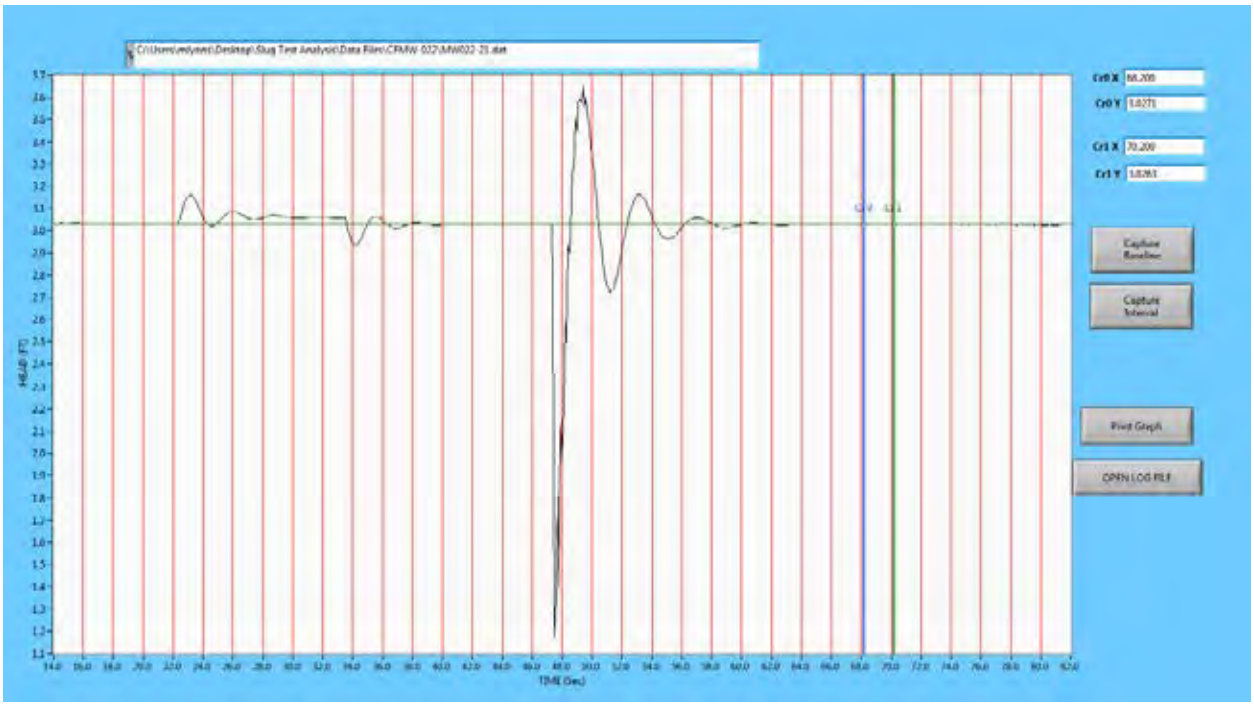
START DATE: 7/14/2017
START TIME: 5:03 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW022-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-022
1 Foot Displacement
Test #2





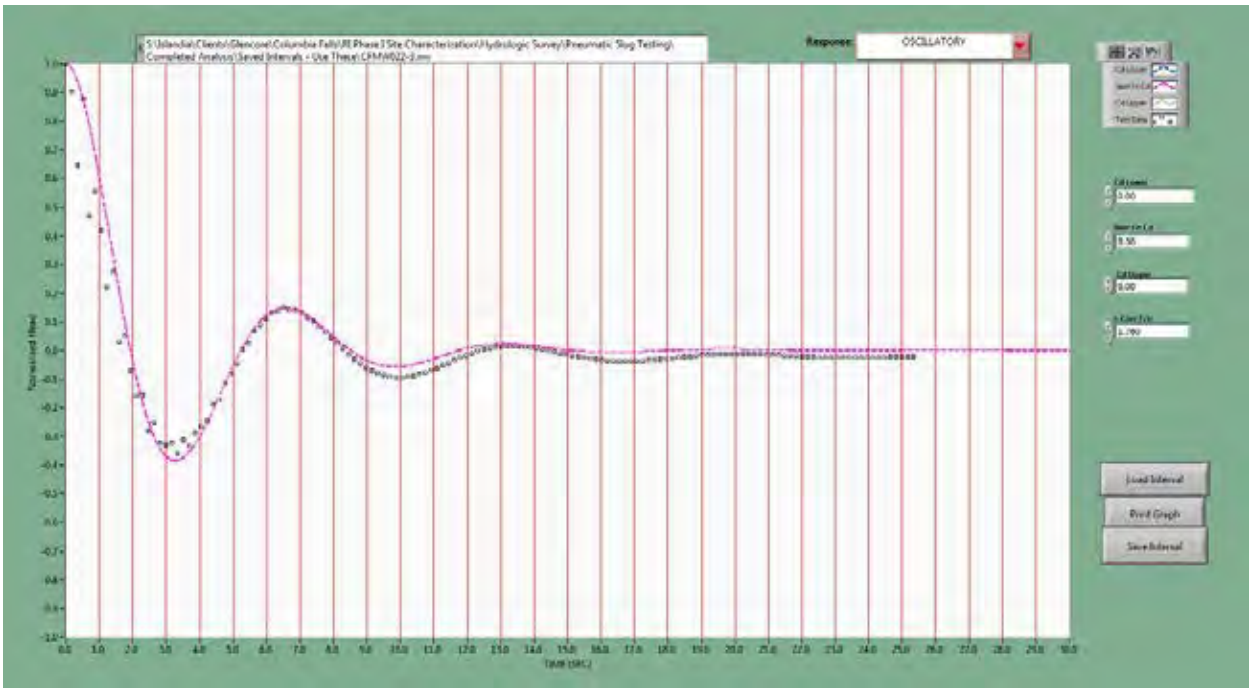
CFMW-022
2 Foot Displacement
Test #1

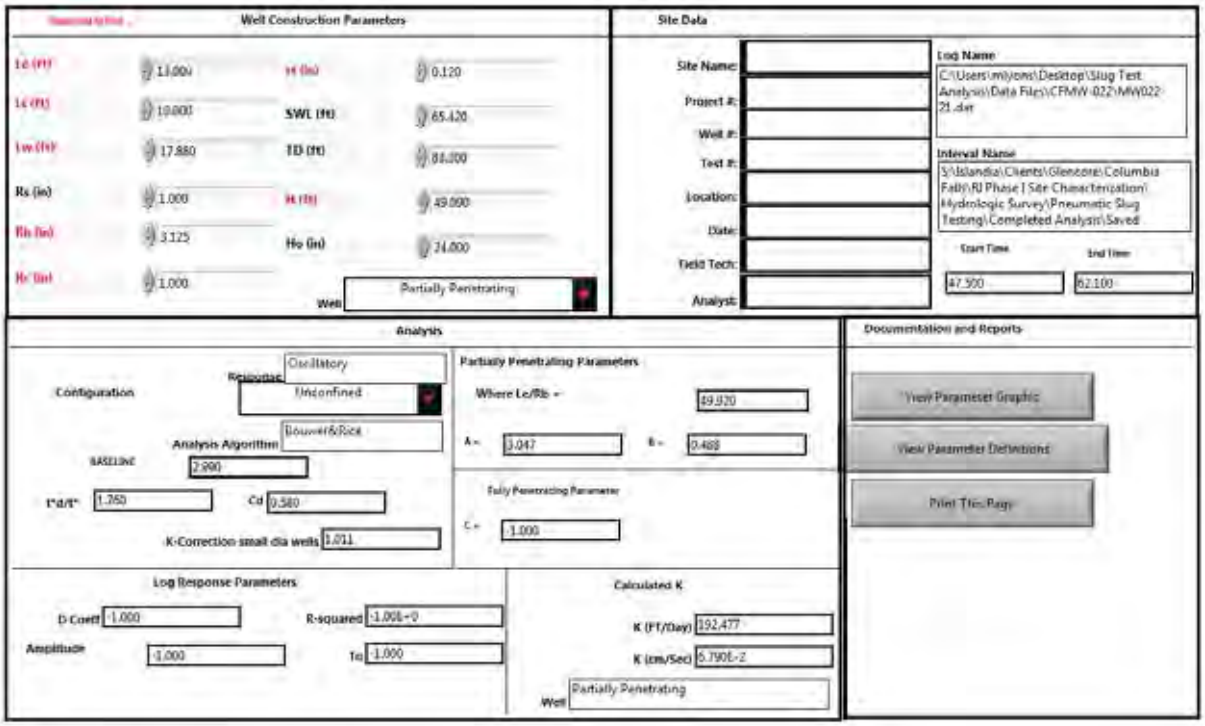


SITE INFORMATION -- SLUG TEST REV. 3.0

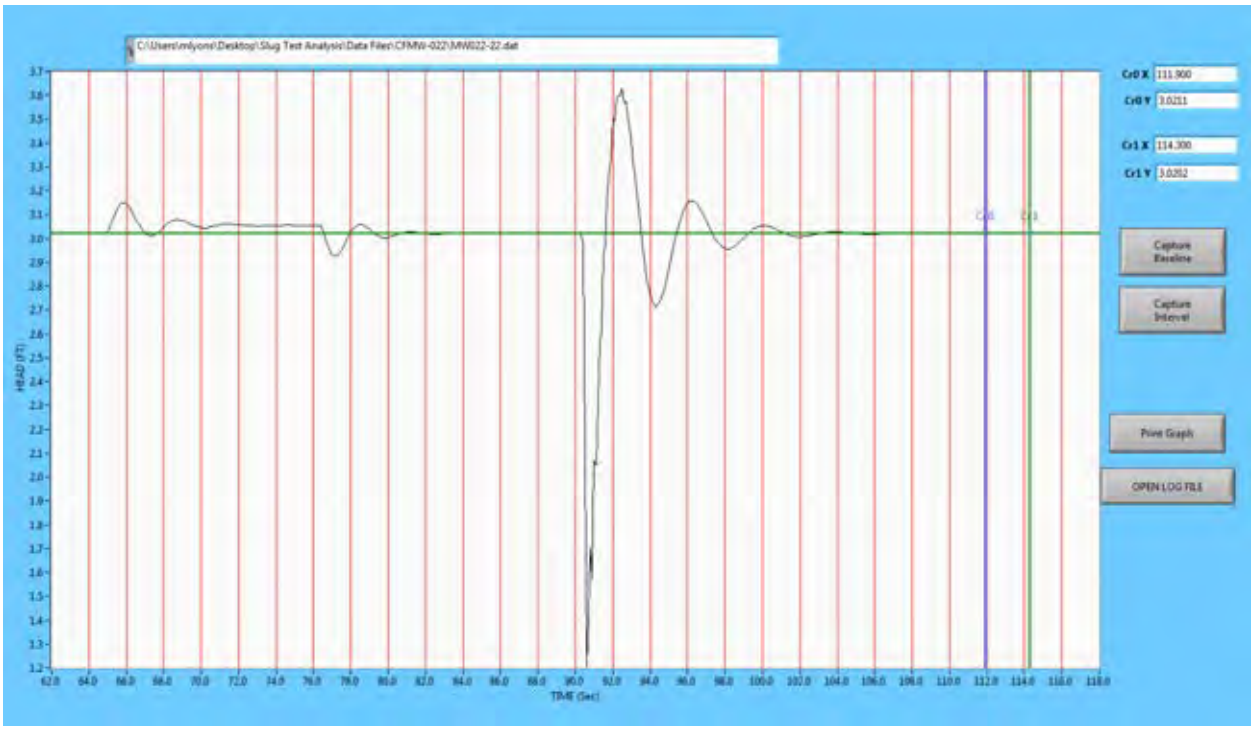
START DATE: 7/14/2017
START TIME: 5:04 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW022-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-022
2 Foot Displacement
Test #1





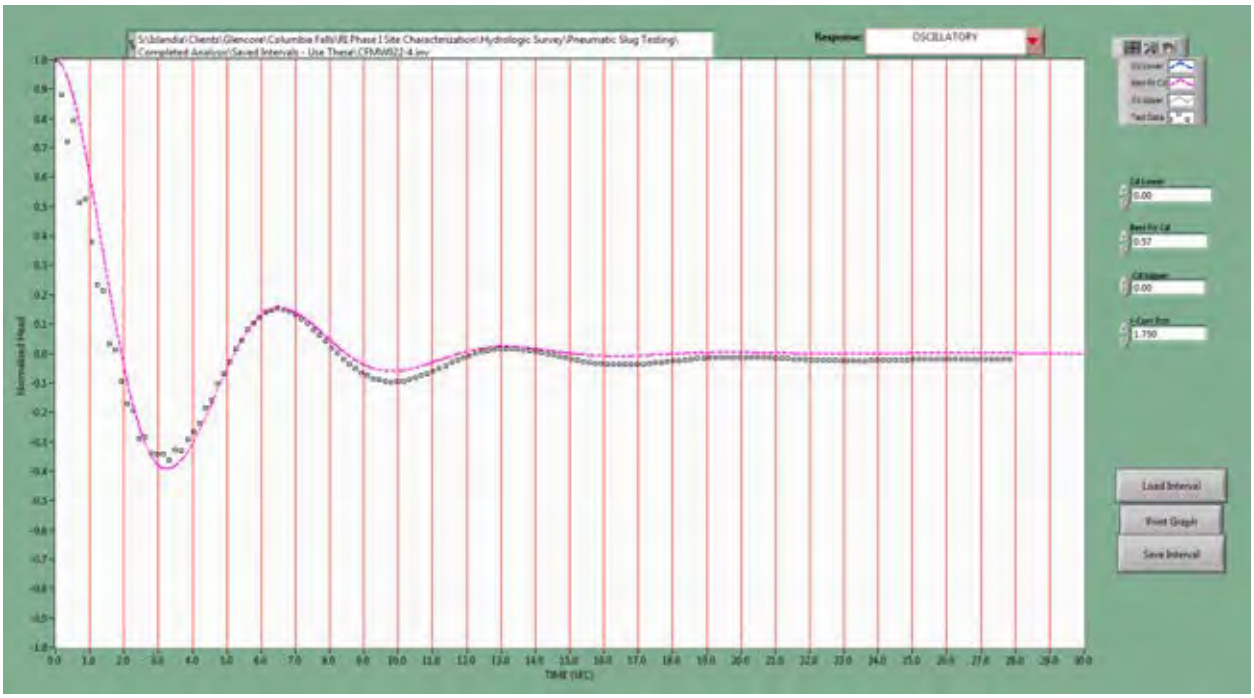
CFMW-022
2 Foot Displacement
Test #2

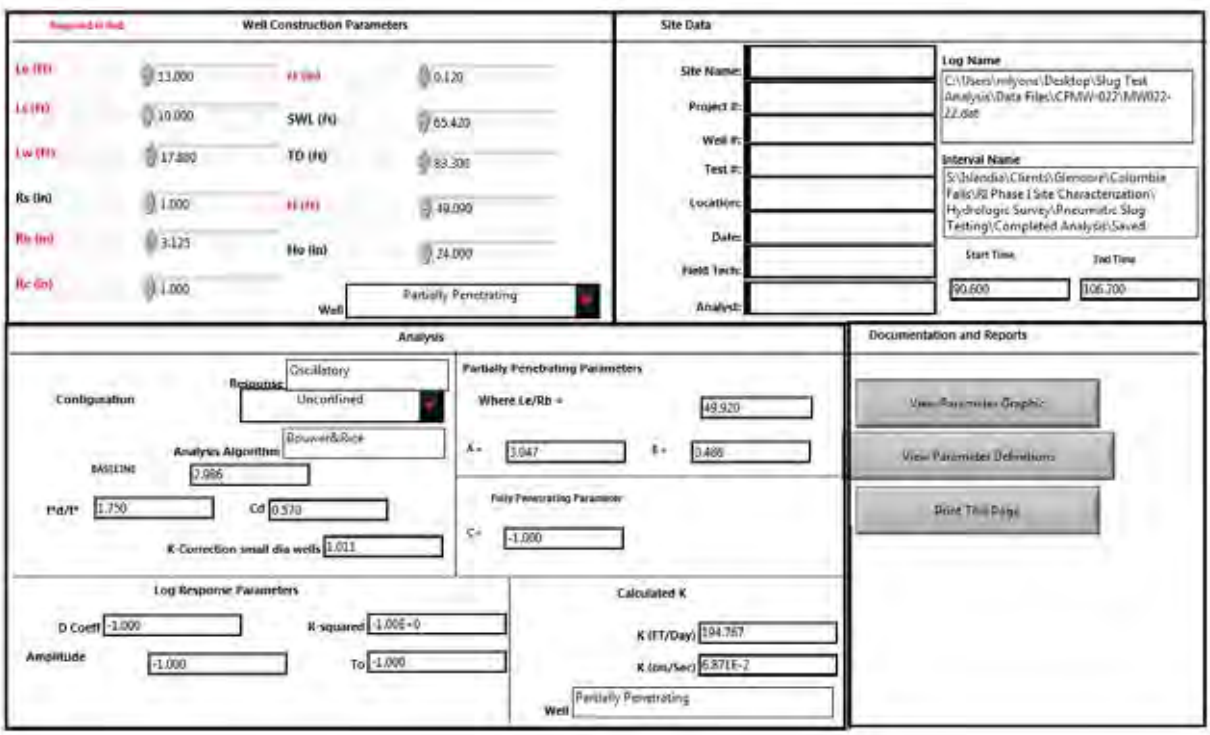


SITE INFORMATION -- SLUG TEST REV. 3.0

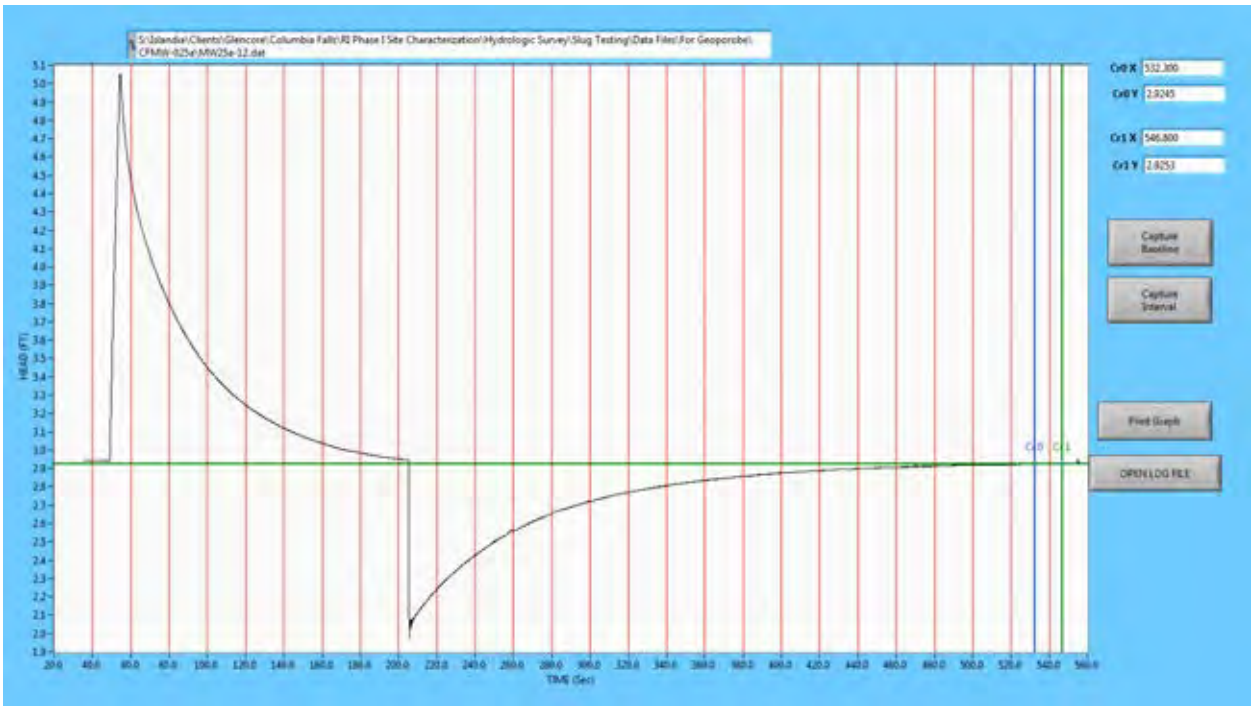
START DATE: 7/14/2017
START TIME: 5:06 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW022-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-022
2 Foot Displacement
Test #2





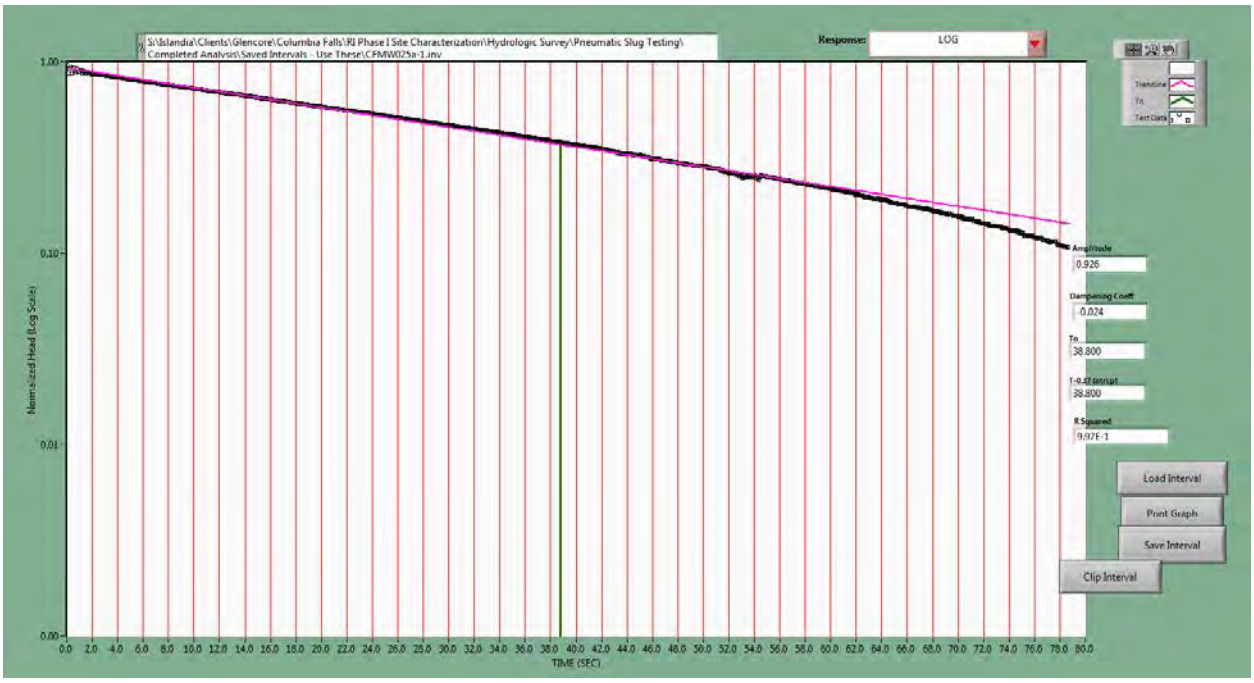
CFMW-025a
1 Foot Displacement
Test #1



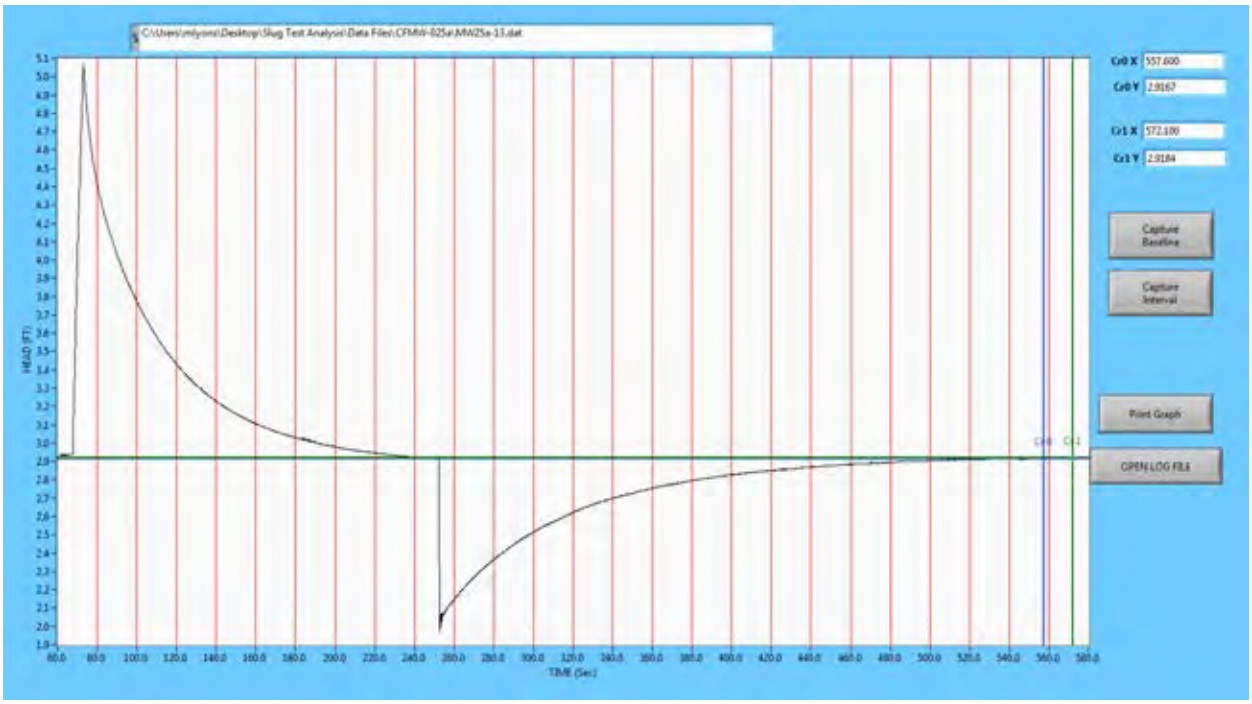
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/11/2017
START TIME: 3:41 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW25A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-025a
1 Foot Displacement
Test #1



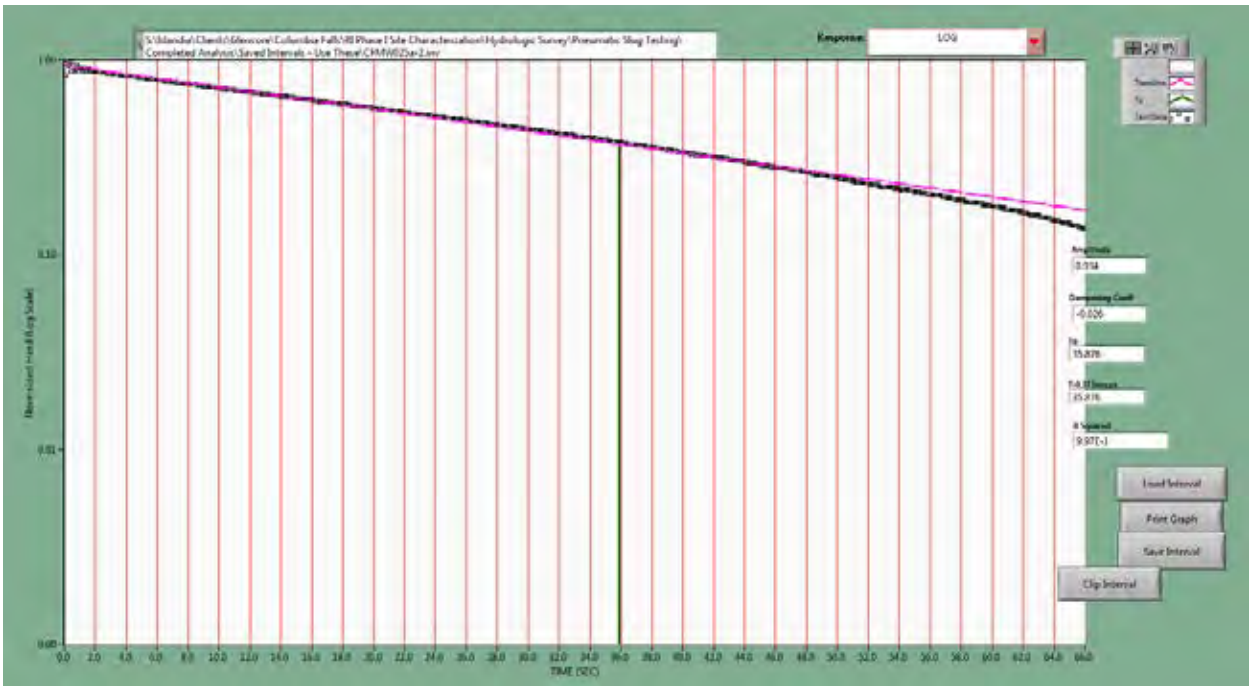
CFMW-025a
1 Foot Displacement
Test #2

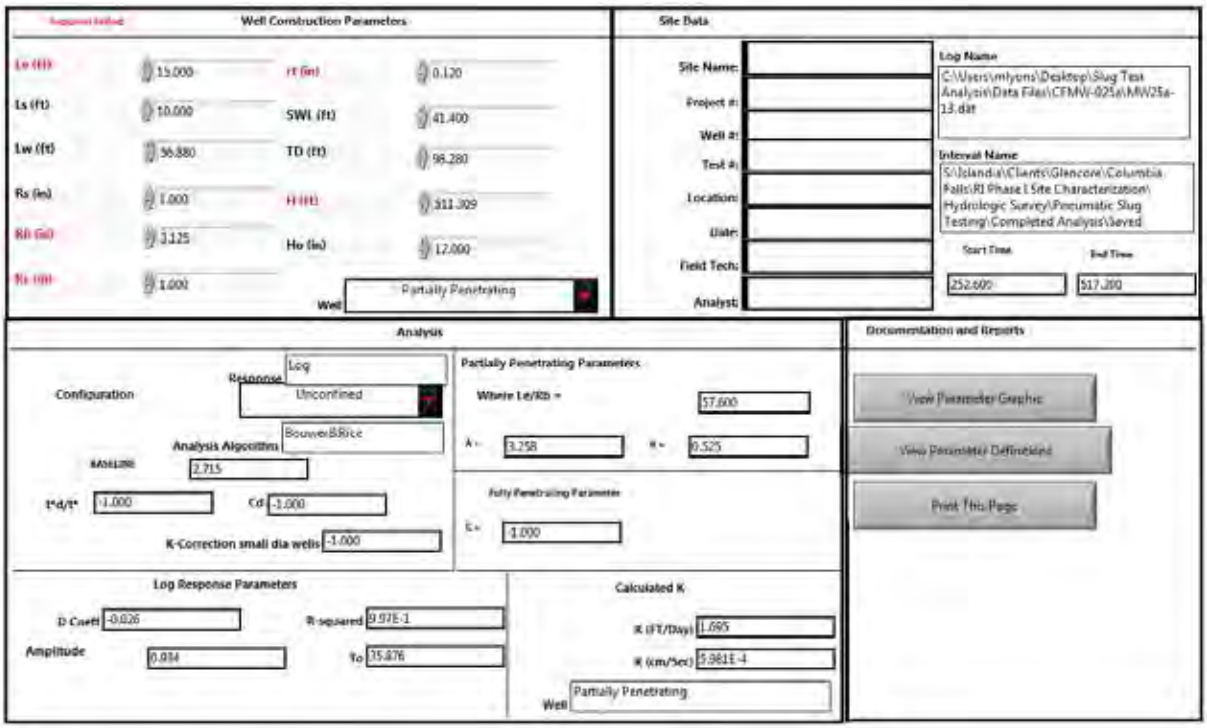


SITE INFORMATION -- SLUG TEST REV. 3.0

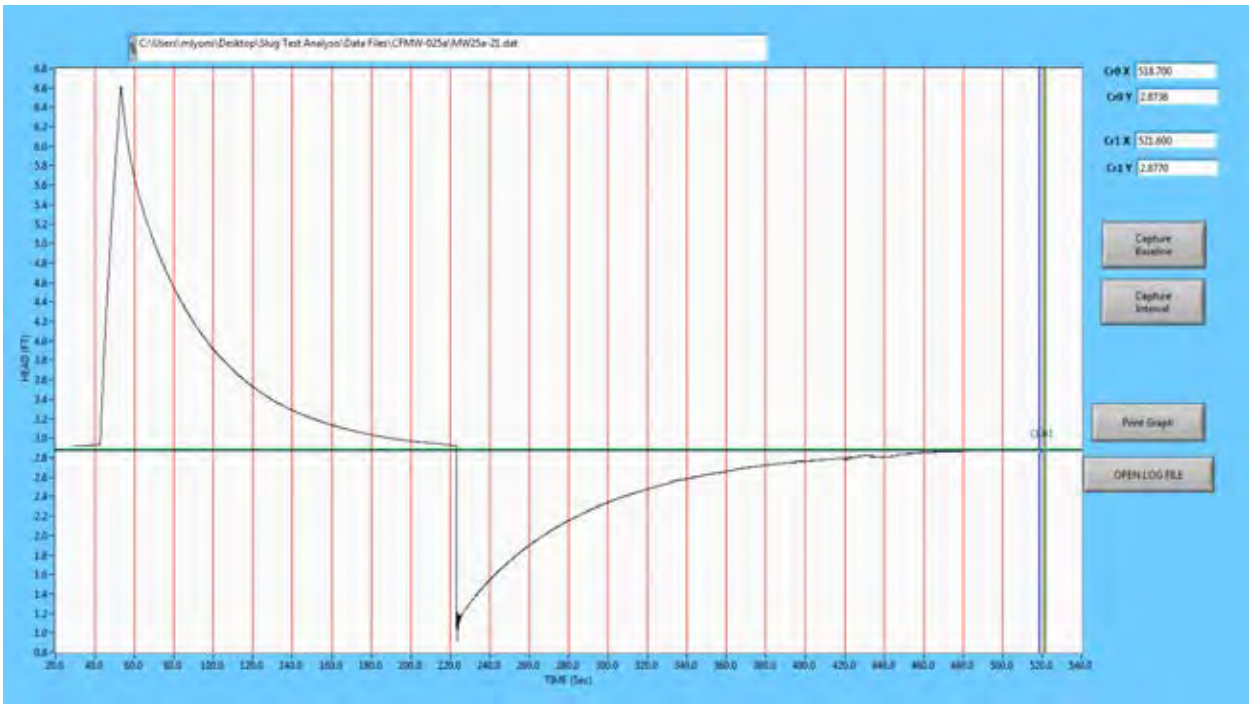
START DATE: 7/11/2017
START TIME: 3:51 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW25A-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-025a
1 Foot Displacement
Test #2





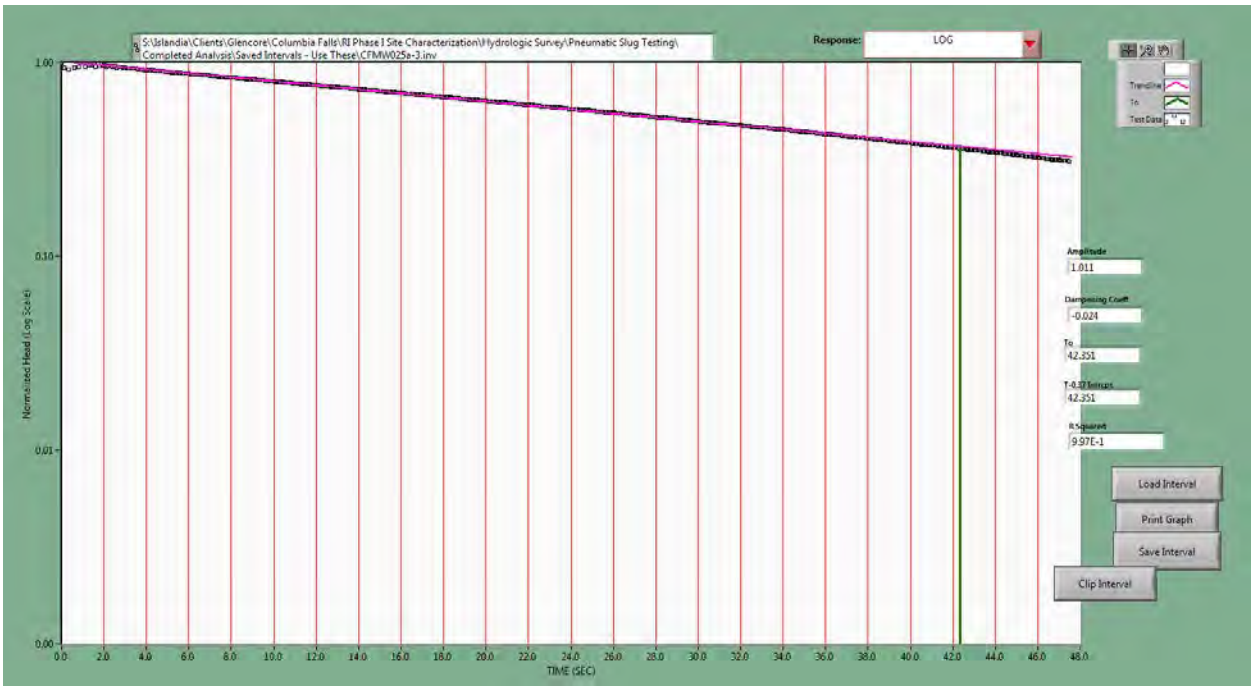
CFMW-025a
2 Foot Displacement
Test #1

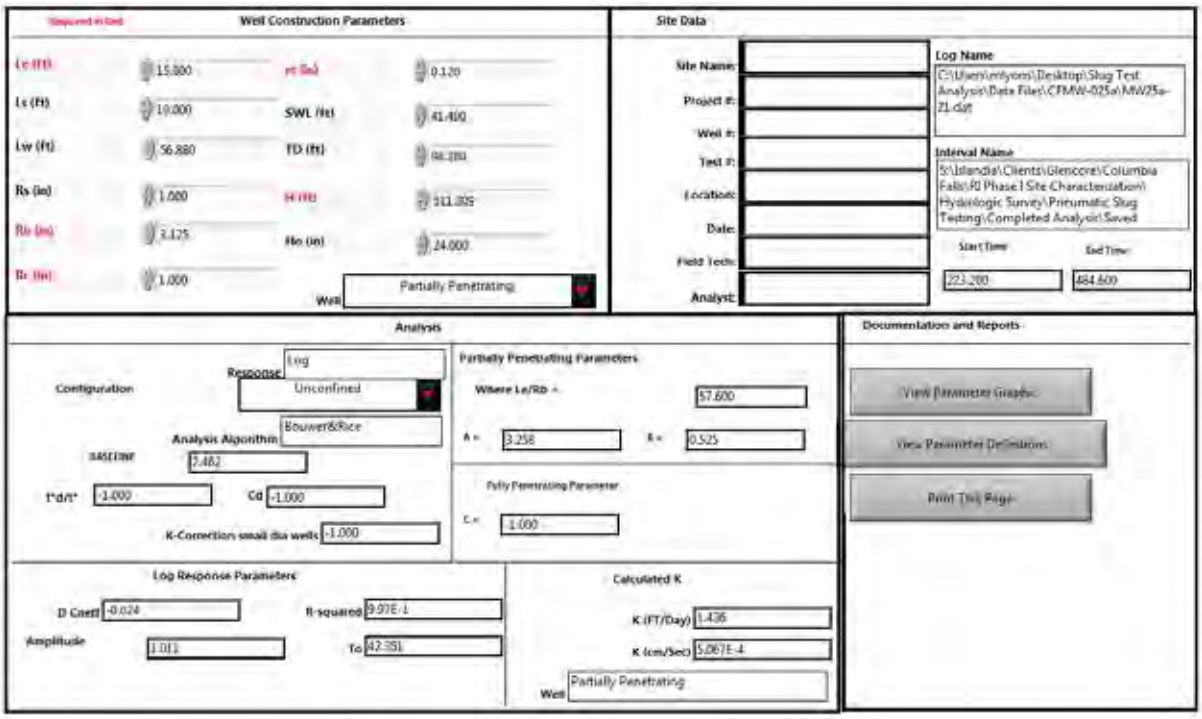


SITE INFORMATION -- SLUG TEST REV. 3.0

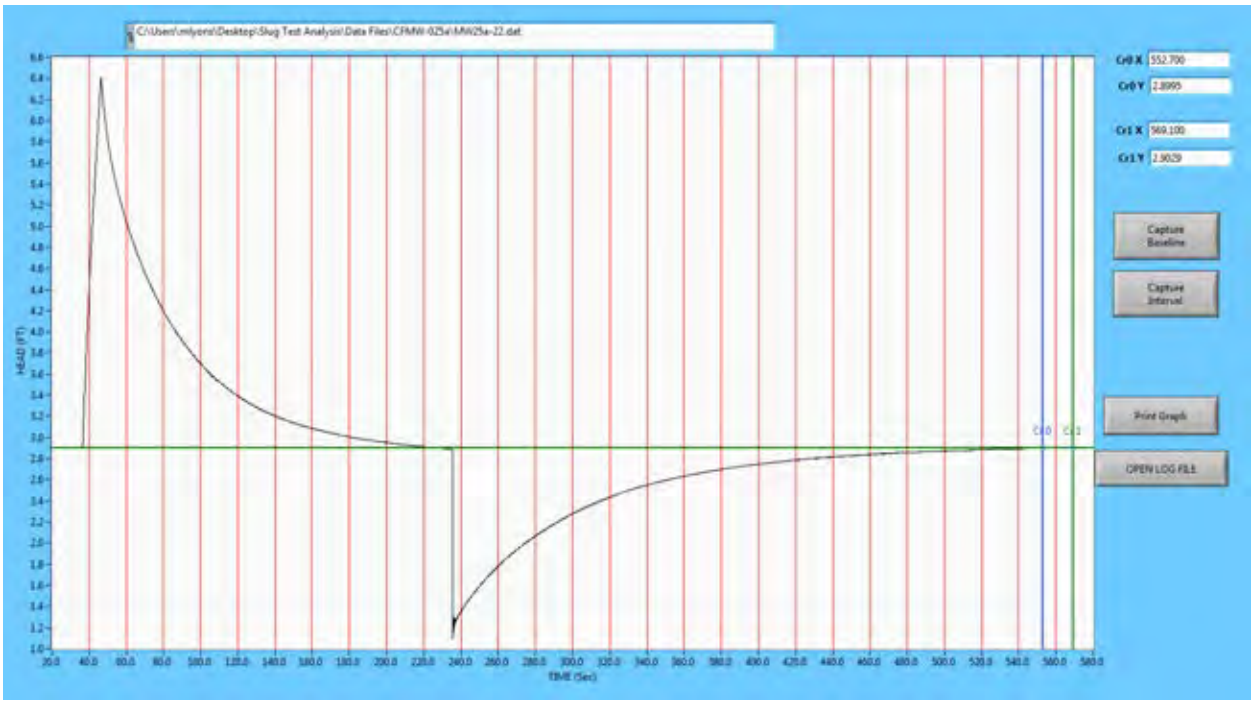
START DATE: 7/11/2017
START TIME: 4:01 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW25A-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-025a
2 Foot Displacement
Test #1





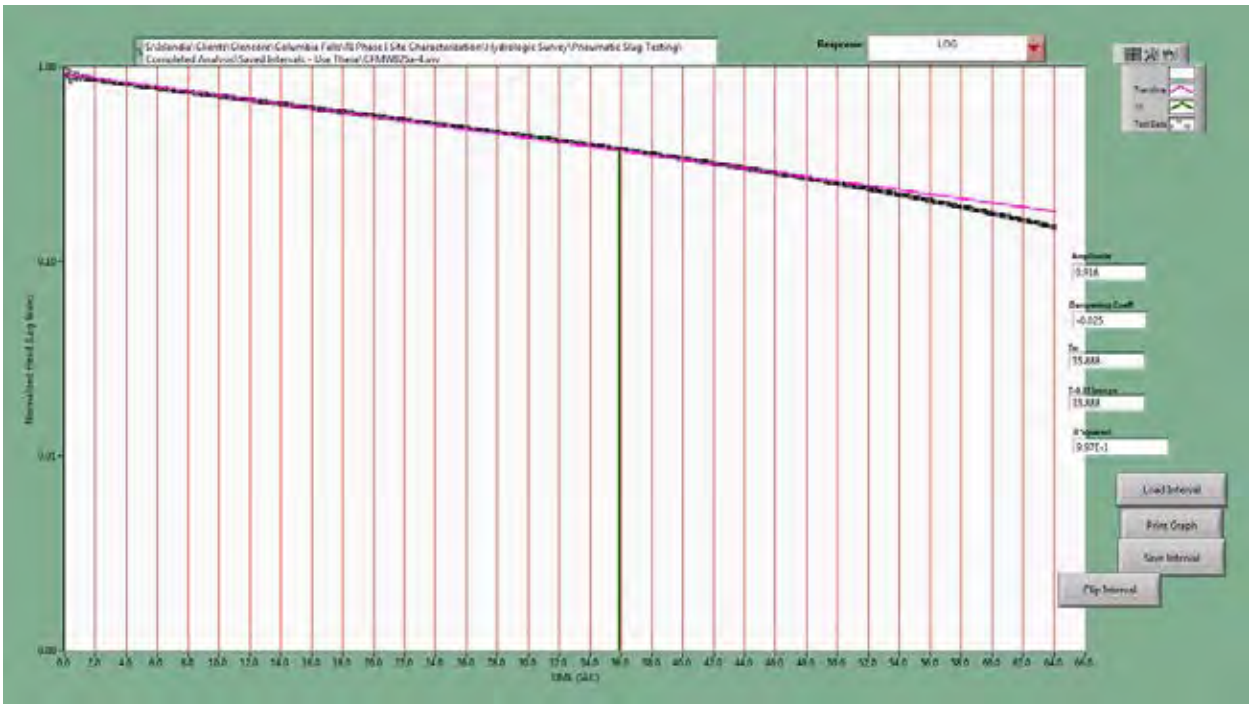
CFMW-025a
2 Foot Displacement
Test #2

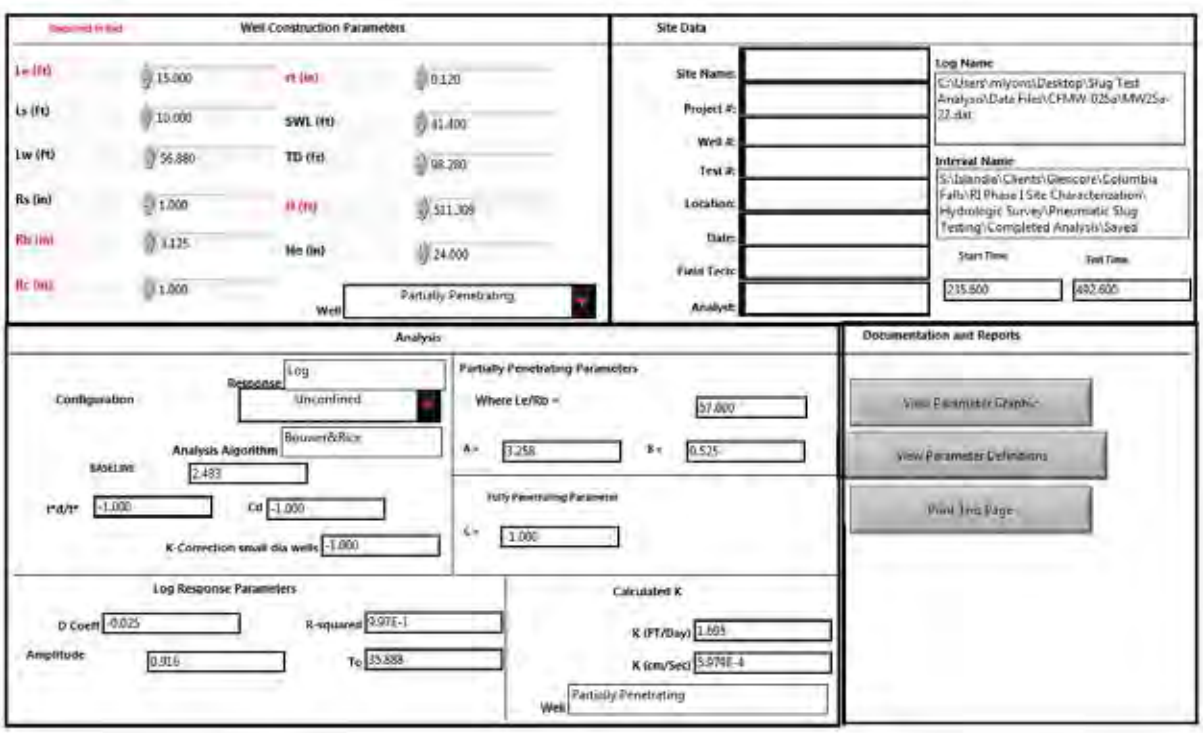


SITE INFORMATION -- SLUG TEST REV. 3.0

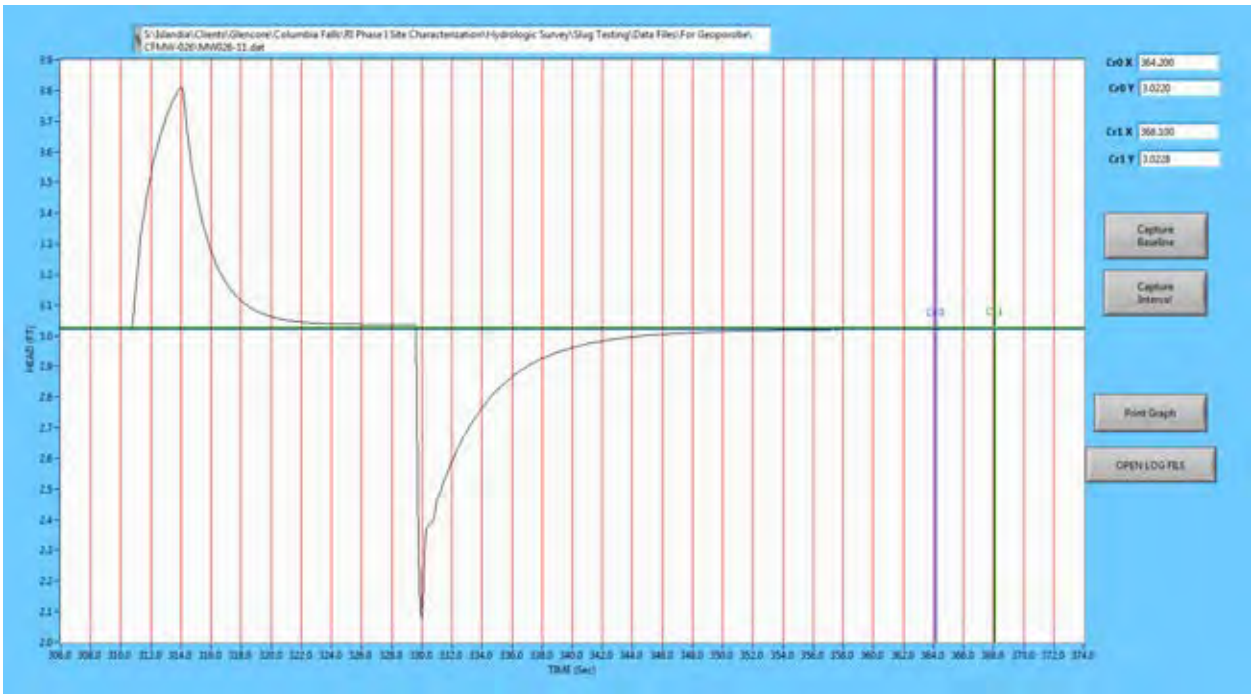
START DATE: 7/11/2017
START TIME: 4:10 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW25A-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-025a
2 Foot Displacement
Test #2





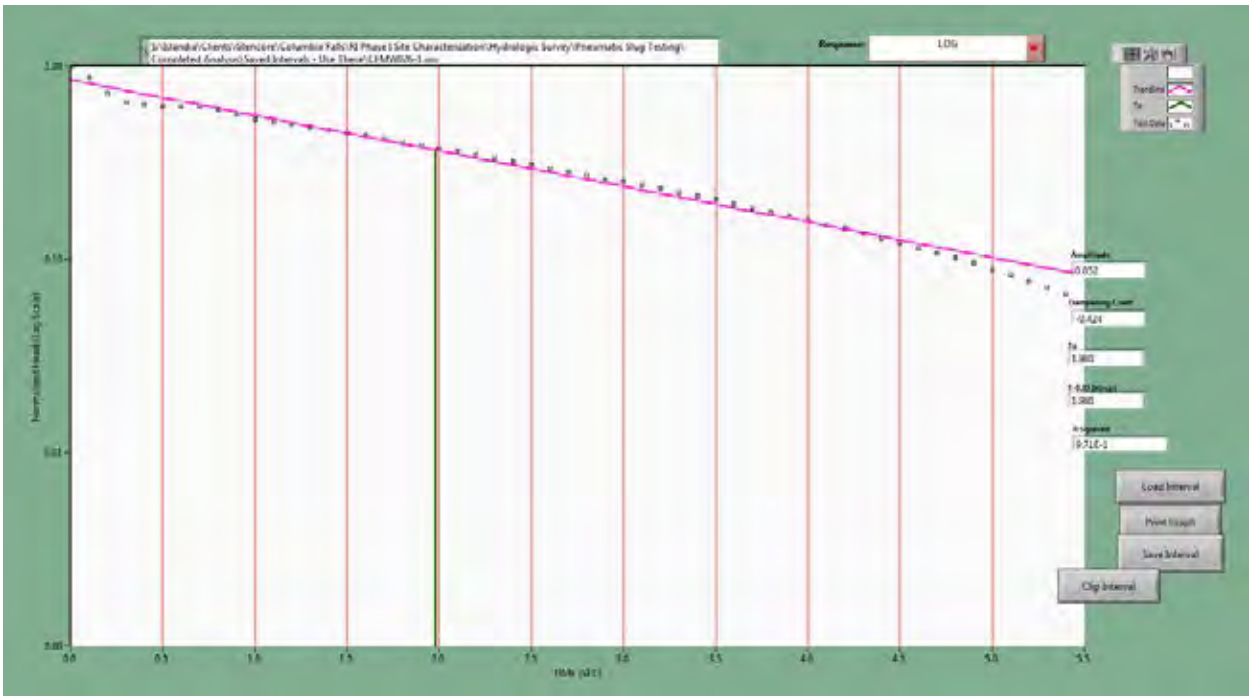
CFMW-026
1 Foot Displacement
Test #1

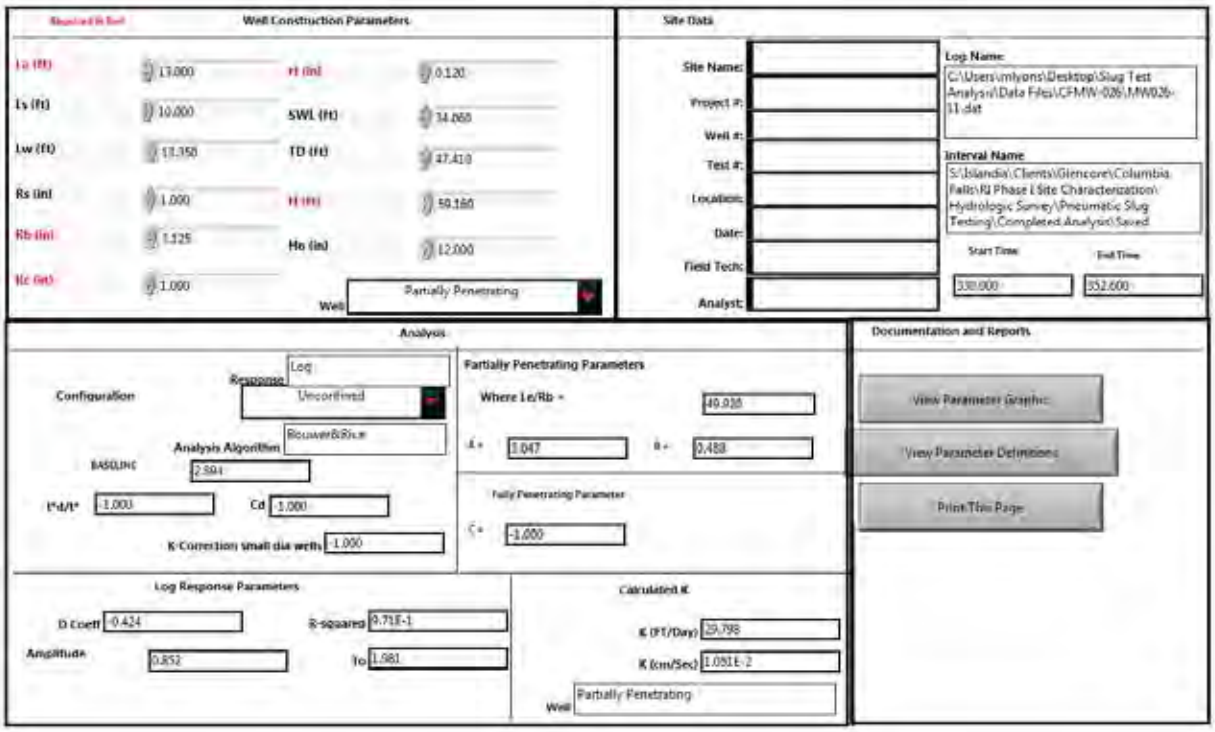


SITE INFORMATION -- SLUG TEST REV. 3.0

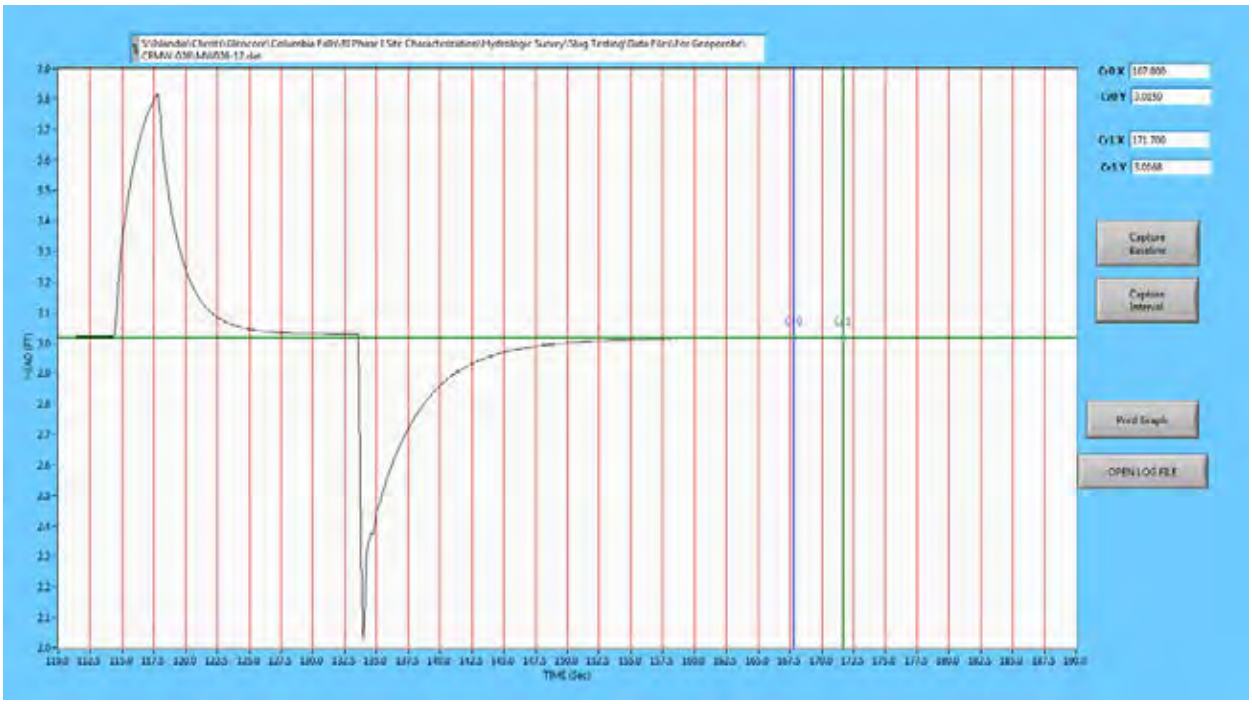
START DATE: 7/10/2017
START TIME: 10:25 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW026-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-026
1 Foot Displacement
Test #1





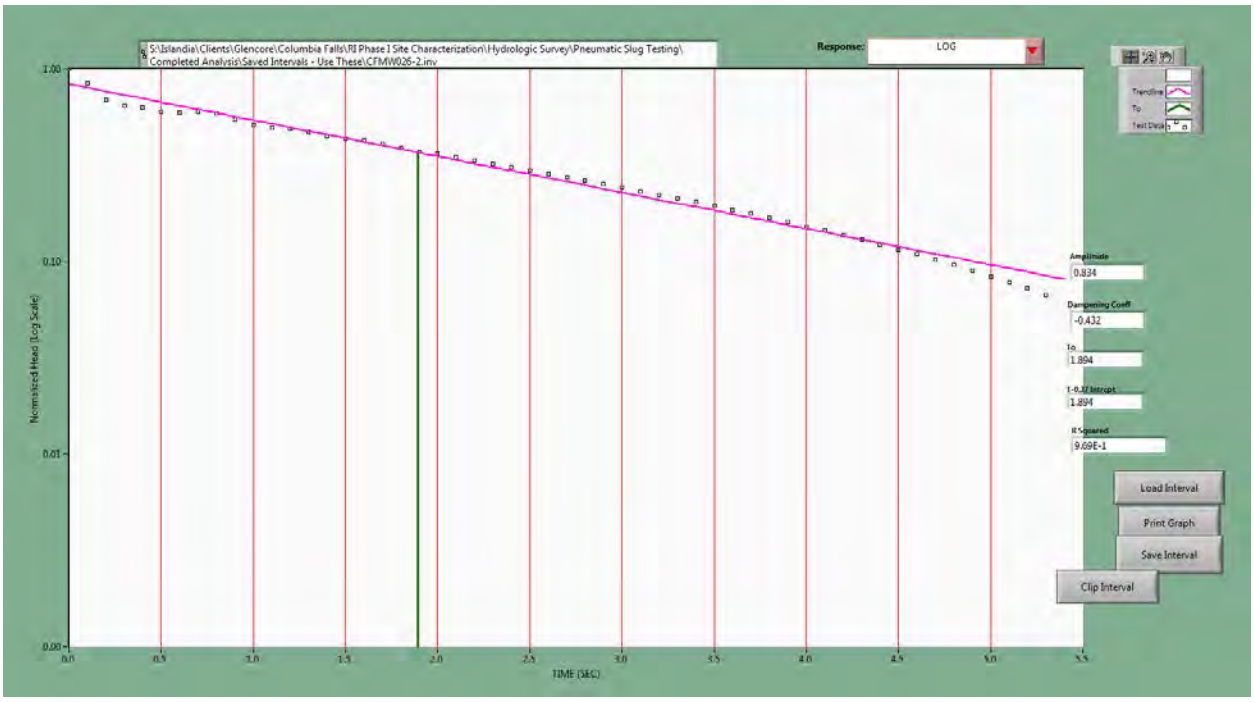
CFMW-026
1 Foot Displacement
Test #2

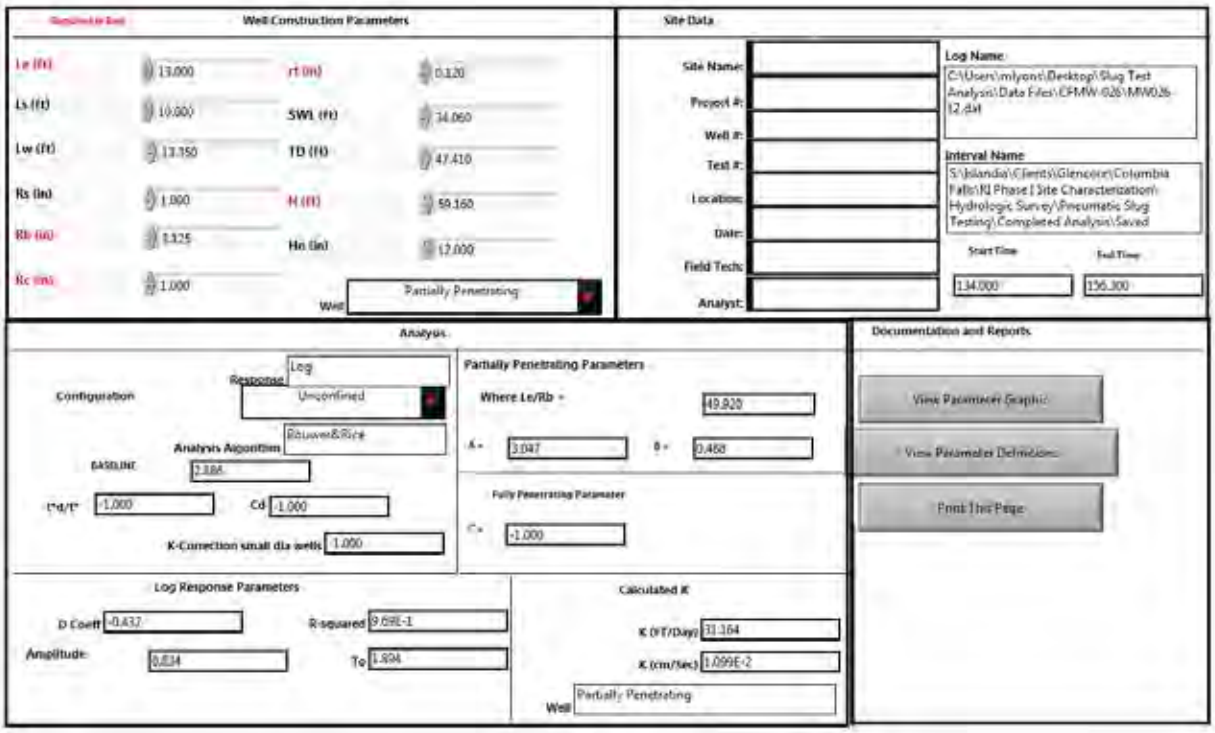


SITE INFORMATION -- SLUG TEST REV. 3.0

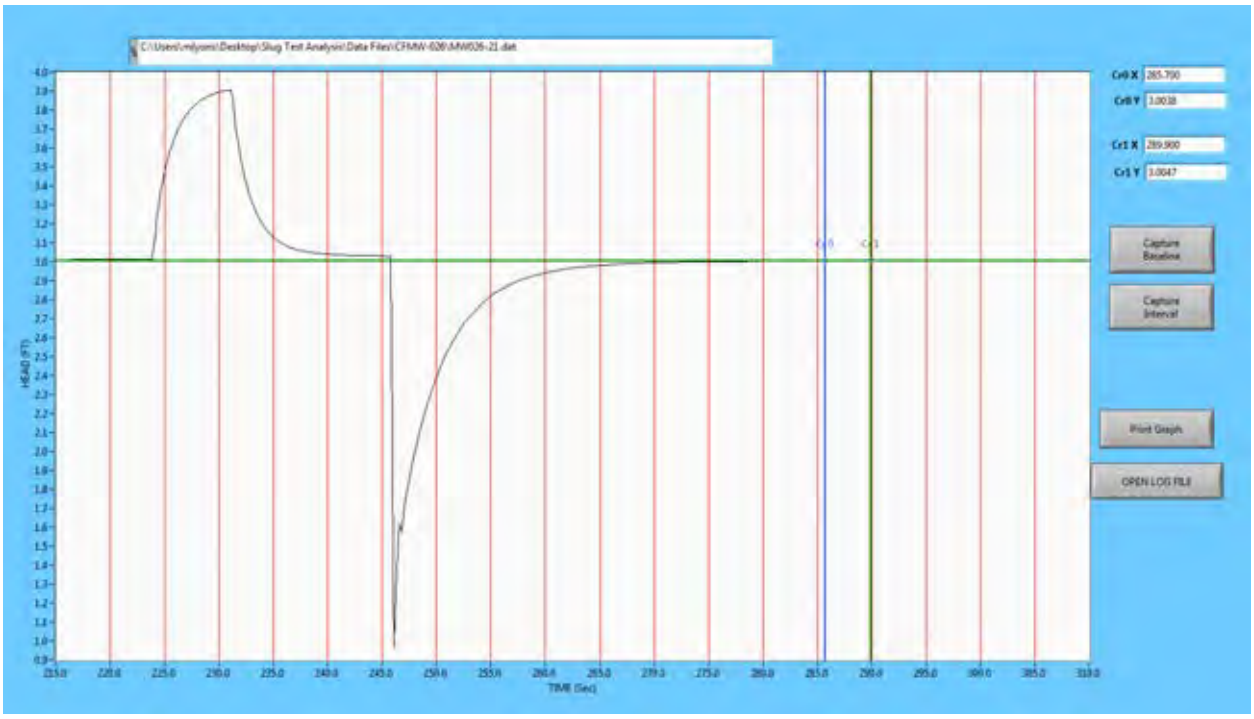
START DATE: 7/10/2017
START TIME: 10:32 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW026-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-026
1 Foot Displacement
Test #2





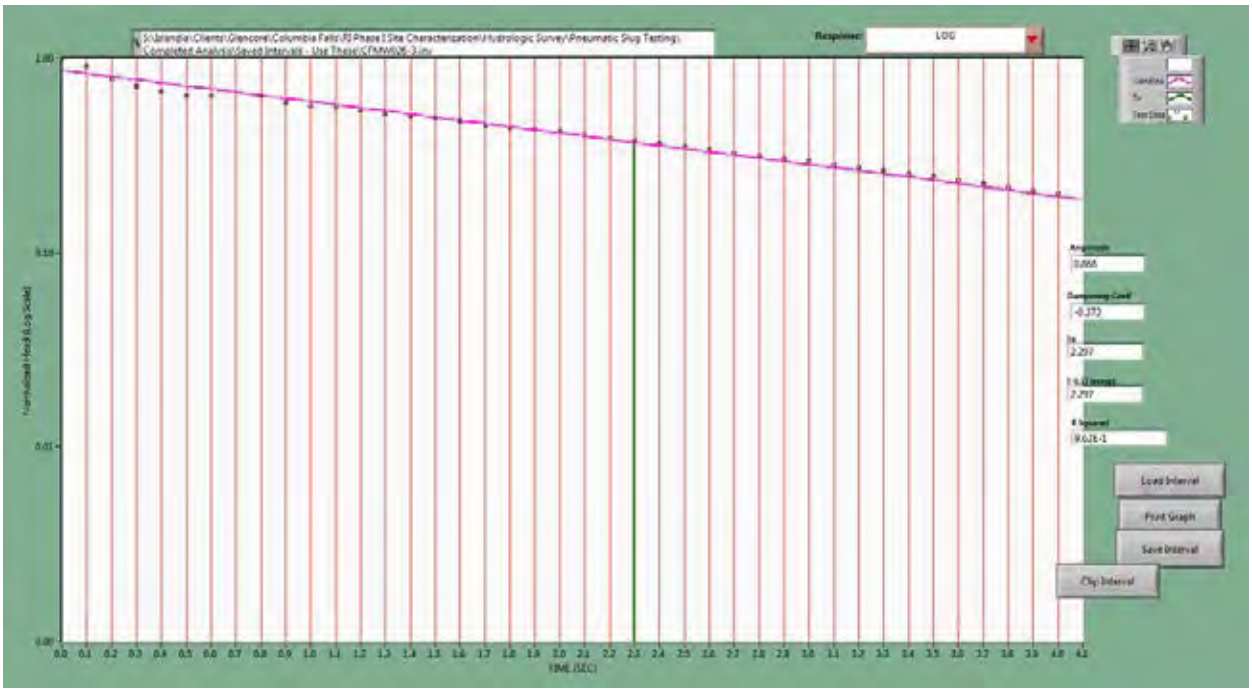
CFMW-026
2 Foot Displacement
Test #1

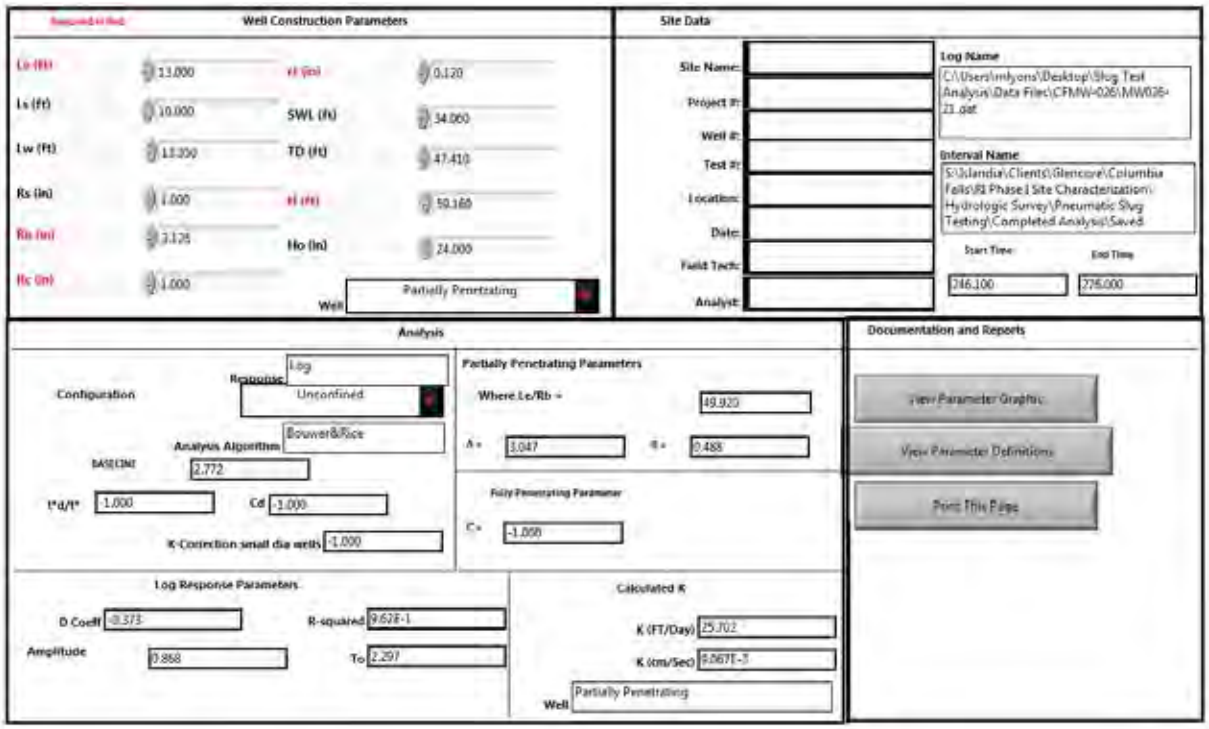


SITE INFORMATION -- SLUG TEST REV. 3.0

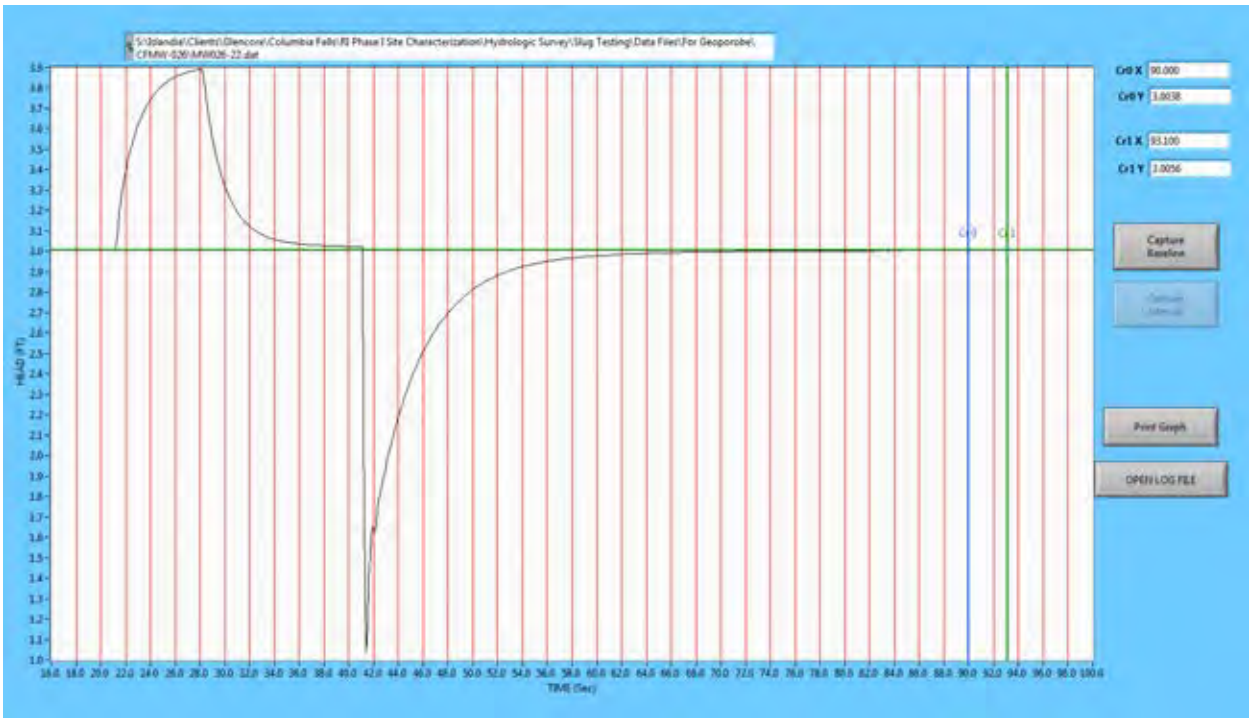
START DATE: 7/10/2017
START TIME: 10:35 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW026-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-026
2 Foot Displacement
Test #1





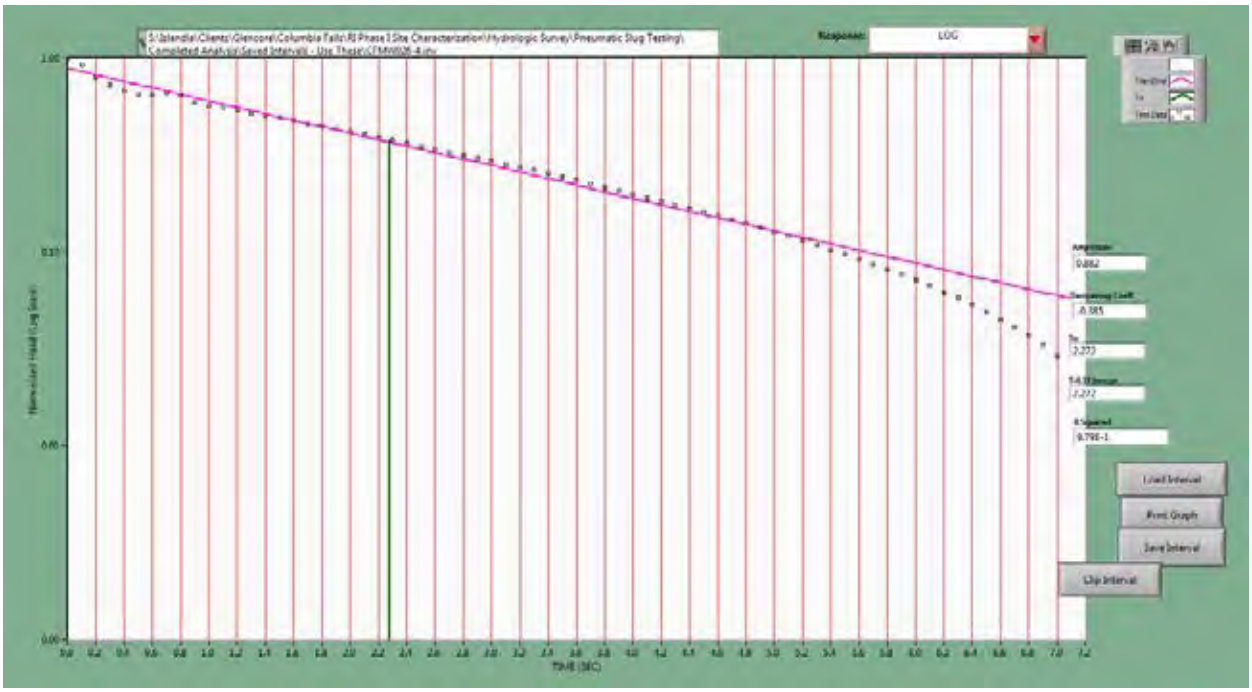
CFMW-026
2 Foot Displacement
Test #2

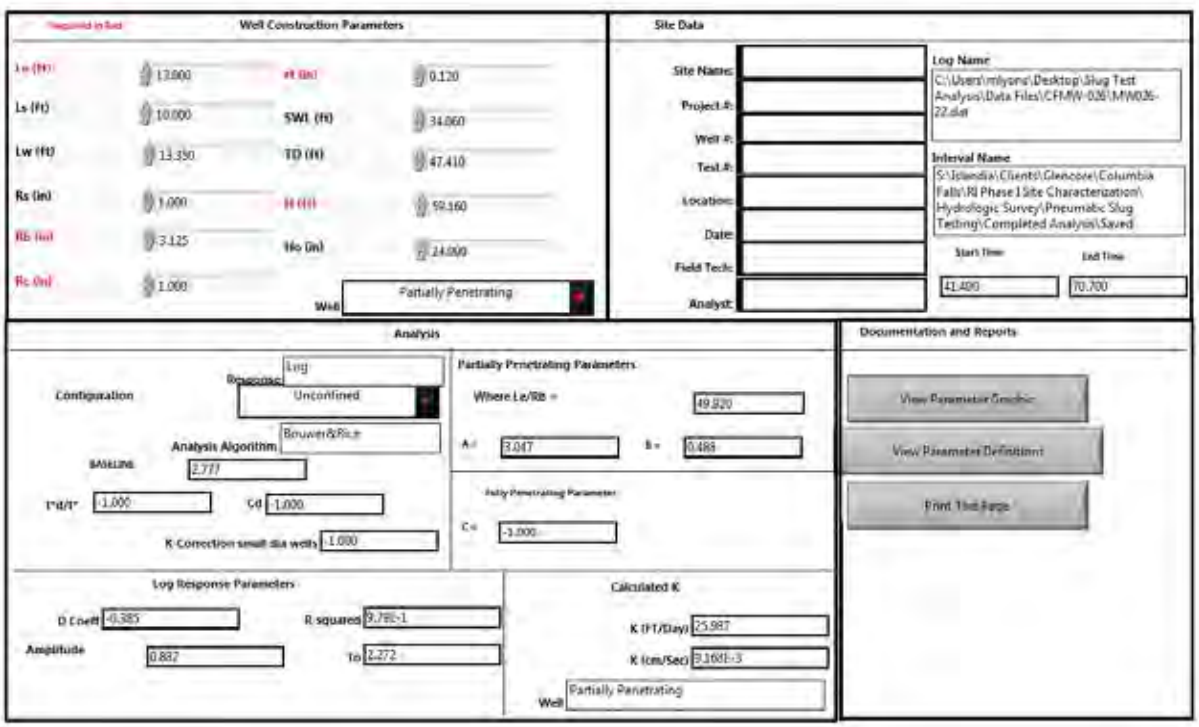


SITE INFORMATION -- SLUG TEST REV. 3.0

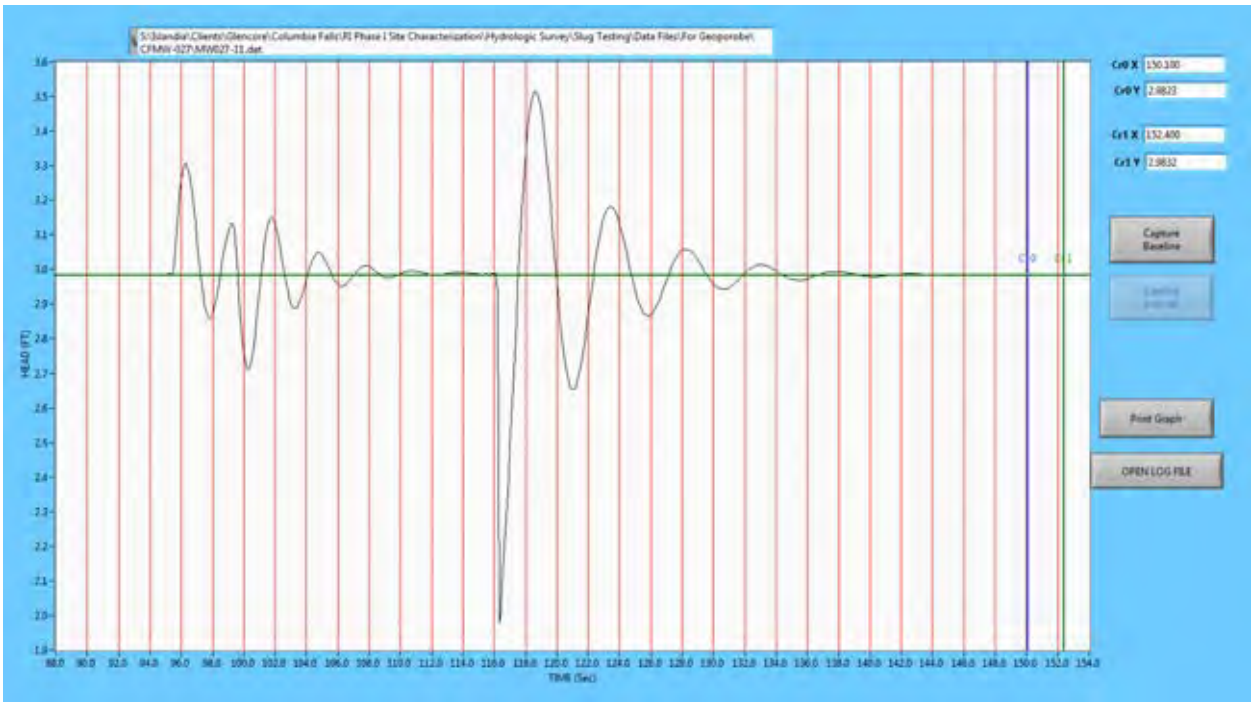
START DATE: 7/10/2017
START TIME: 10:40 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW026-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-026
2 Foot Displacement
Test #2





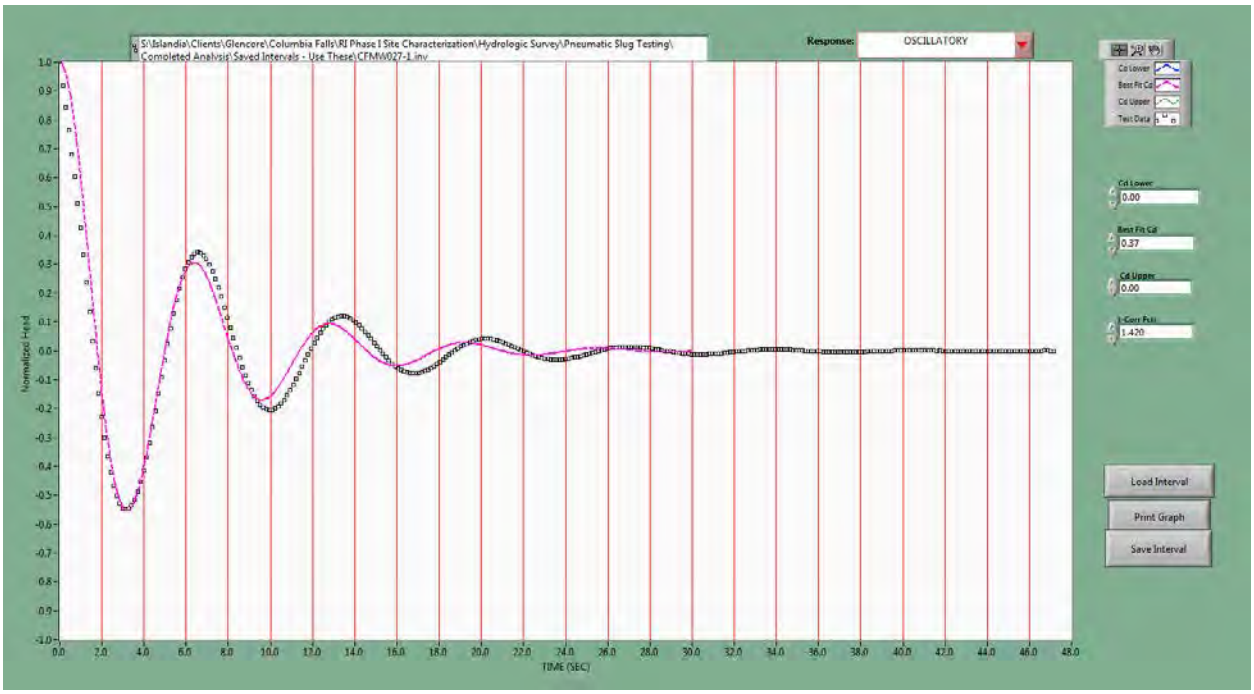
CFMW-027
1 Foot Displacement
Test #1

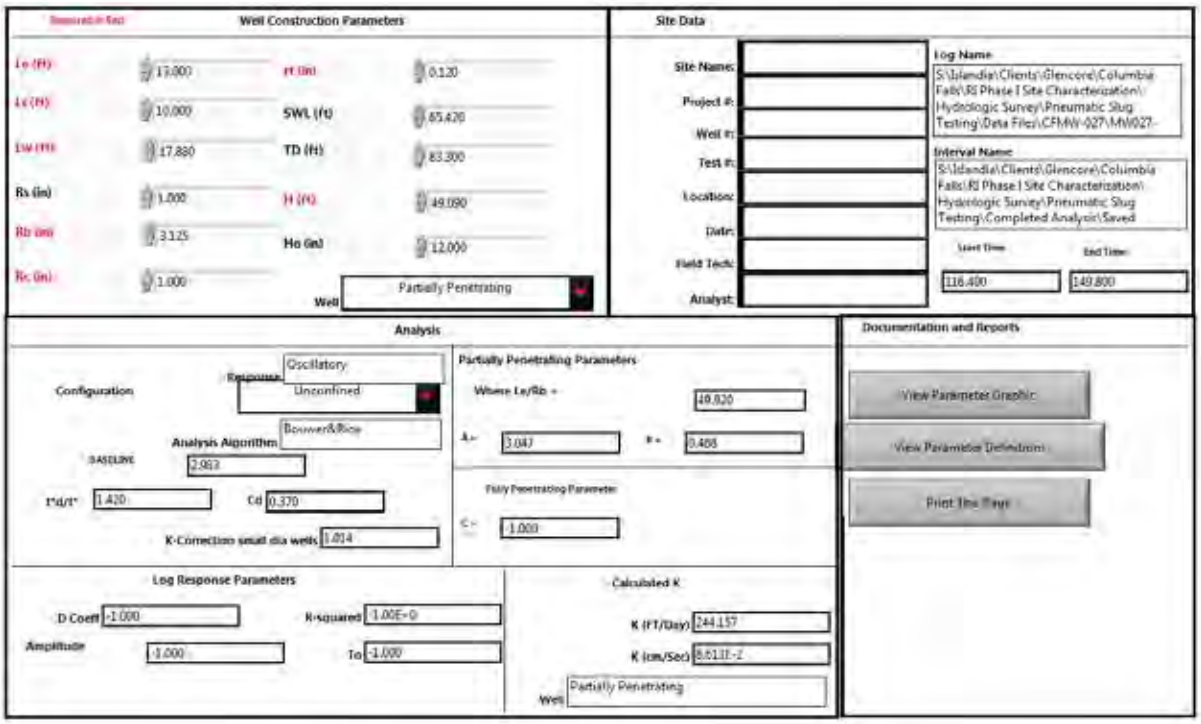


SITE INFORMATION -- SLUG TEST REV. 3.0

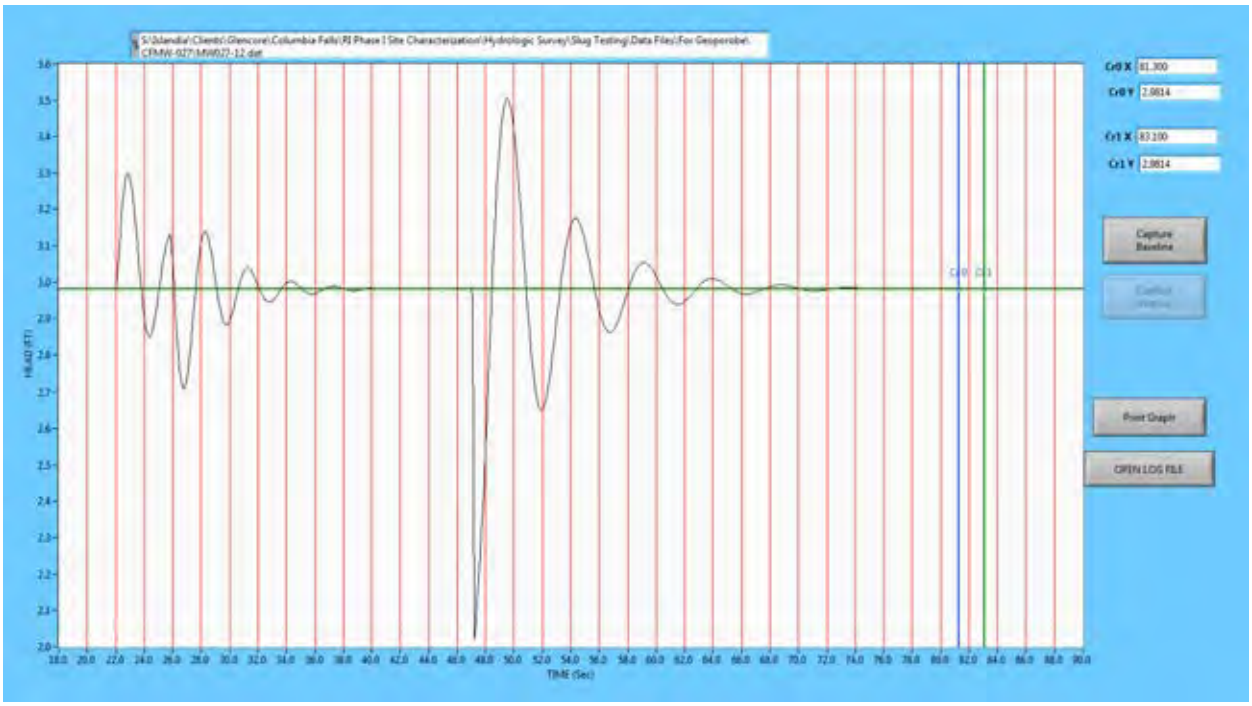
START DATE: 7/17/2017
START TIME: 10:45 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW027-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-027
1 Foot Displacement
Test #1





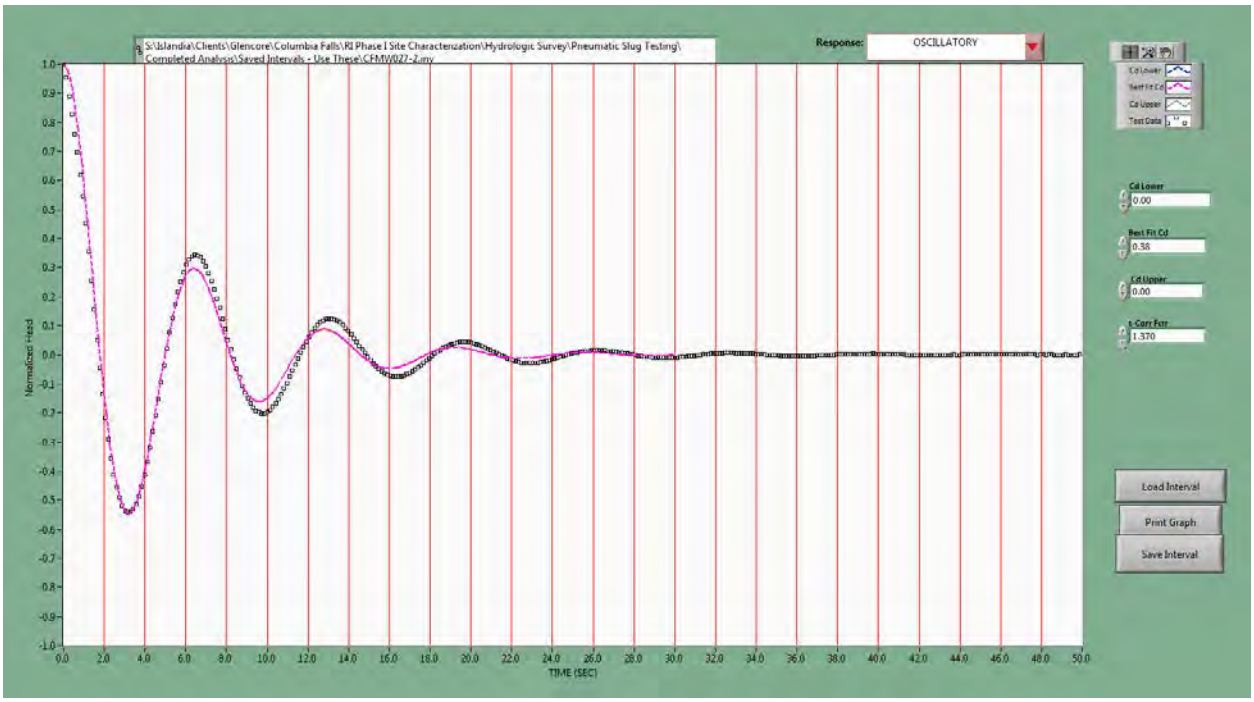
CFMW-027
1 Foot Displacement
Test #2

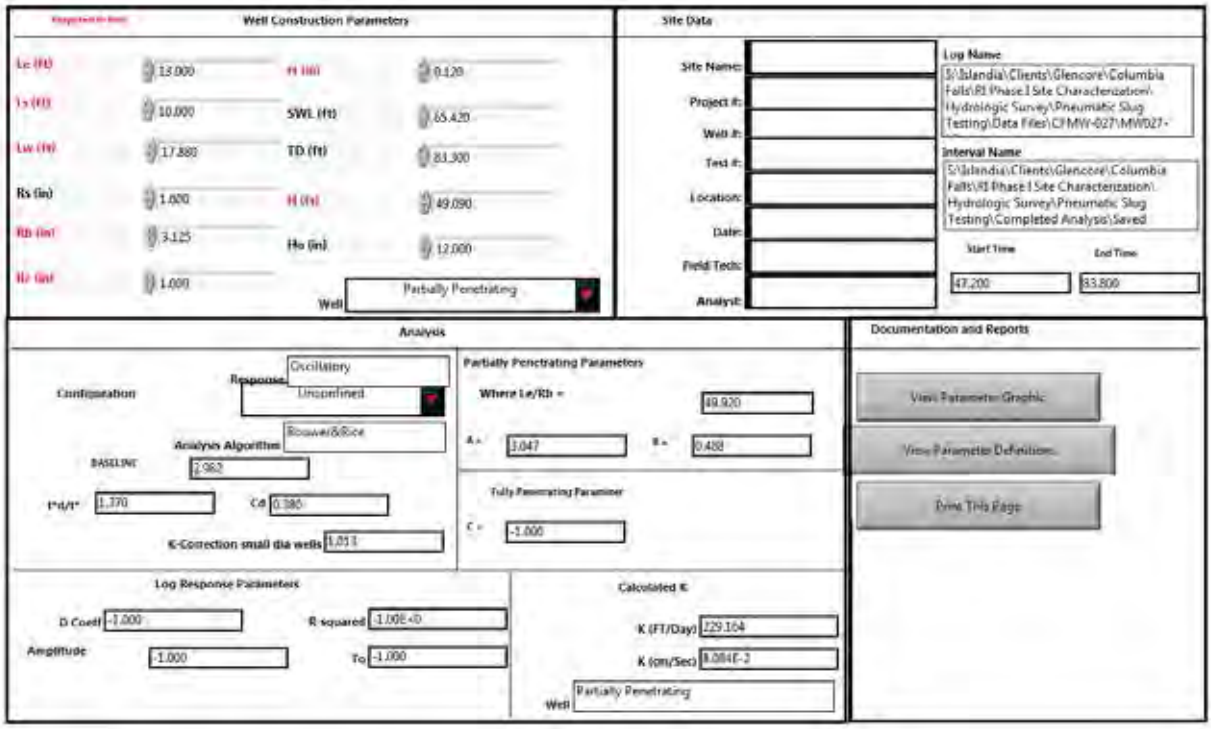


SITE INFORMATION -- SLUG TEST REV. 3.0

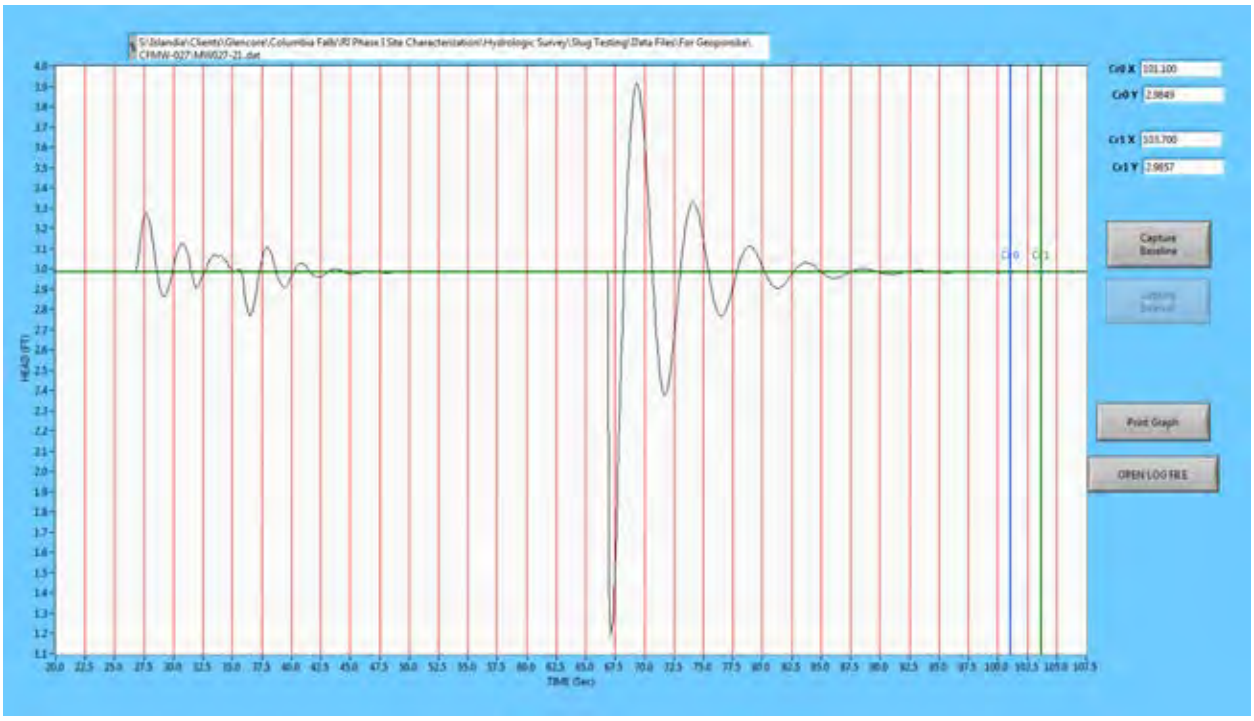
START DATE: 7/17/2017
START TIME: 10:48 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW027-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-027
1 Foot Displacement
Test #2





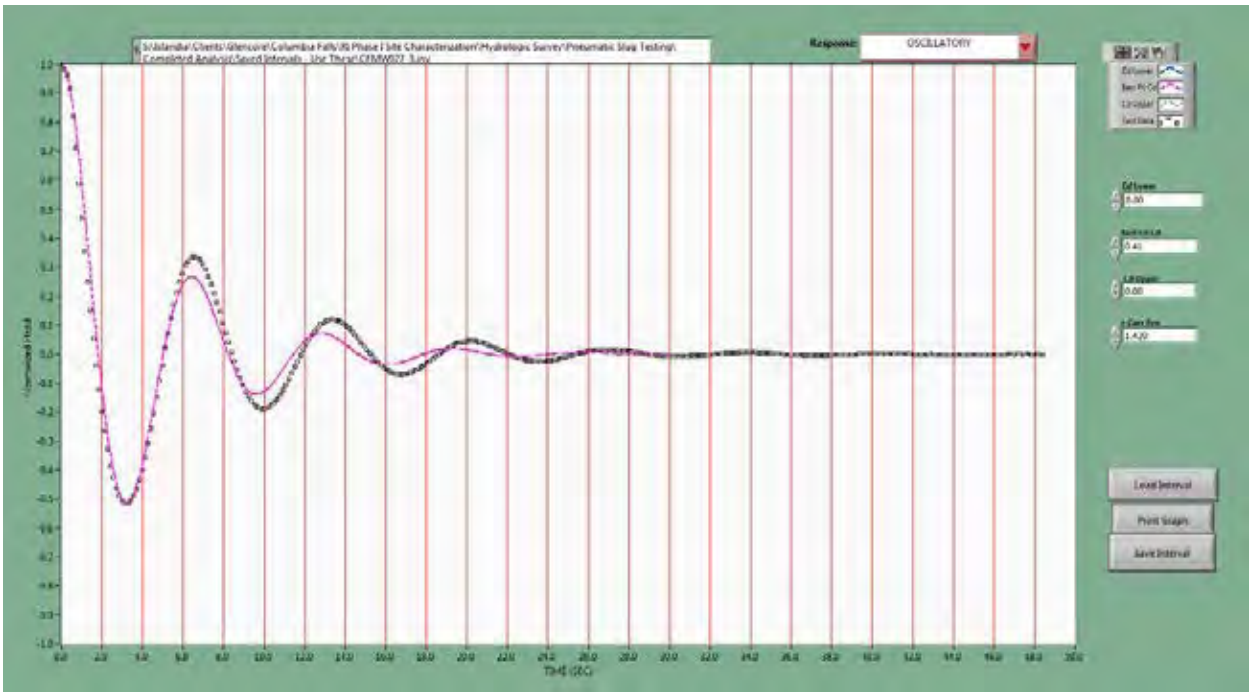
CFMW-027
2 Foot Displacement
Test #1

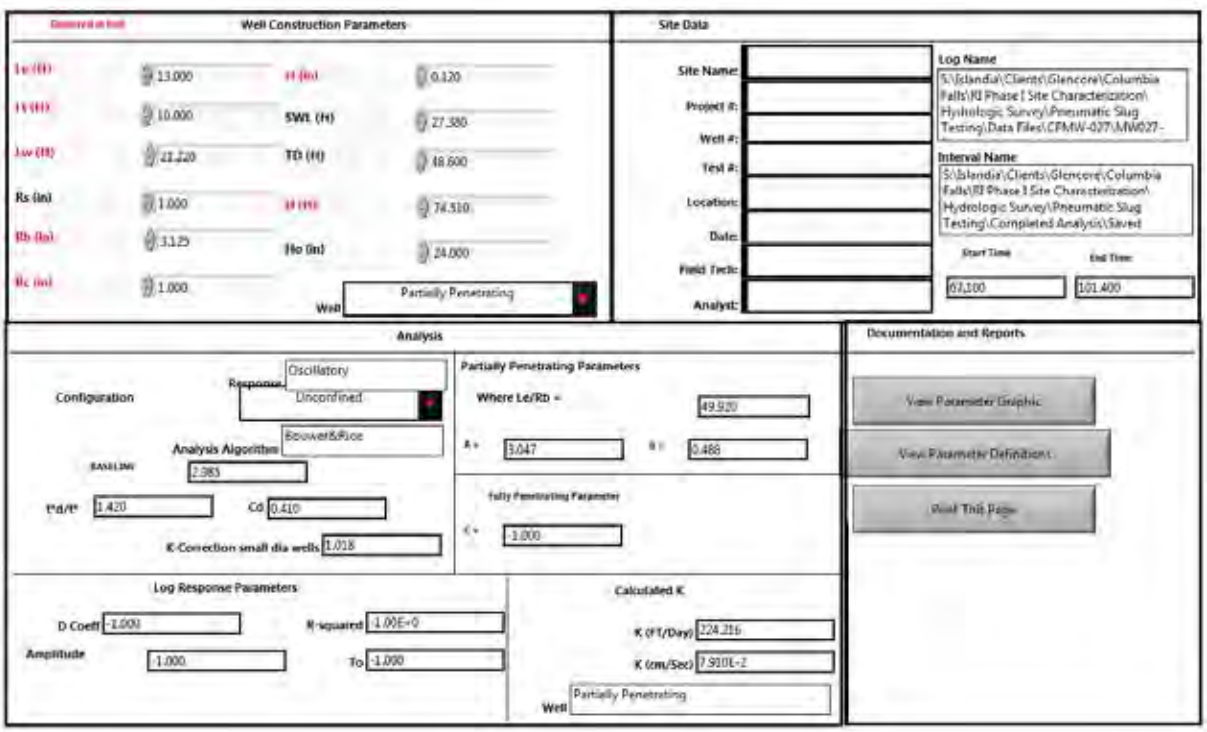


SITE INFORMATION -- SLUG TEST REV. 3.0

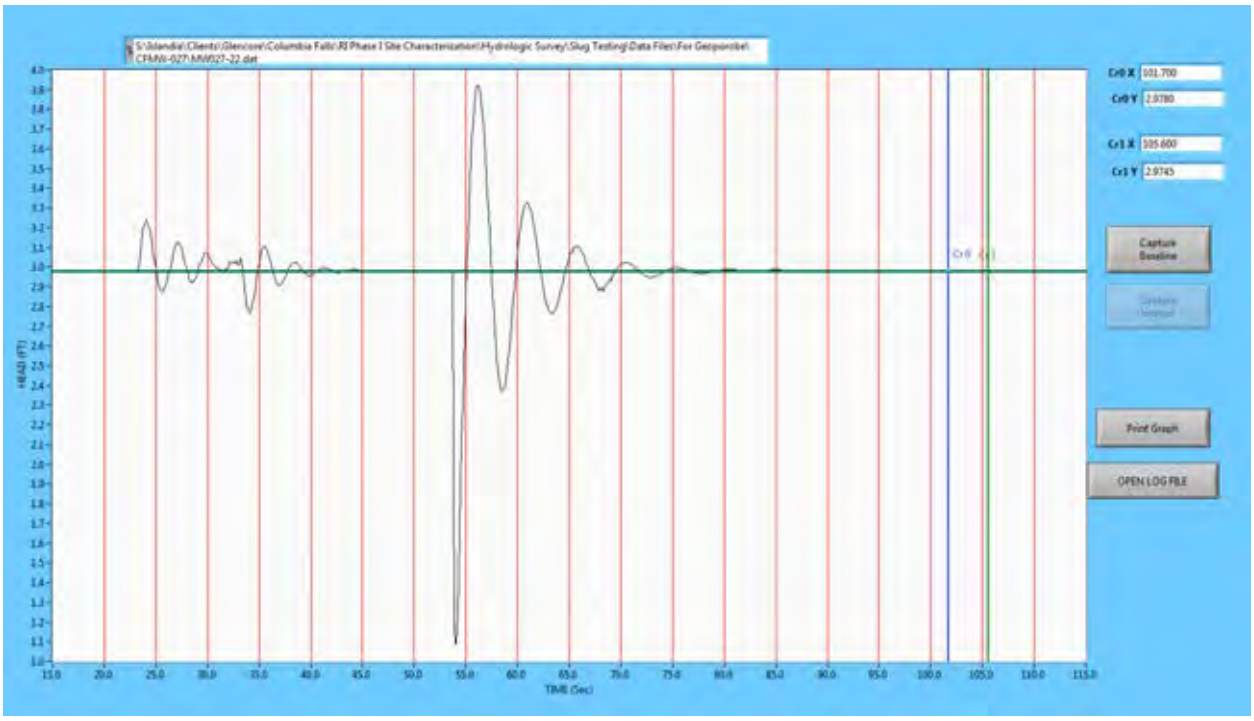
START DATE: 7/17/2017
START TIME: 10:51 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW027-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-027
2 Foot Displacement
Test #1





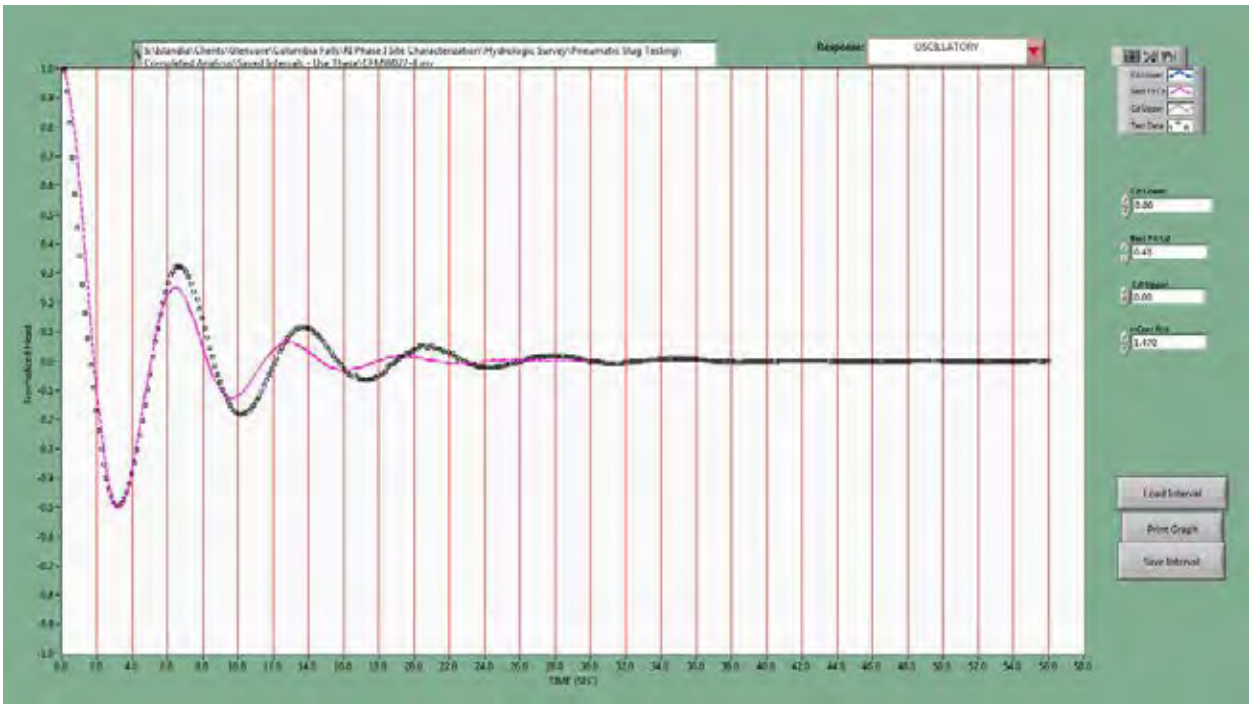
CFMW-027
2 Foot Displacement
Test #2

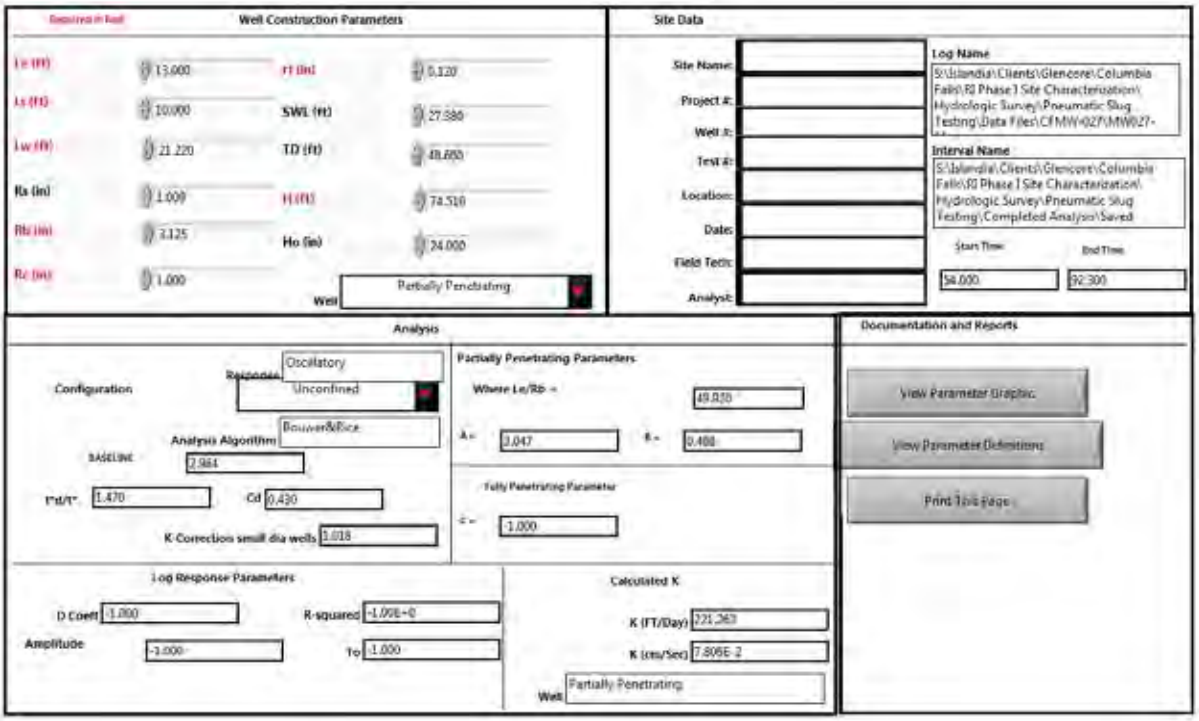


SITE INFORMATION -- SLUG TEST REV. 3.0

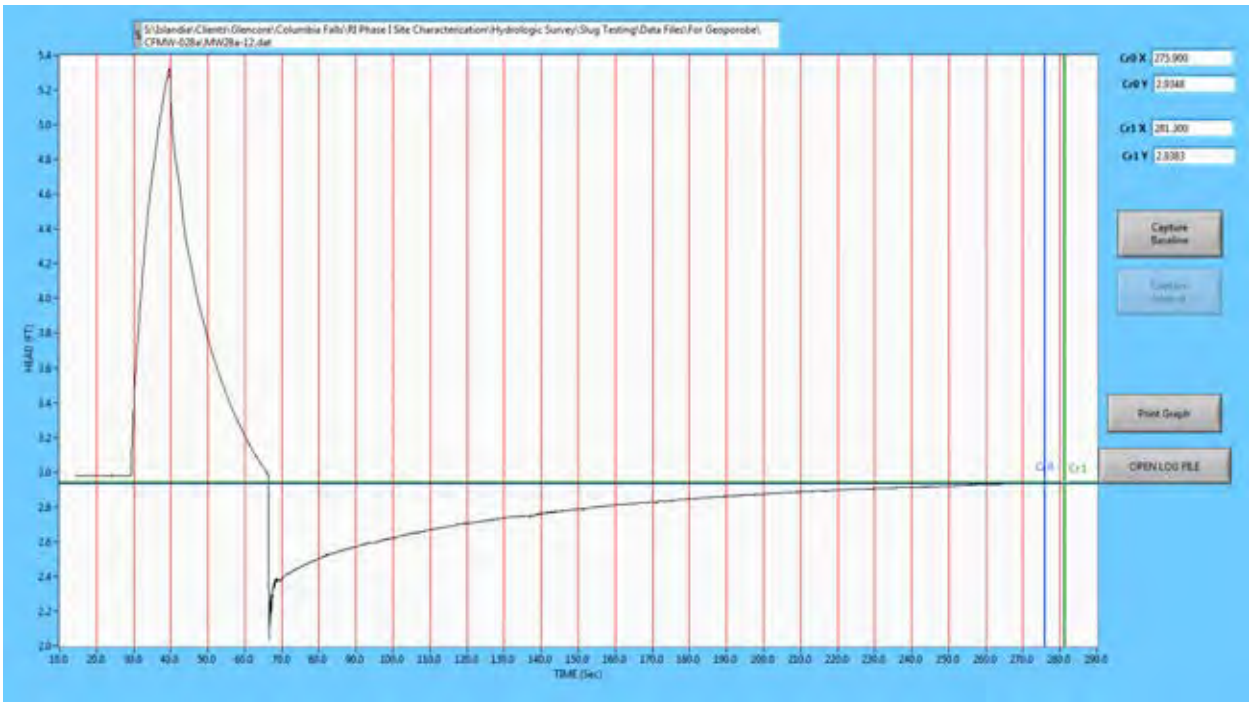
START DATE: 7/17/2017
START TIME: 10:52 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW027-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-027
2 Foot Displacement
Test #2





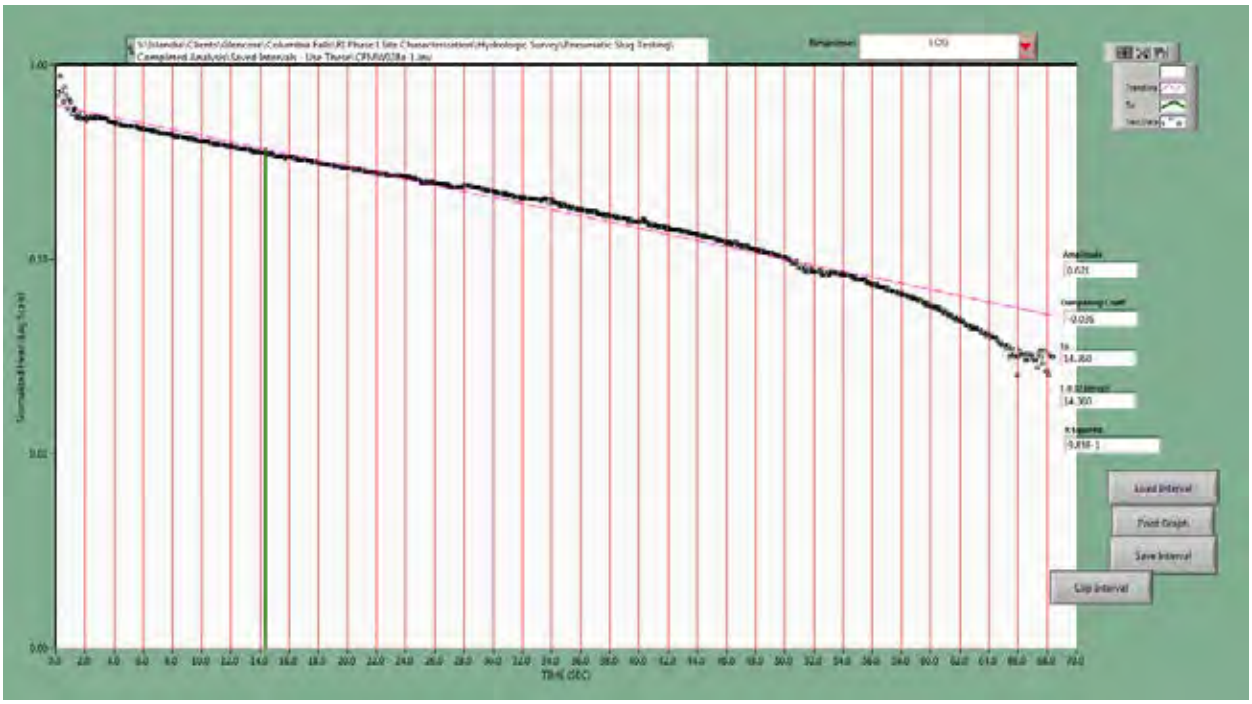
CFMW-028a
1 Foot Displacement
Test #1

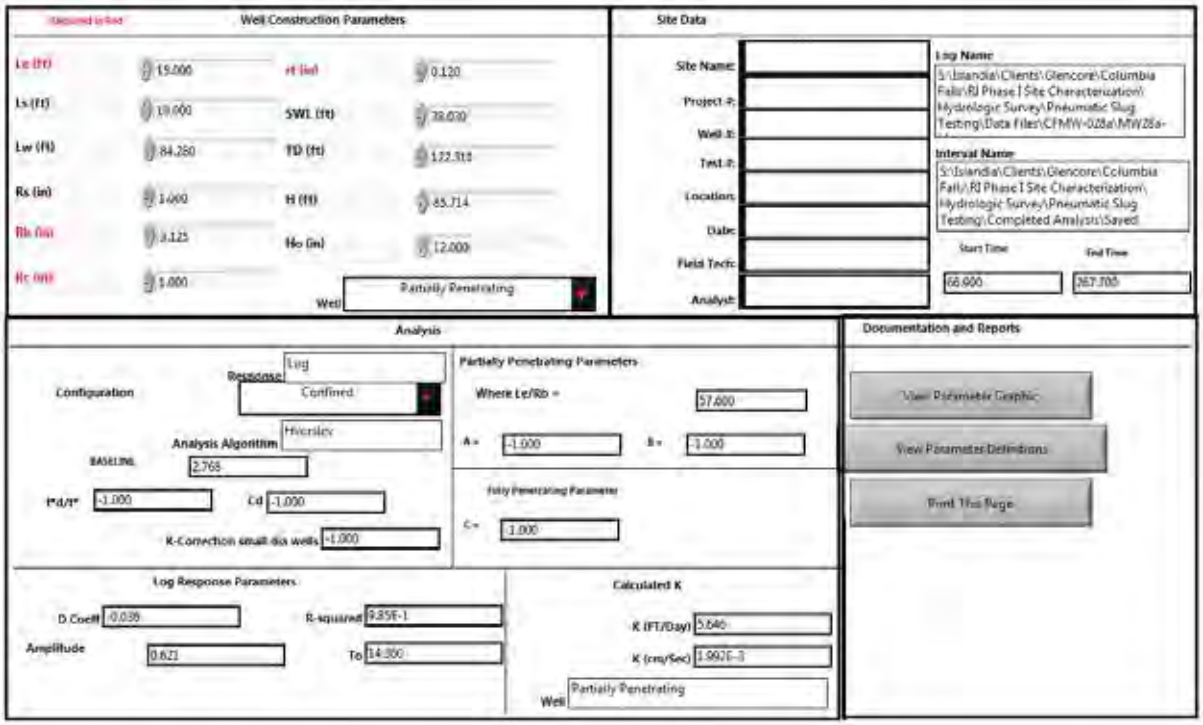


SITE INFORMATION -- SLUG TEST REV. 3.0

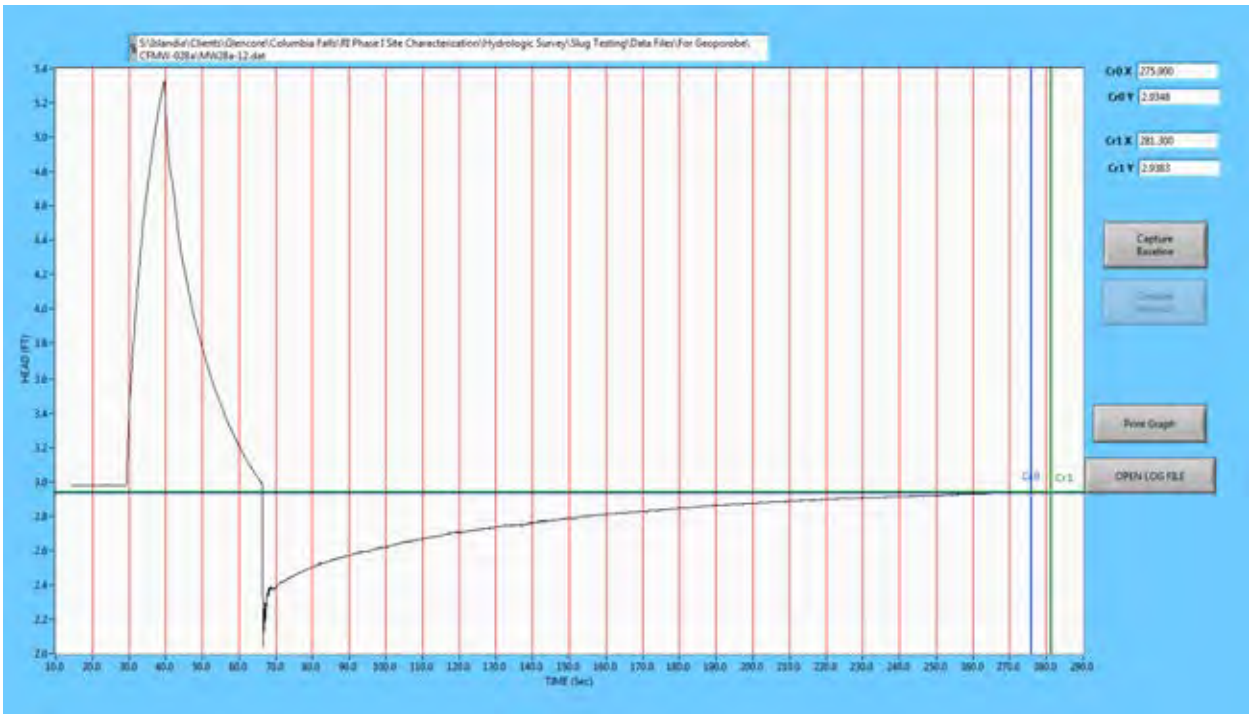
START DATE: 7/12/2017
START TIME: 10:42 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW28A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-028a
1 Foot Displacement
Test #1





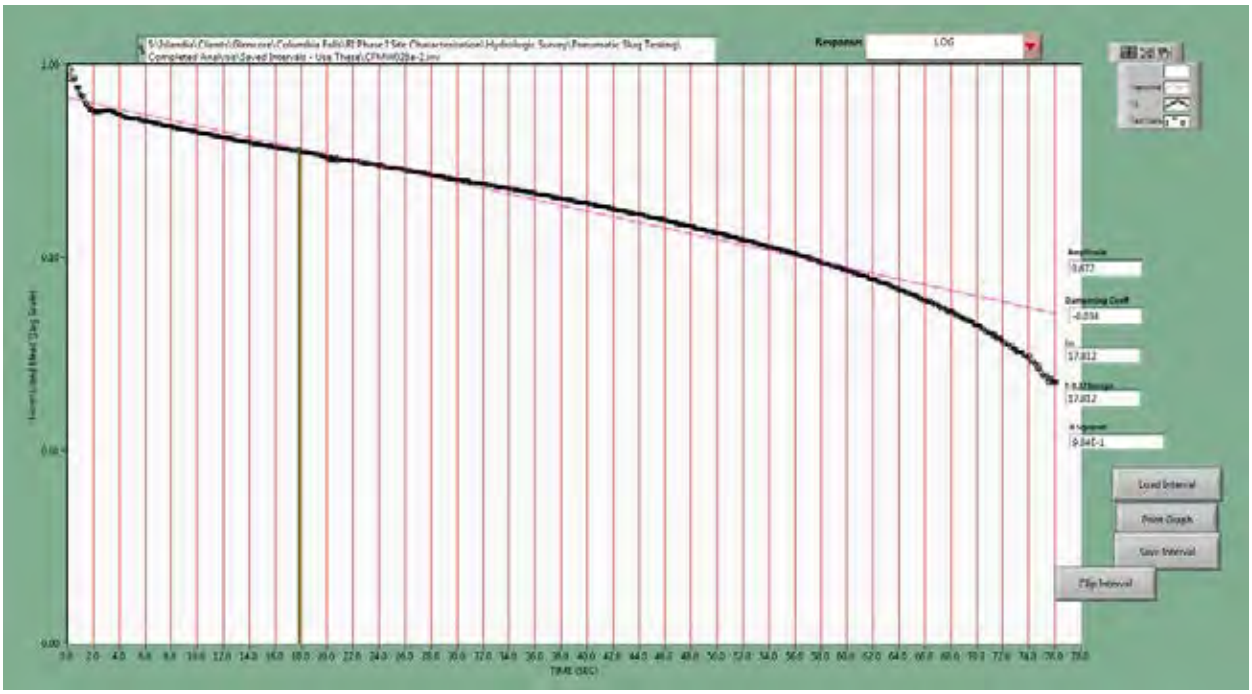
CFMW-028a
1 Foot Displacement
Test #2

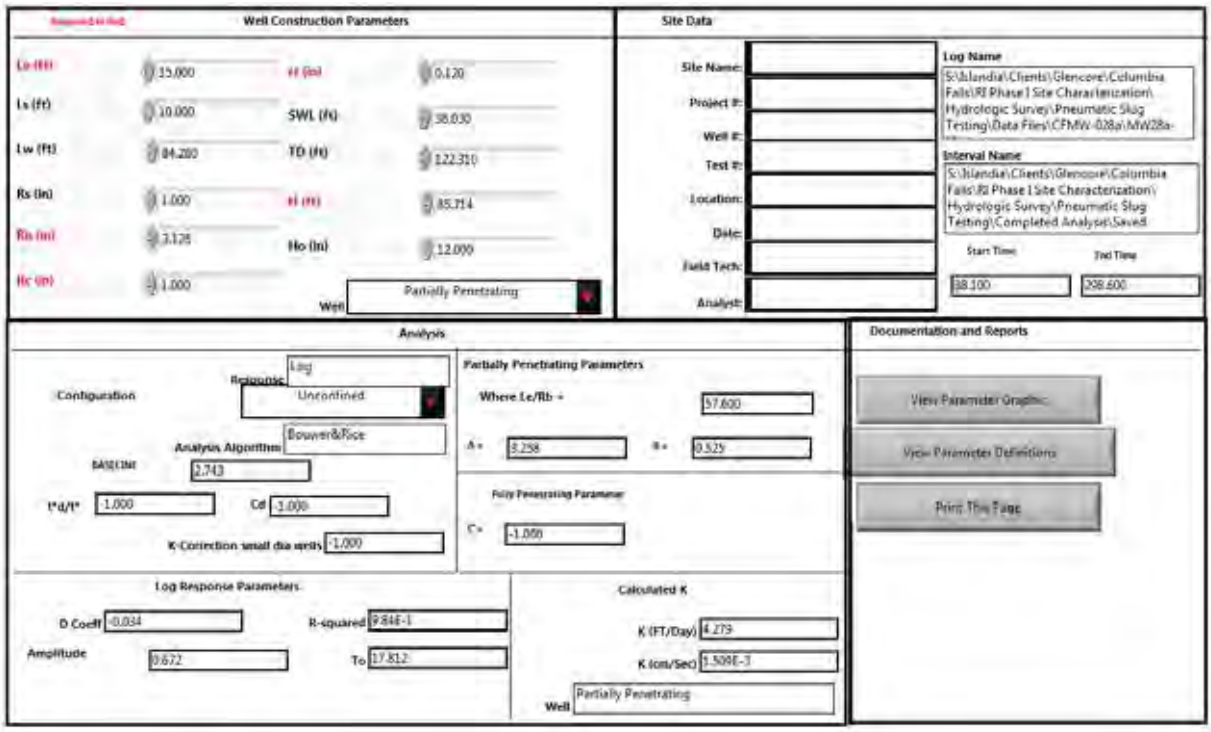


SITE INFORMATION -- SLUG TEST REV. 3.0

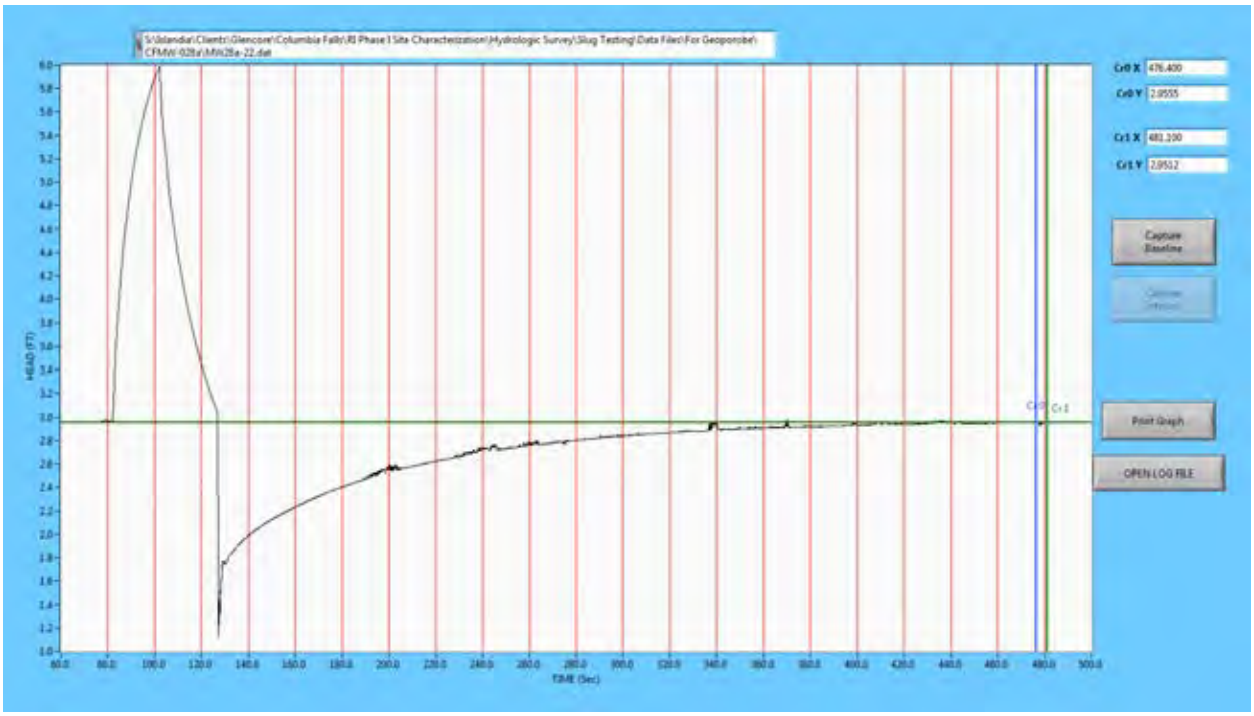
START DATE: 7/12/2017
START TIME: 10:42 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW28A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-028a
1 Foot Displacement
Test #2





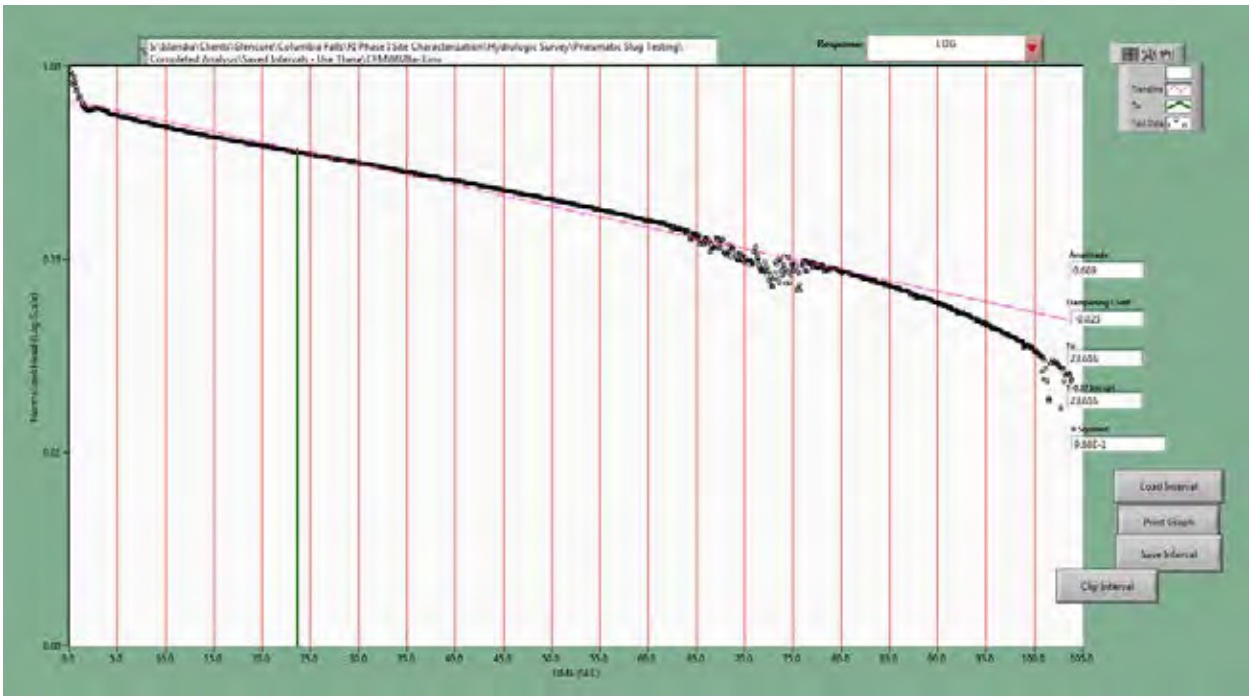
CFMW-028a
2 Foot Displacement
Test #1

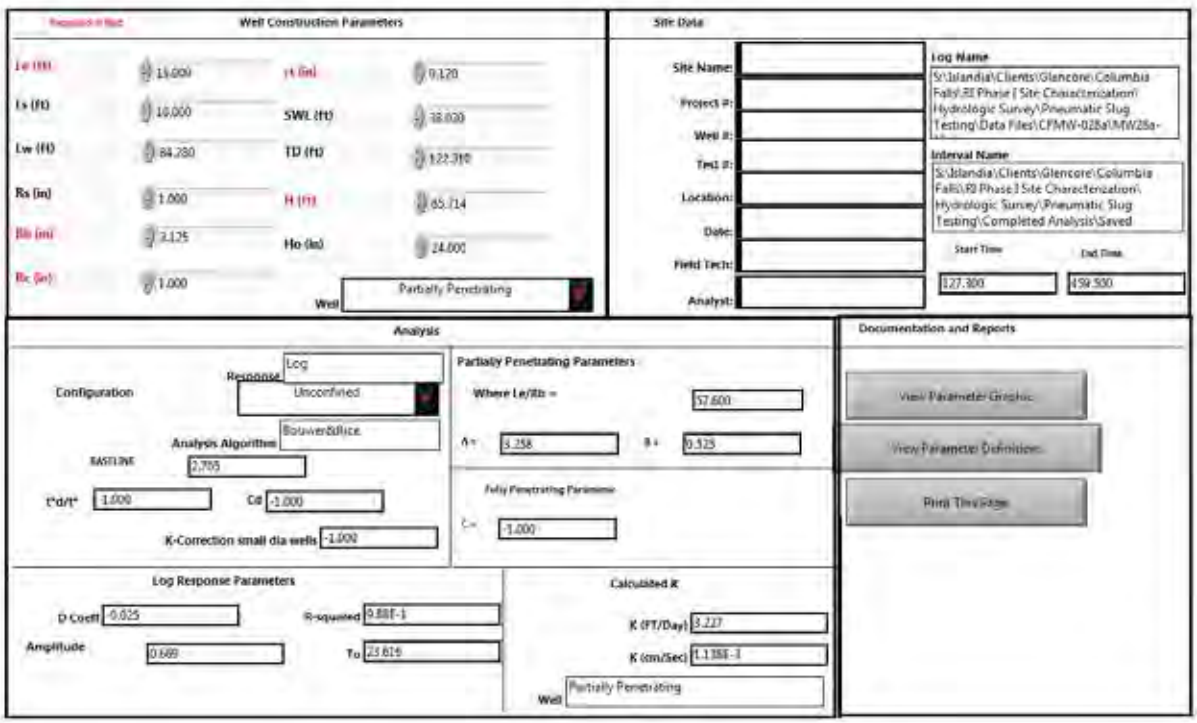


SITE INFORMATION -- SLUG TEST REV. 3.0

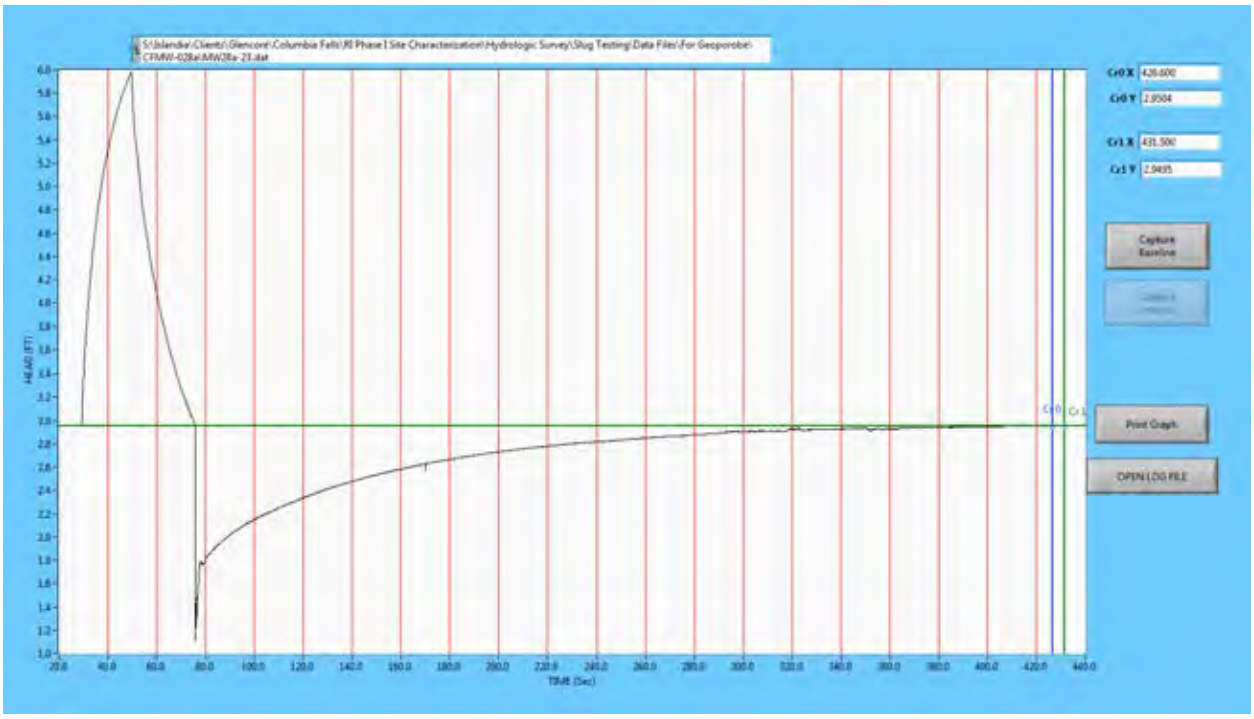
START DATE: 7/12/2017
START TIME: 10:54 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW28A-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-028a
2 Foot Displacement
Test #1





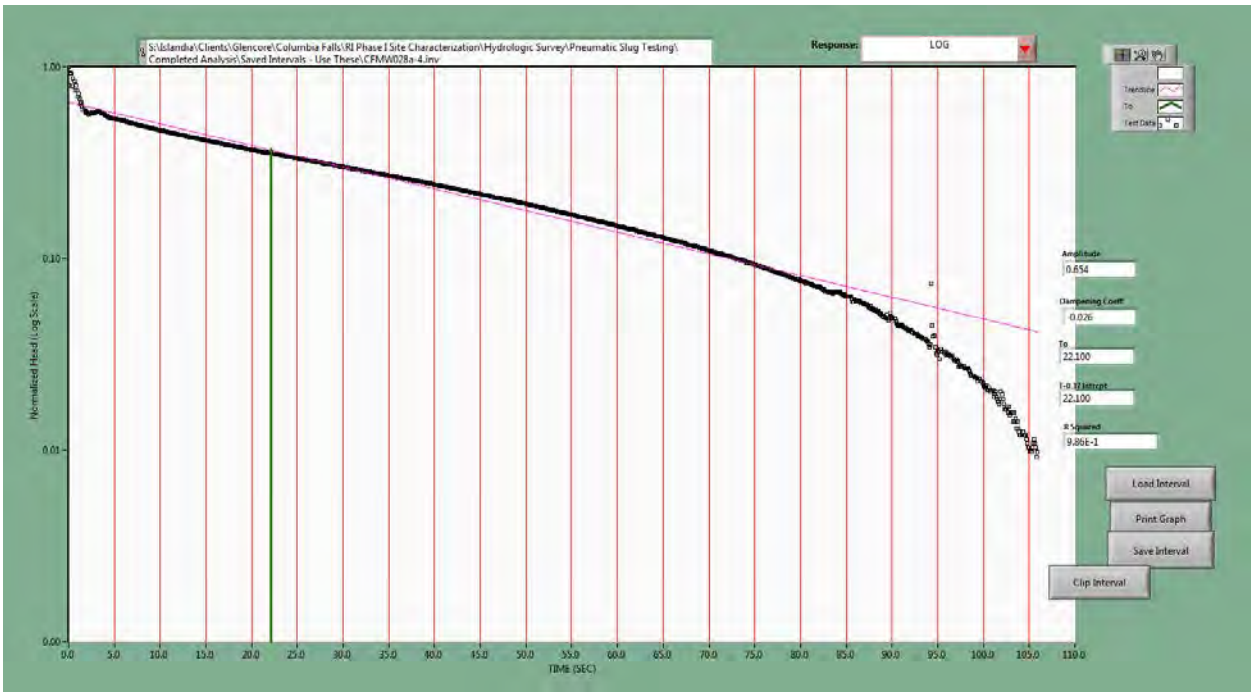
CFMW-028a
2 Foot Displacement
Test #2

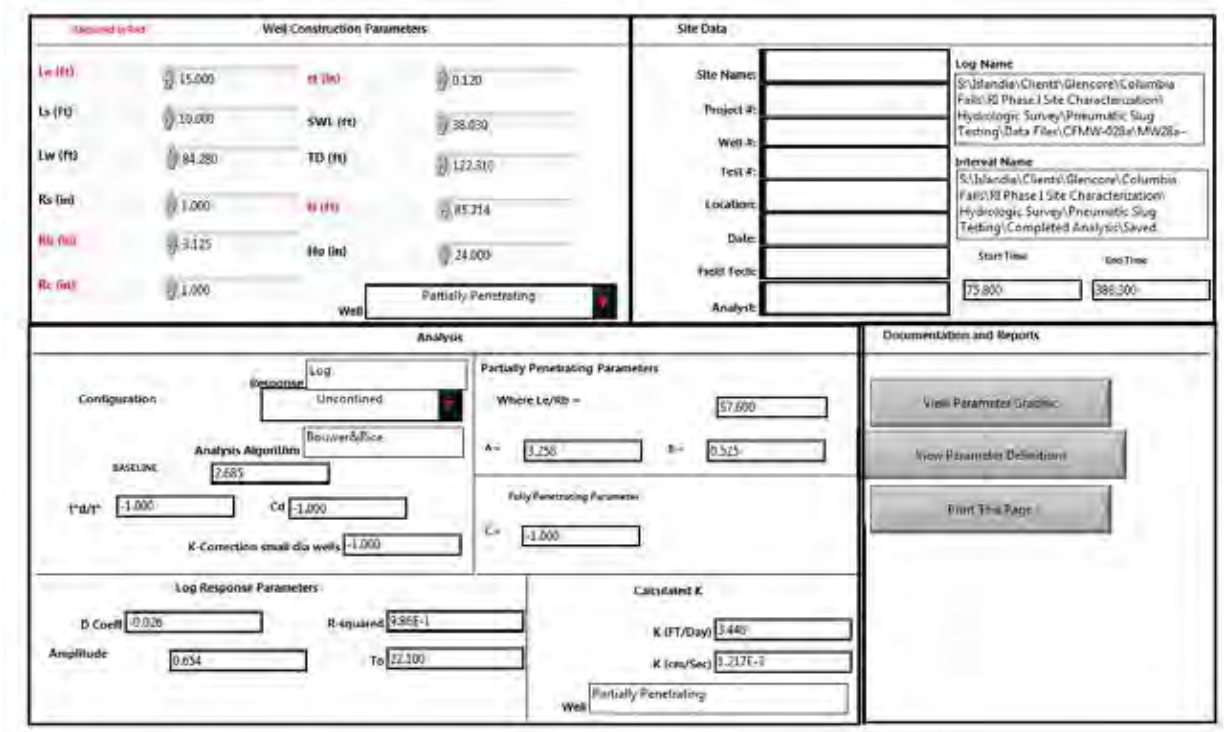


SITE INFORMATION -- SLUG TEST REV. 3.0

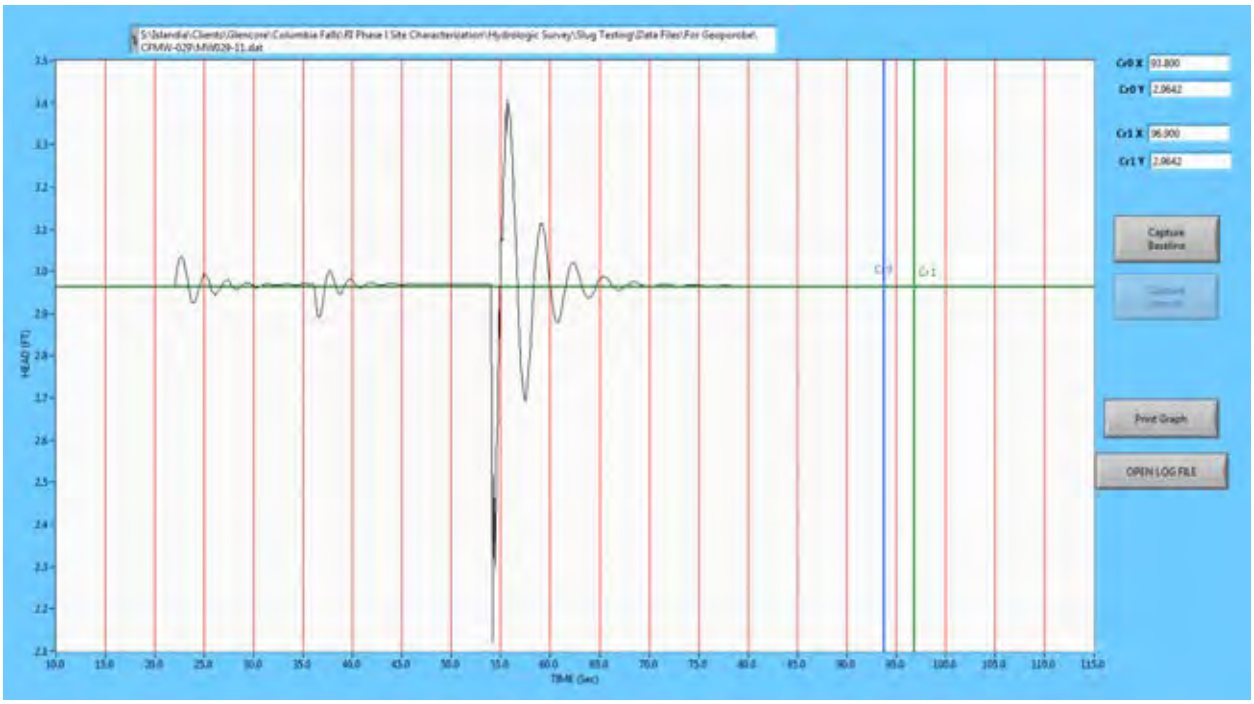
START DATE: 7/12/2017
START TIME: 11:02 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW28A-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-028a
2 Foot Displacement
Test #2





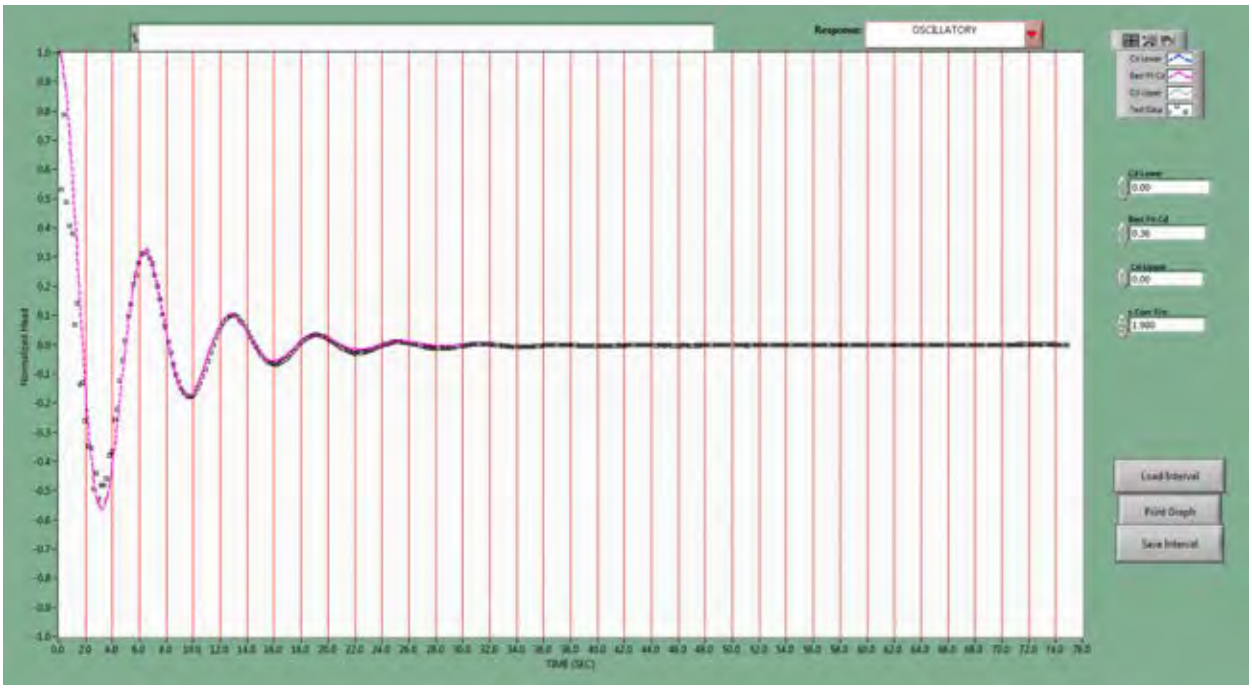
CFMW-029
1 Foot Displacement
Test #1

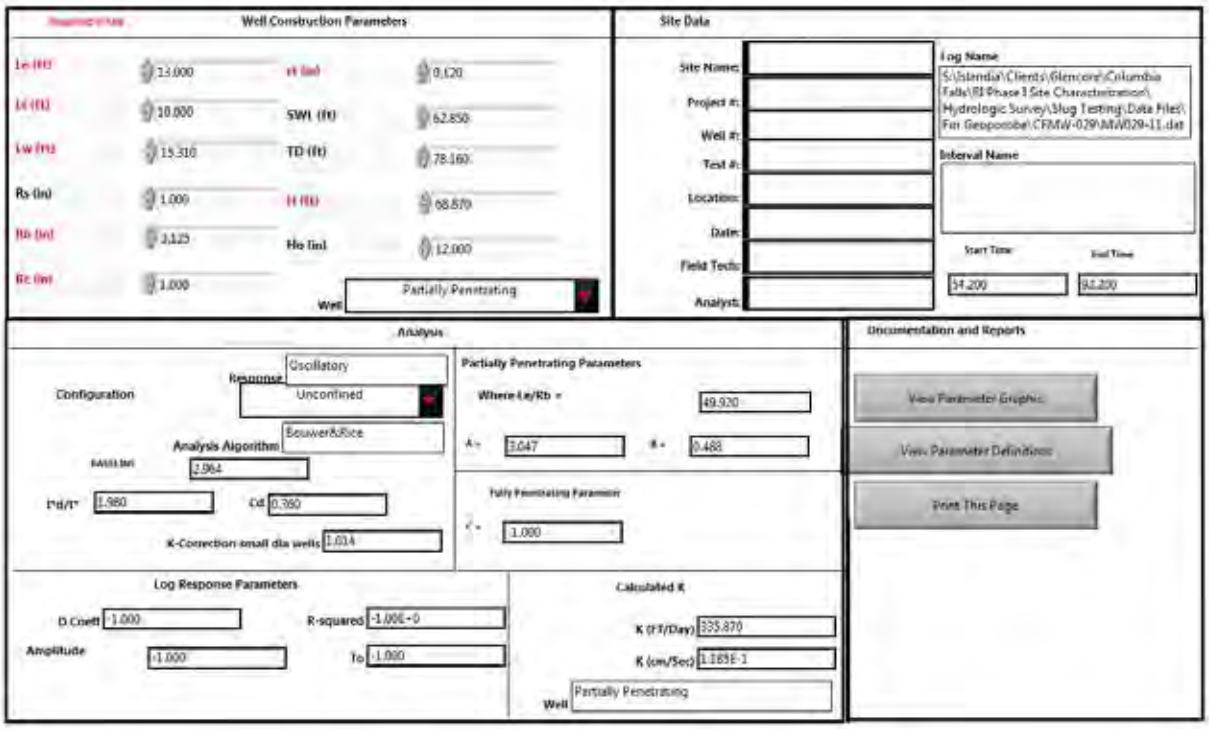


SITE INFORMATION -- SLUG TEST REV. 3.0

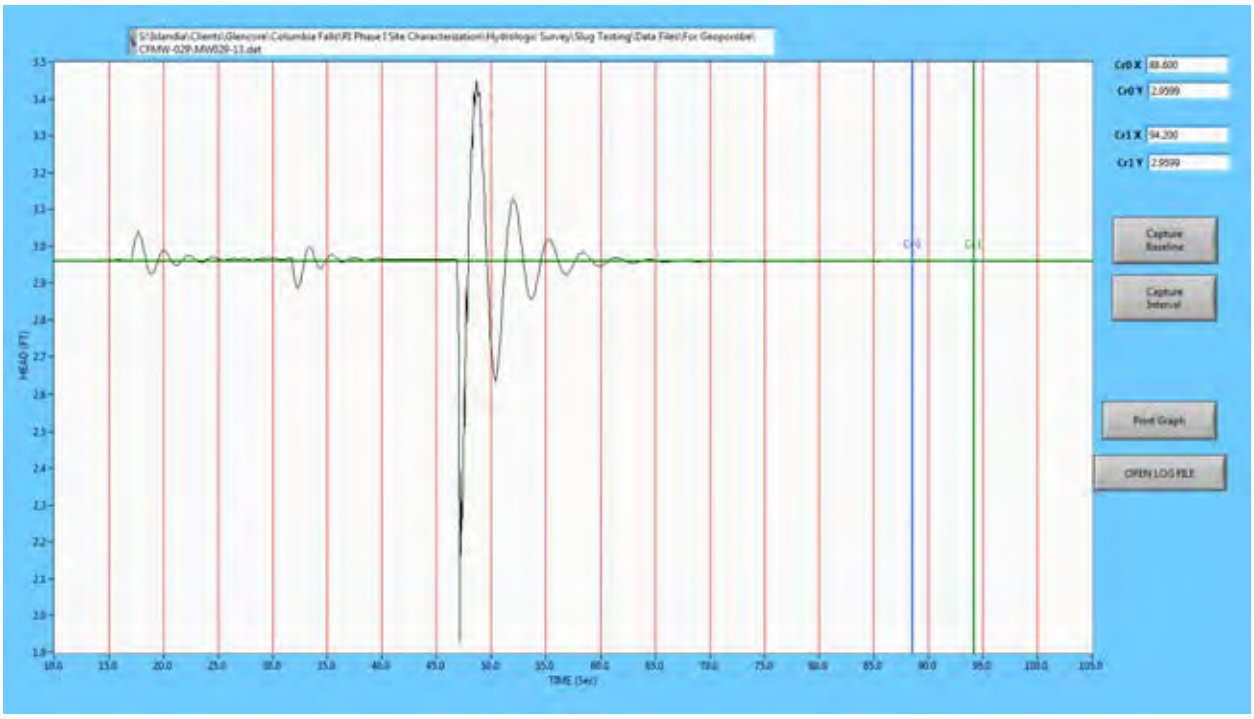
START DATE: 7/17/2017
START TIME: 10:09 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW029-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-029
1 Foot Displacement
Test #1





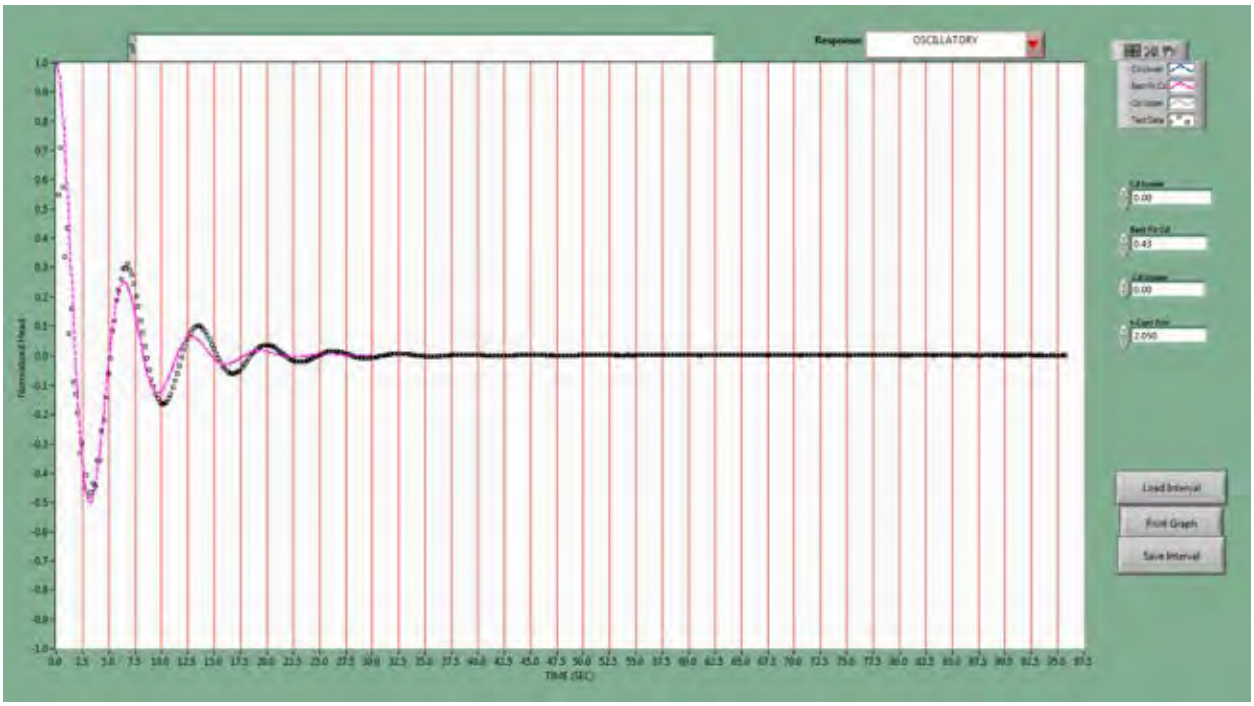
CFMW-029
1 Foot Displacement
Test #2

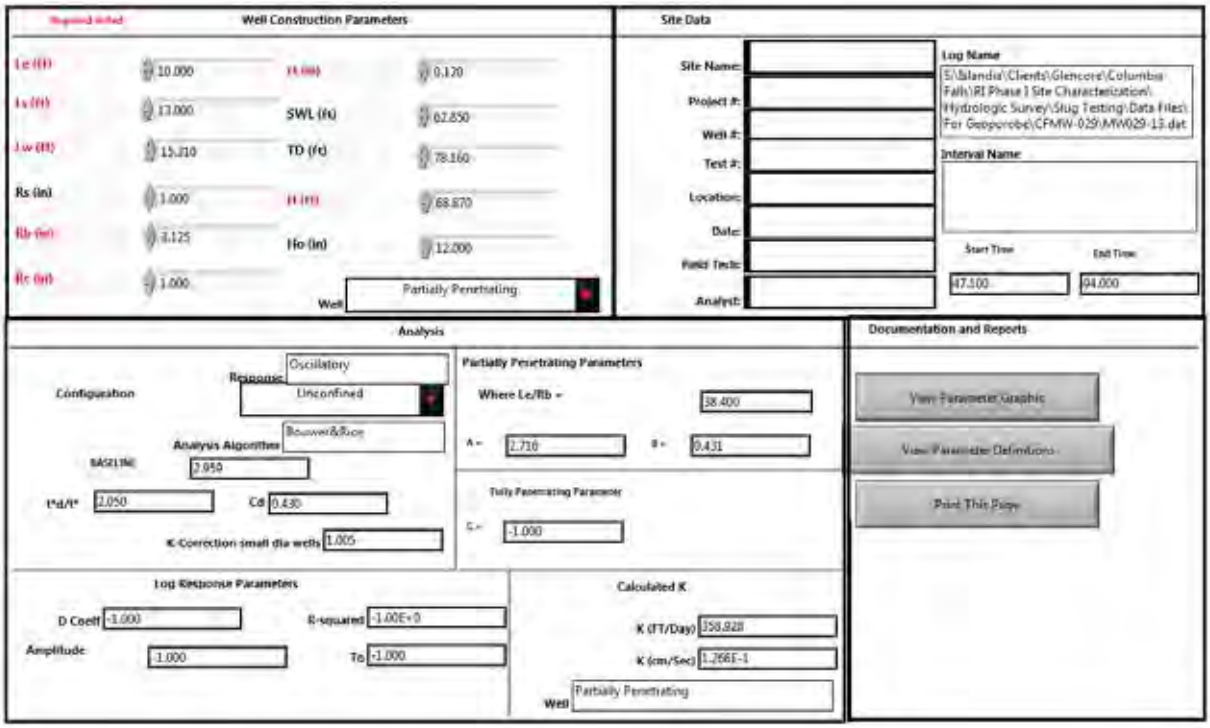


SITE INFORMATION -- SLUG TEST REV. 3.0

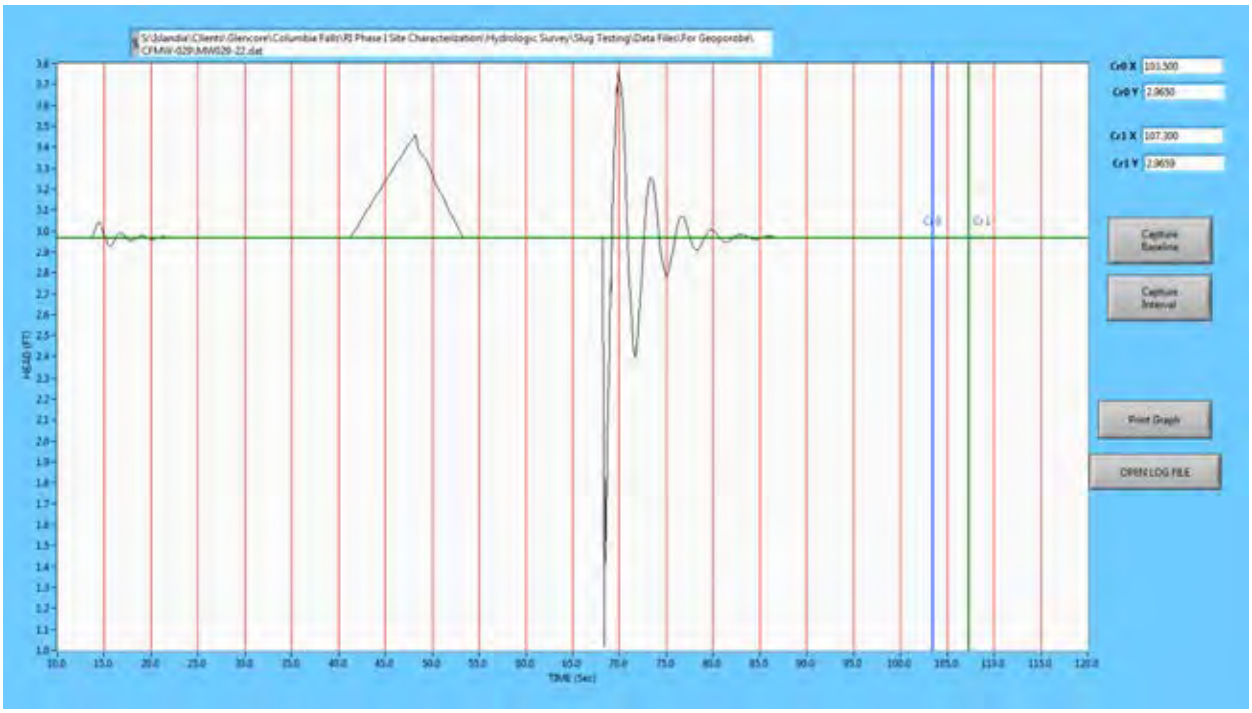
START DATE: 7/17/2017
START TIME: 10:12 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW029-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-029
1 Foot Displacement
Test #2





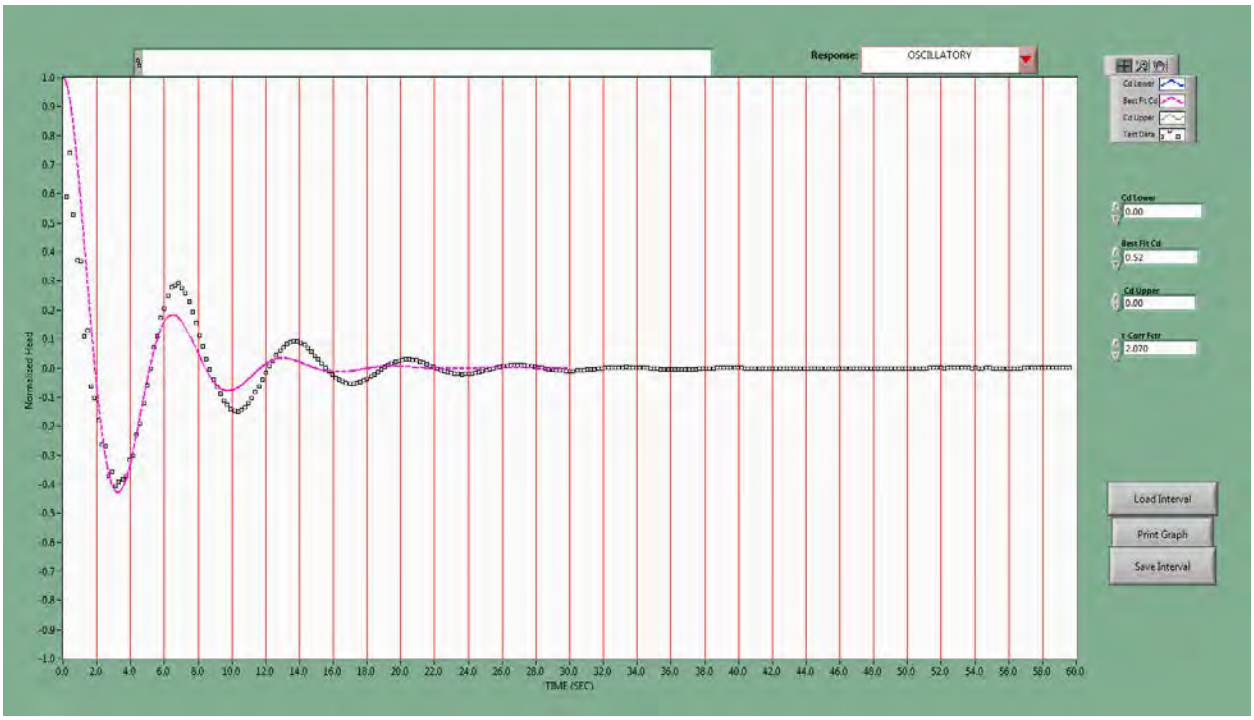
CFMW-029
2 Foot Displacement
Test #1

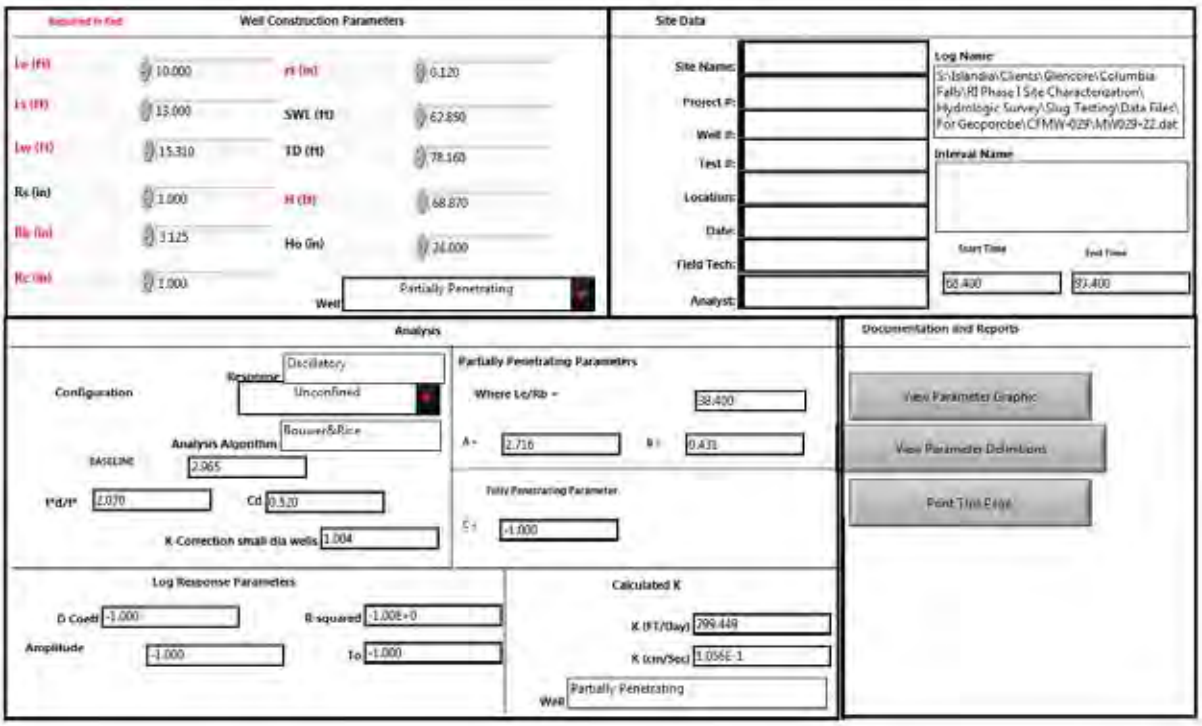


SITE INFORMATION -- SLUG TEST REV. 3.0

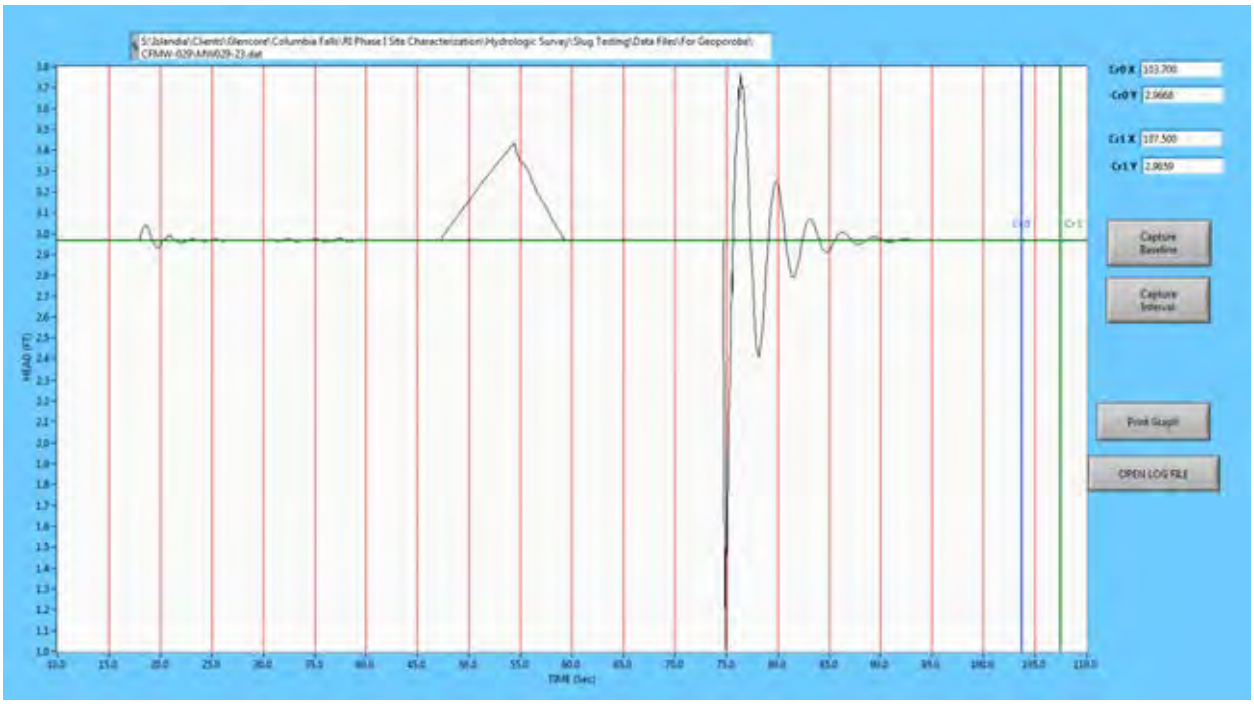
START DATE: 7/17/2017
START TIME: 10:22 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW029-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-029
2 Foot Displacement
Test #1





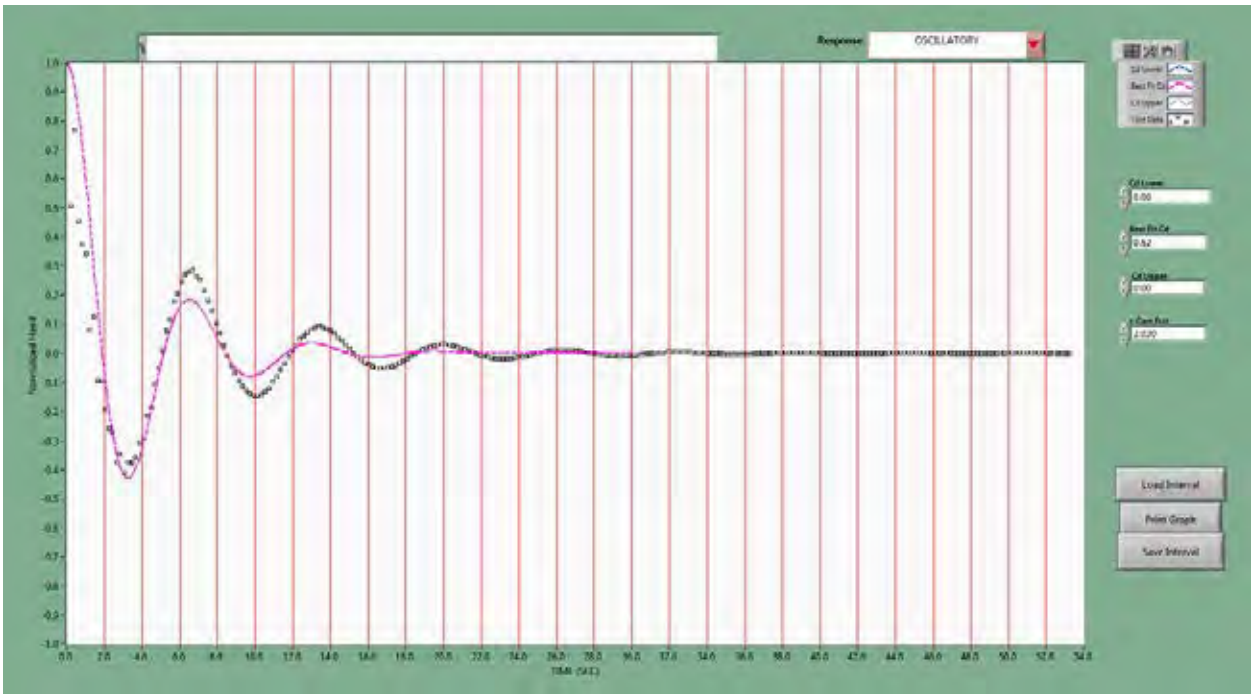
CFMW-029
2 Foot Displacement
Test #2

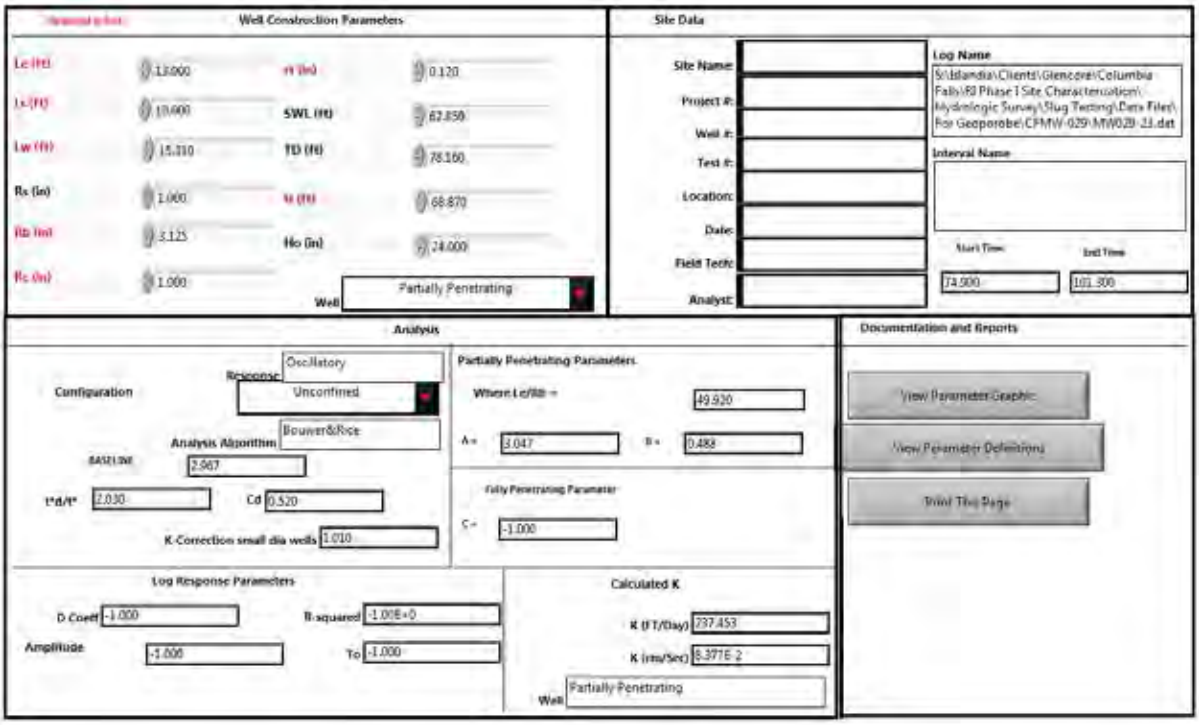


SITE INFORMATION -- SLUG TEST REV. 3.0

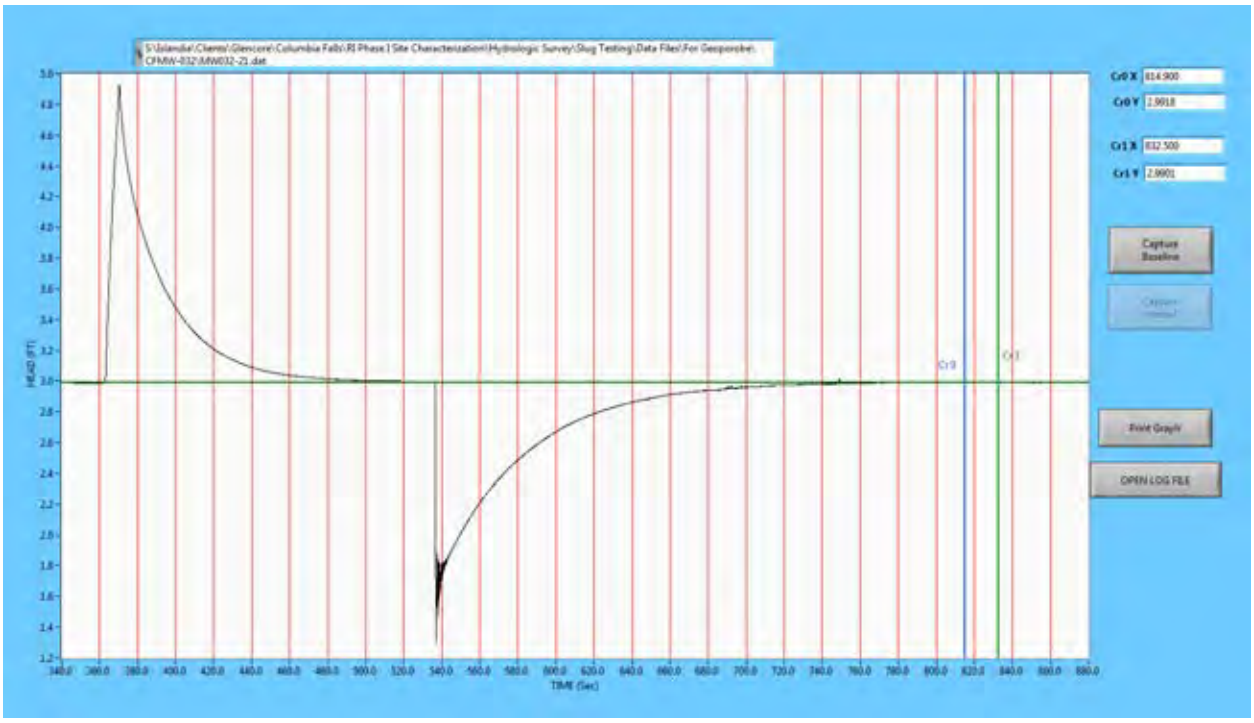
START DATE: 7/17/2017
START TIME: 10:24 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW029-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-029
2 Foot Displacement
Test #2





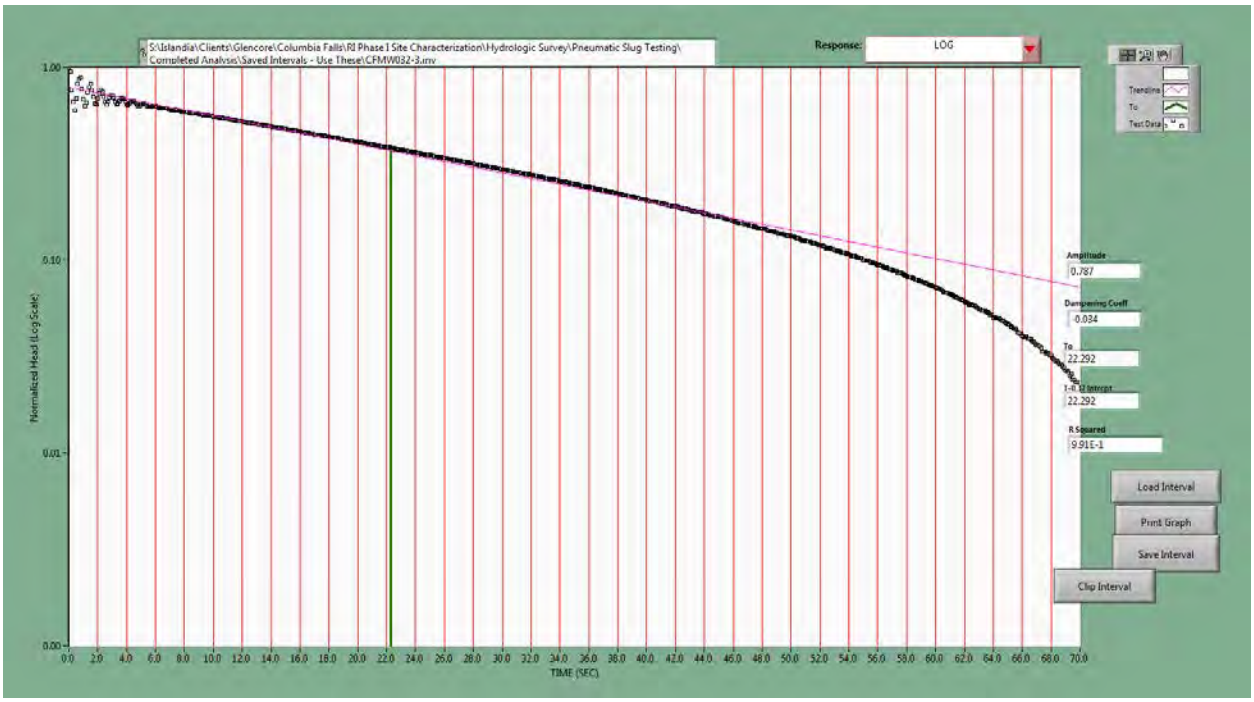
CFMW-032
2 Foot Displacement
Test #1

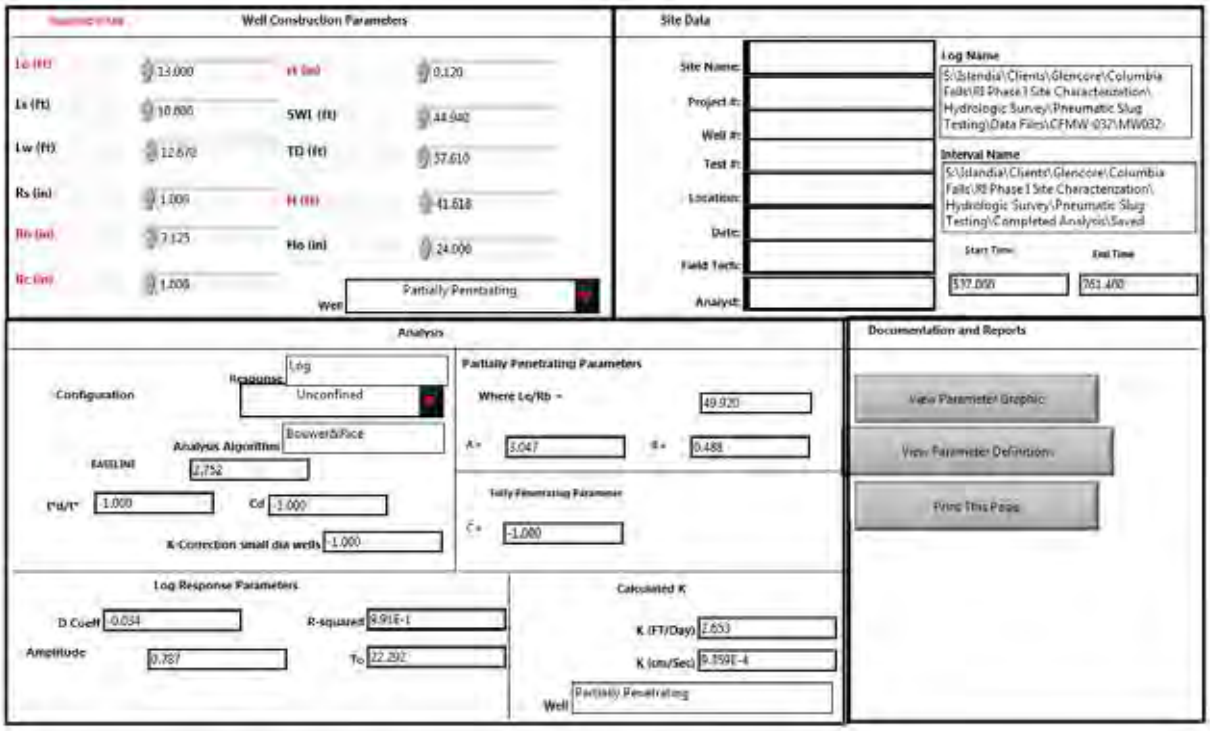


SITE INFORMATION -- SLUG TEST REV. 3.0

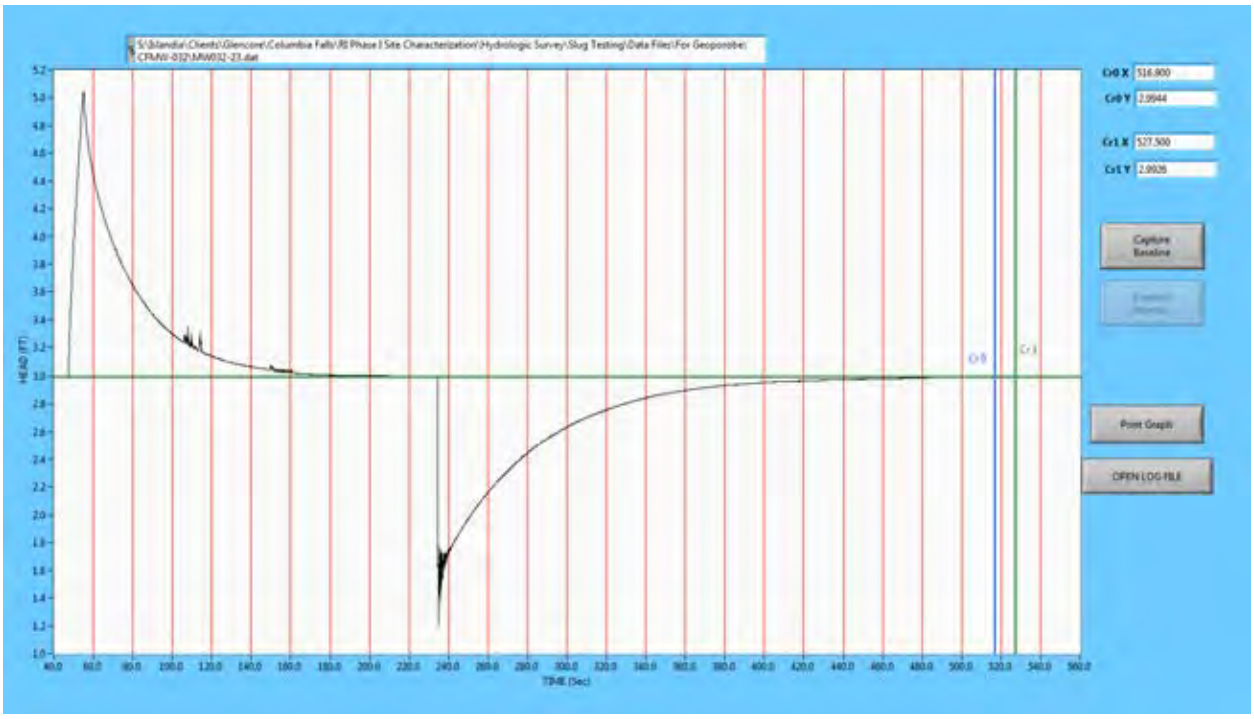
START DATE: 7/10/2017
START TIME: 2:25 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW032-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-032
2 Foot Displacement
Test #1





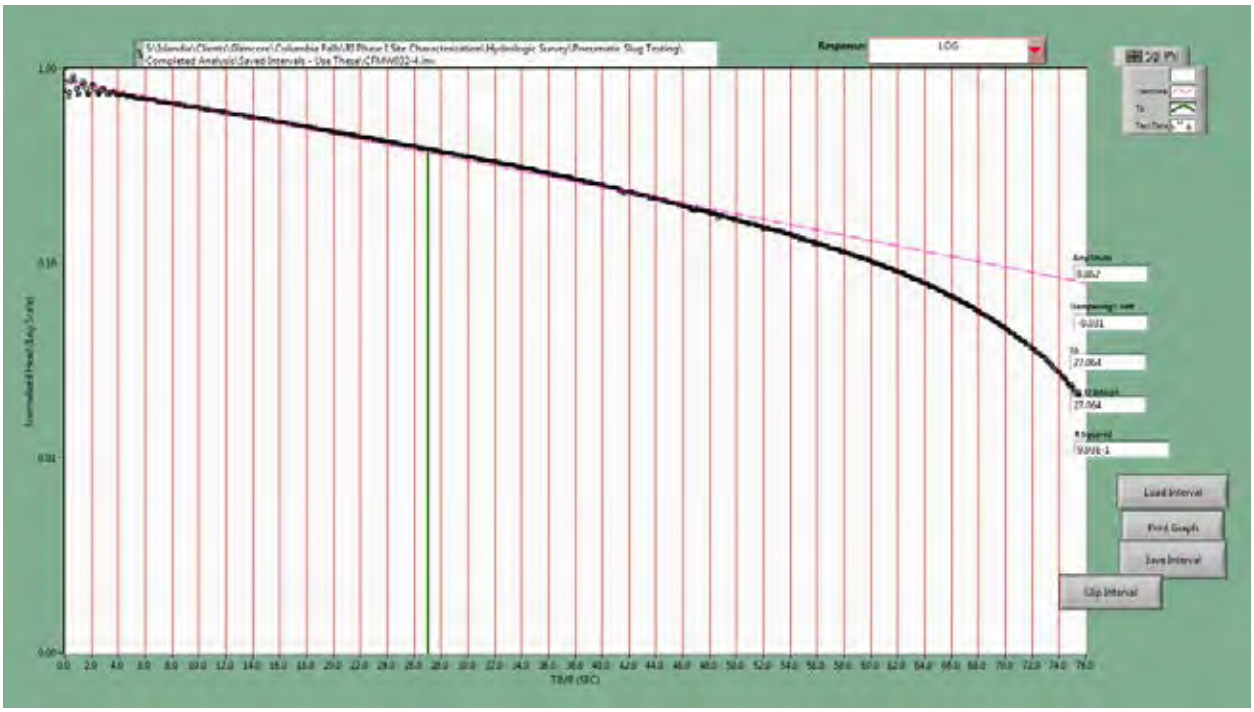
CFMW-032
2 Foot Displacement
Test #2

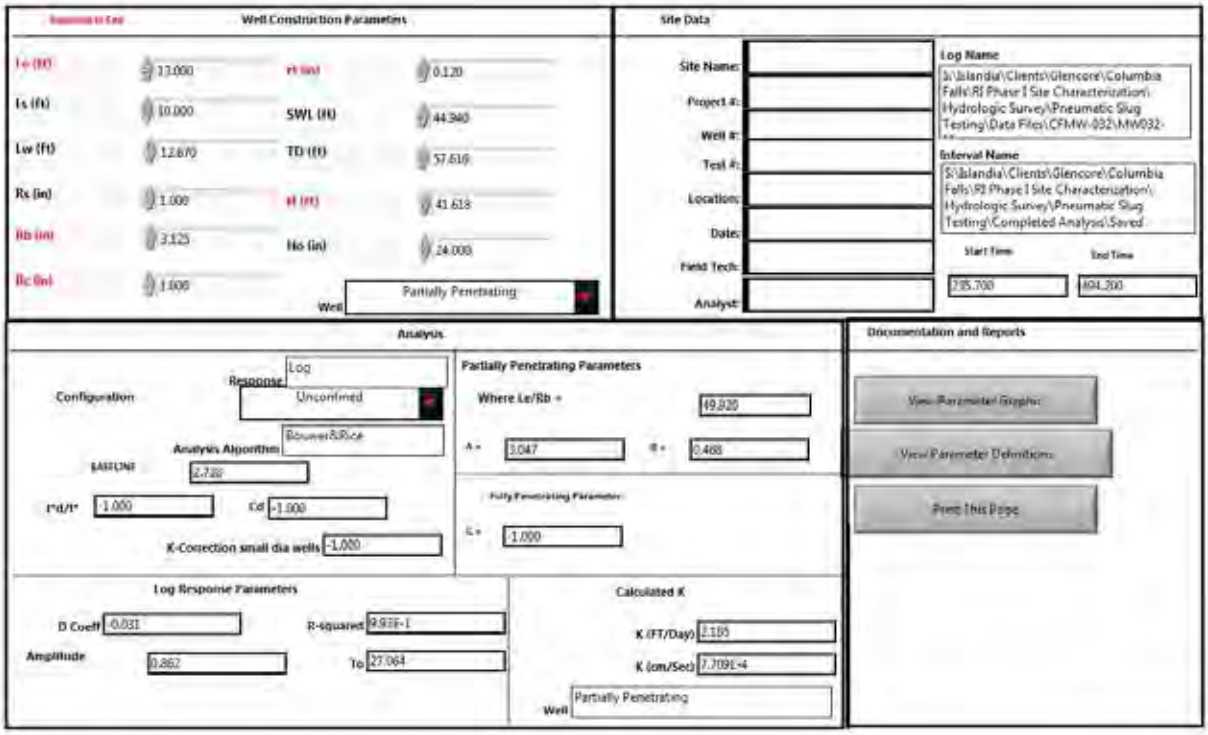


SITE INFORMATION -- SLUG TEST REV. 3.0

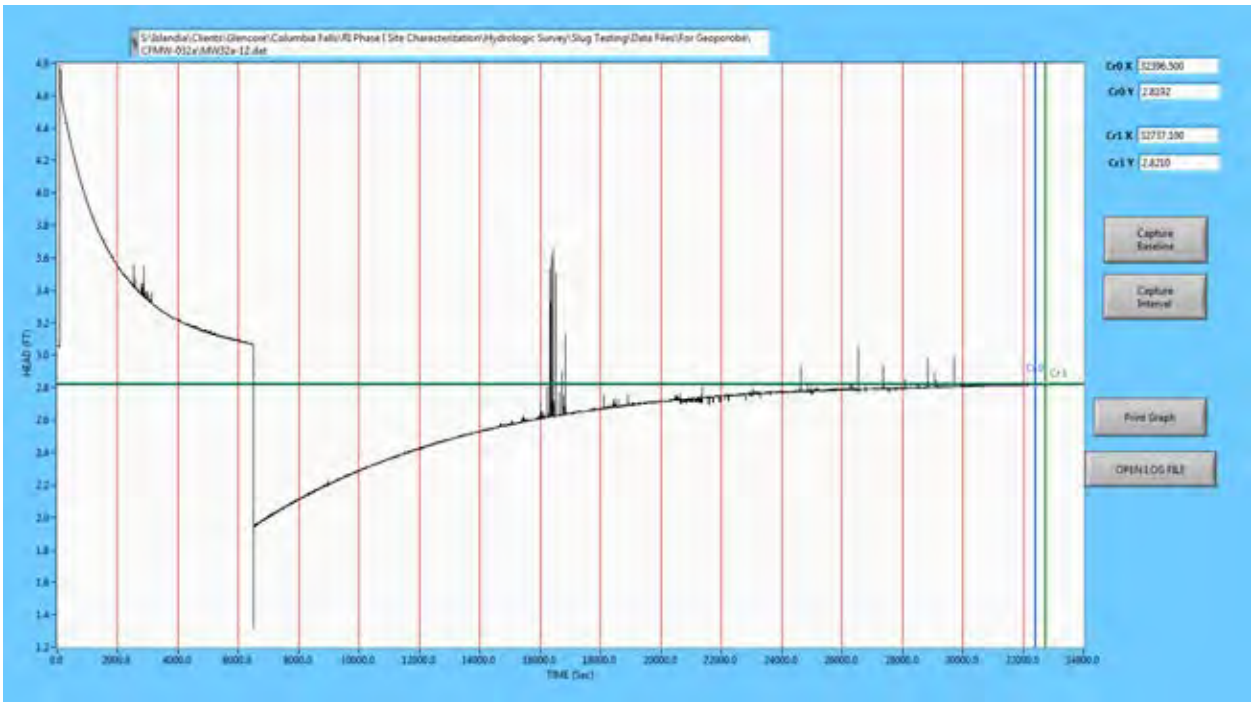
START DATE: 7/10/2017
START TIME: 2:40 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW032-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-032
2 Foot Displacement
Test #2





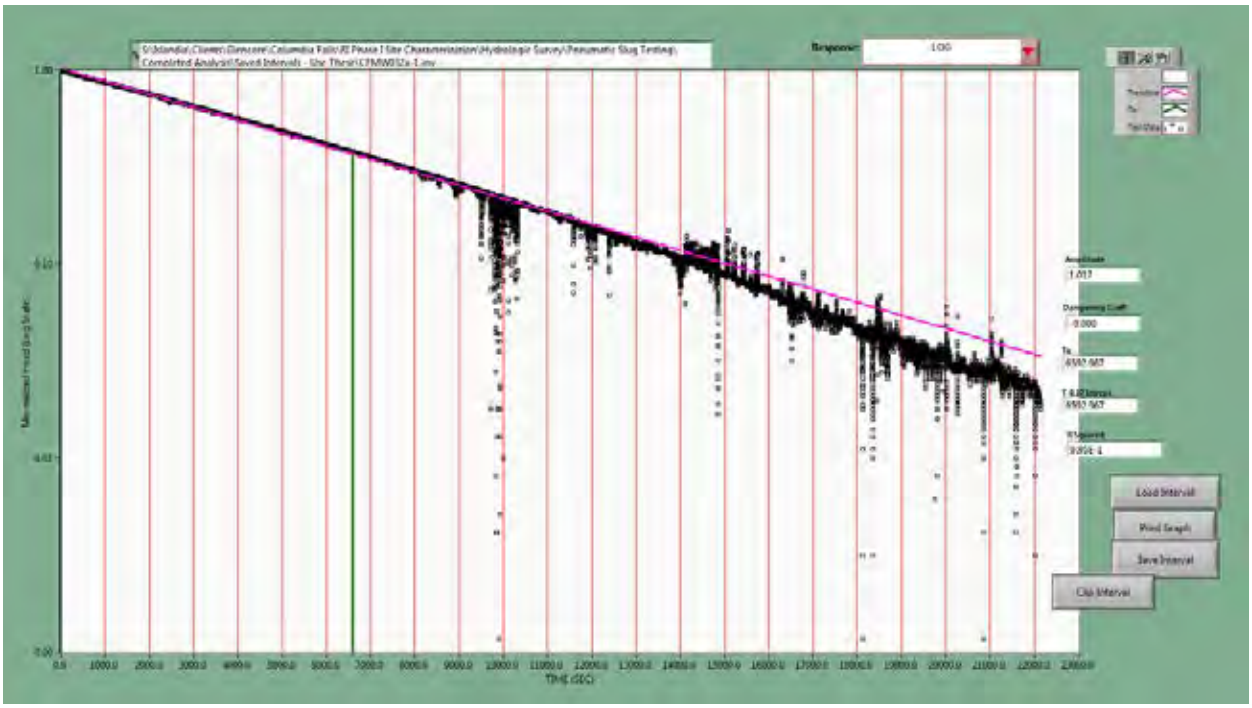
CFMW-032a
1 Foot Displacement
Test #1

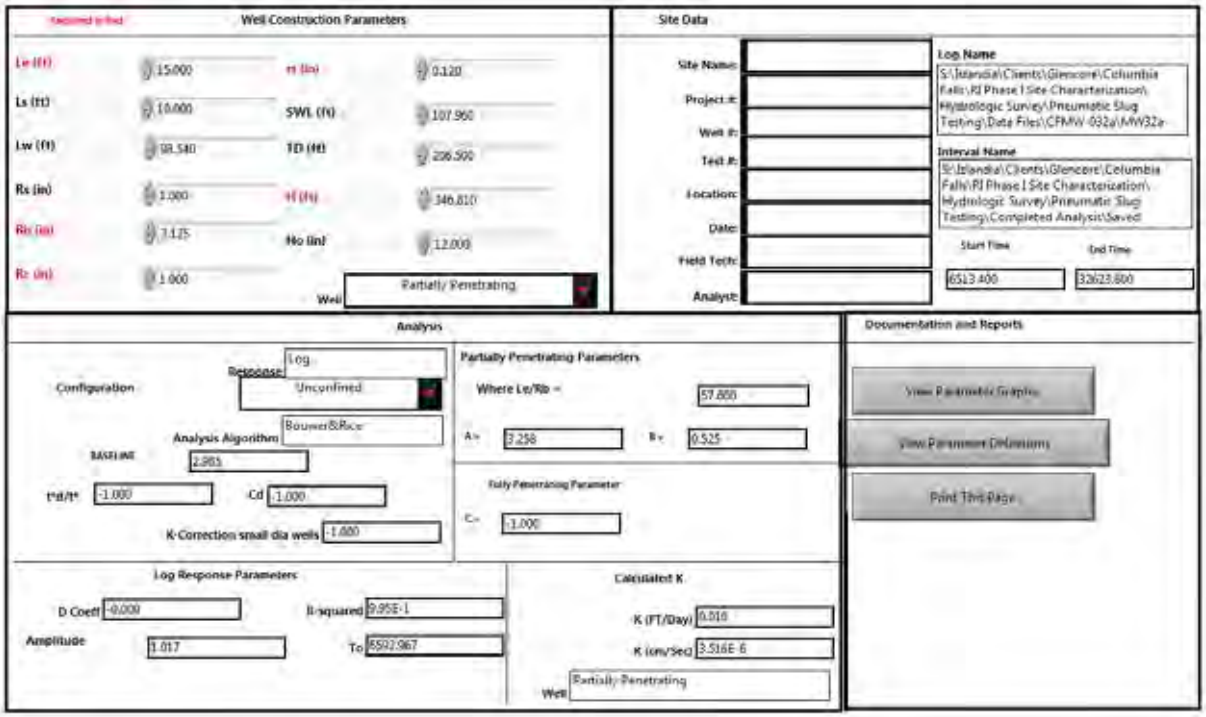


SITE INFORMATION -- SLUG TEST REV. 3.0

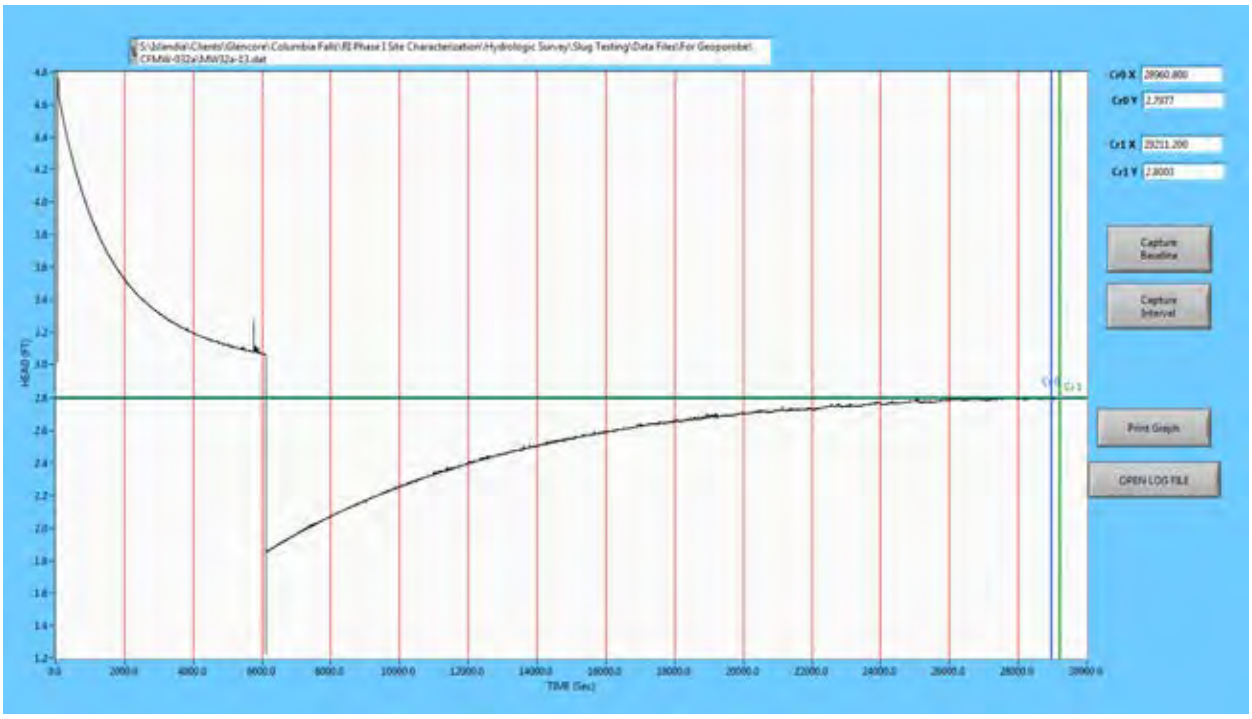
START DATE: 7/25/2017
START TIME: 8:23 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW32A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-032a
1 Foot Displacement
Test #1





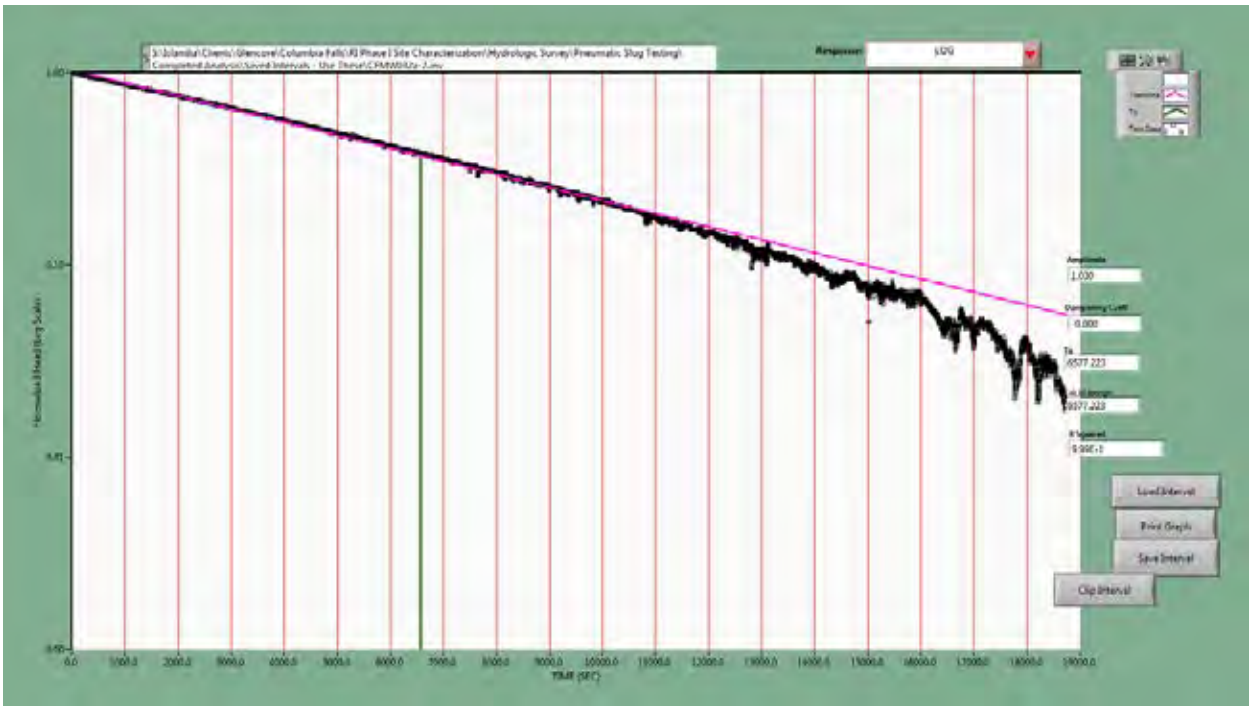
CFMW-032a
1 Foot Displacement
Test #2



SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/26/2017
START TIME: 8:42 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW32A-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-032a
1 Foot Displacement
Test #2



Well Construction Parameters

Le (ft)	15.000	rt (in)	0.120
Ls (ft)	10.000	SWL (ft)	107.968
Lw (ft)	98.540	TD (ft)	206.508
Rs (in)	1.000	H (ft)	346.810
Rb (in)	3.125	Ho (in)	12.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:
Project #:
Well #:
Test #:
Location:
Date:
Field Tech:
Analyst:

Log Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Pneumatic Slug Testing\Data Files\CFMW-032a\MW32a-

Interval Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Pneumatic Slug Testing\Completed Analysis\Saved

Start Time: 6122.800
End Time: 29083.700

Analysis

Configuration: Response: Log; Unconfined
Analysis Algorithm: Bouwer&Rice
BASELINE: 2.985
r*d/r*: -1.000
Cd: -1.000
K Correction small dia wells: -1.000

Partially Penetrating Parameters
Where Le/Rb = 57.600
A = 3.258
B = 0.525

Fully Penetrating Parameters
C = -1.000

Log Response Parameters

D Coeff: -0.000
R-squared: 9.99E-1
Amplitude: 1.030
To: 6577.223

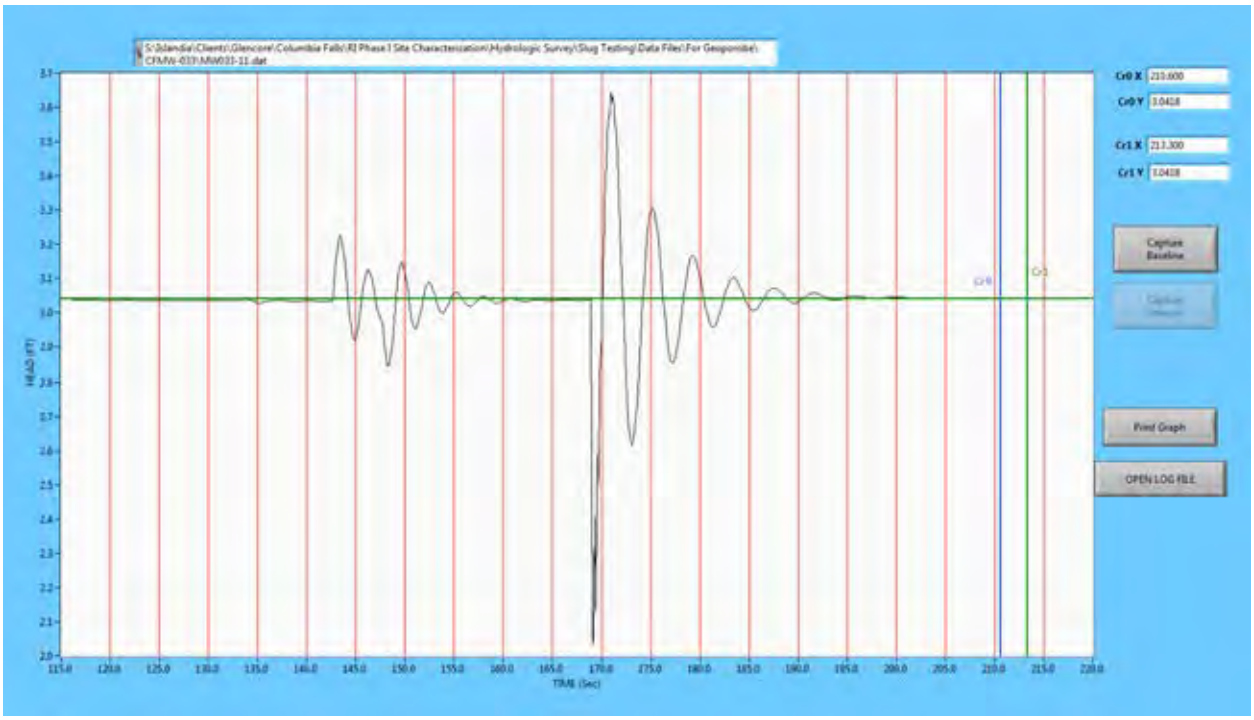
Calculated K

K (FT/Day): 0.010
K (cm/Sec): 3.524E-6
Well: Partially Penetrating

Documentation and Reports

View Parameter Graphic
View Parameter Detection
Initial Test Setup

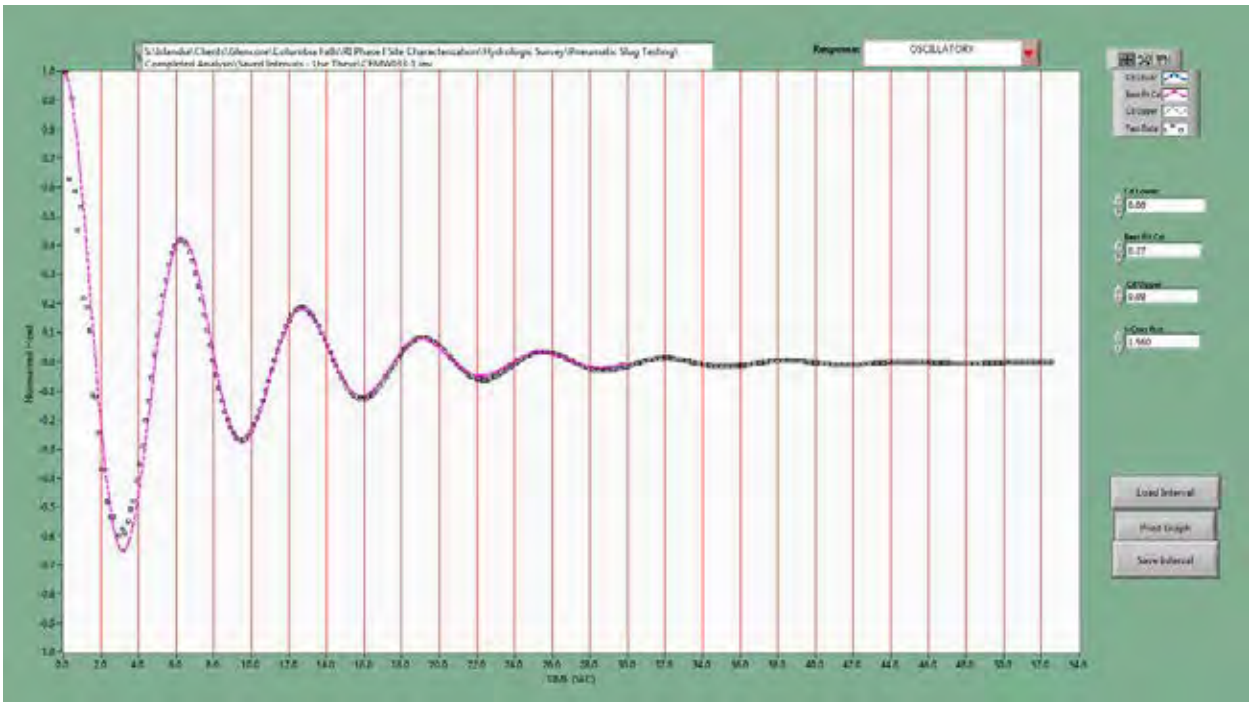
CFMW-033
1 Foot Displacement
Test #1



SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/14/2017
START TIME: 12:09 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW033-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-033
1 Foot Displacement
Test #1



Well Construction Parameters

Lw (ft)	13.000	H (in)	0.120
Ls (ft)	10.000	SWL (ft)	41.750
Lw (ft)	21.670	TD (ft)	63.620
Rs (in)	1.000	H (ft)	83.110
Rb (in)	3.125	Ho (in)	12.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:
Project #:
Well #:
Test #:
Location:
Date:
Field Tech:
Analyst:

Log Name: C:\Users\mlyons\Desktop\Slug Test Analysis\Data Files\CFMW-033\MW033-11.dat

Interval Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Pneumatic Slug Testing\Completed Analysis\Saved

Start Time: 169.100
End Time: 203.000

Analysis

Configuration: Unconfined
Response: Oscillatory
Analysis Algorithm: Bouwer&Rice
BASELINE: 3.040
t*d/t*: 1.560
Cd: 0.270
K-Correction small dia wells: 1.033

Partially Penetrating Parameters
Where Le/Rb = 49.920
A = 3.047
B = 0.488

Fully Penetrating Parameter
C = -1.000

Log Response Parameters

D Coeff: -1.000
R-squared: -1.00E+0
Amplitude: -1.000
To: -1.000

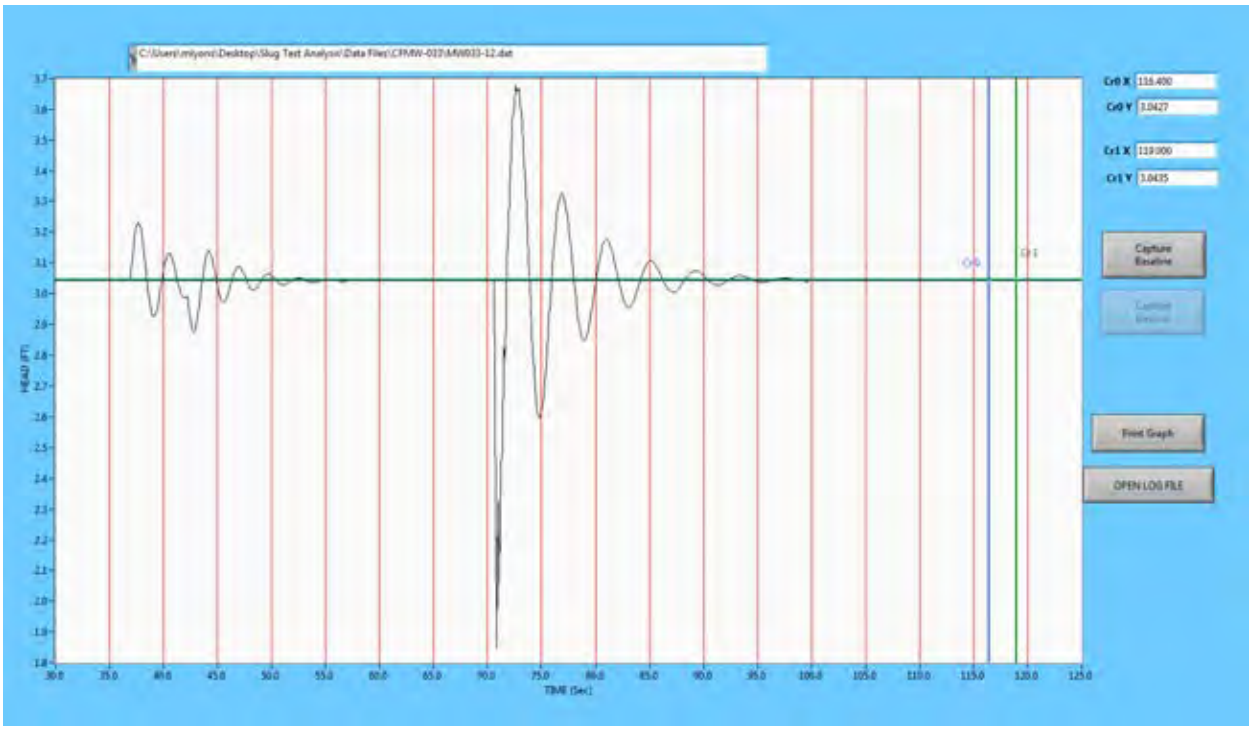
Calculated K

K (FT/Day): 179.759
K (cm/Sec): 1.340E-1
Well: Partially Penetrating

Documentation and Reports

View Parameter Graphic
View Parameter Definitions
Print This Page

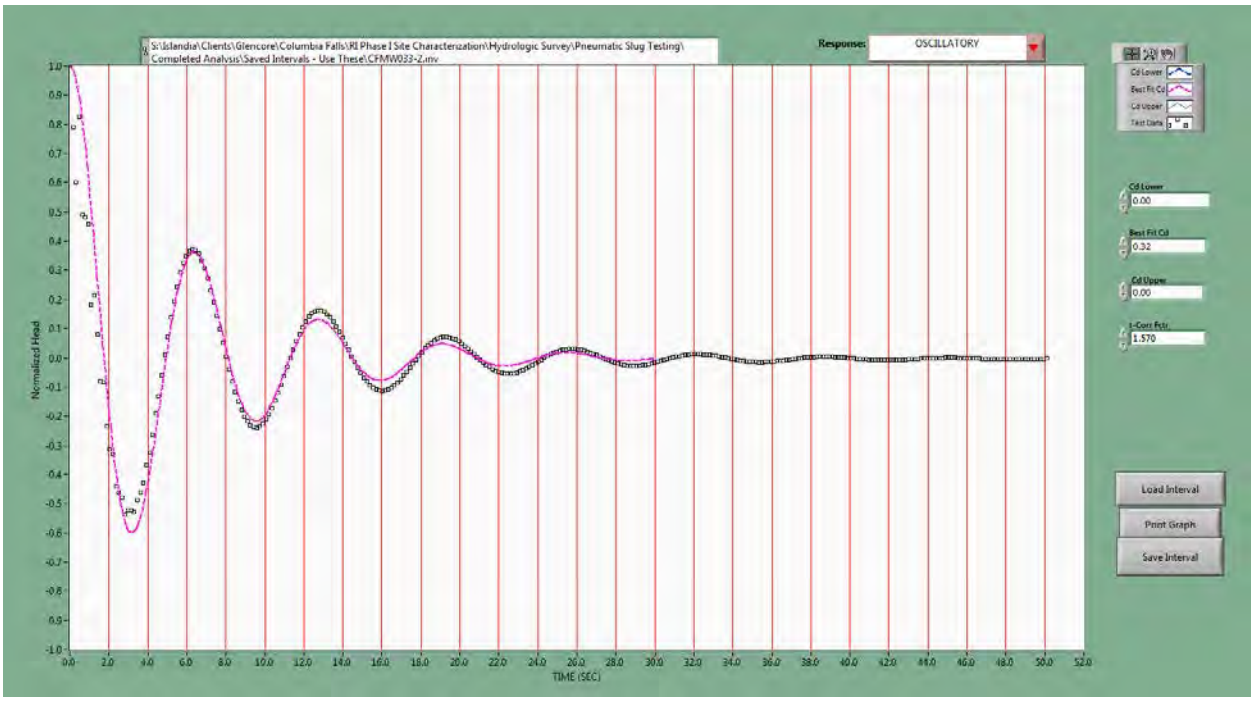
CFMW-033
1 Foot Displacement
Test #2

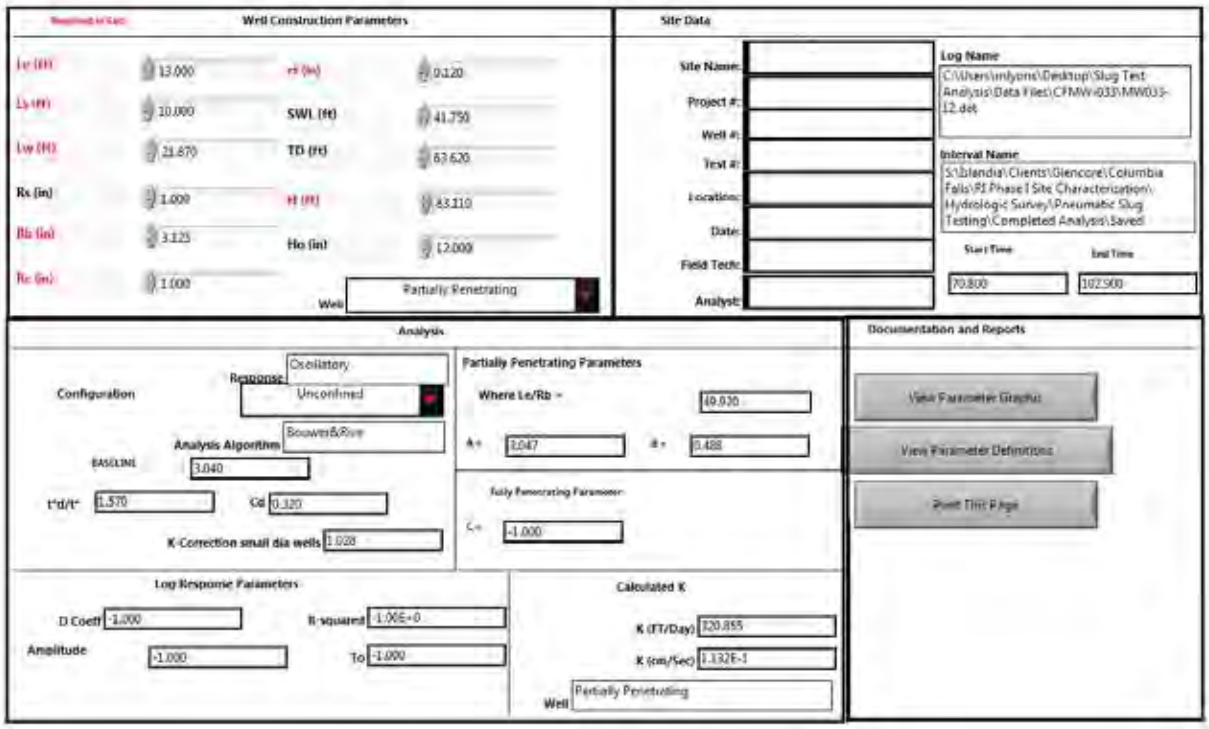


SITE INFORMATION -- SLUG TEST REV. 3.0

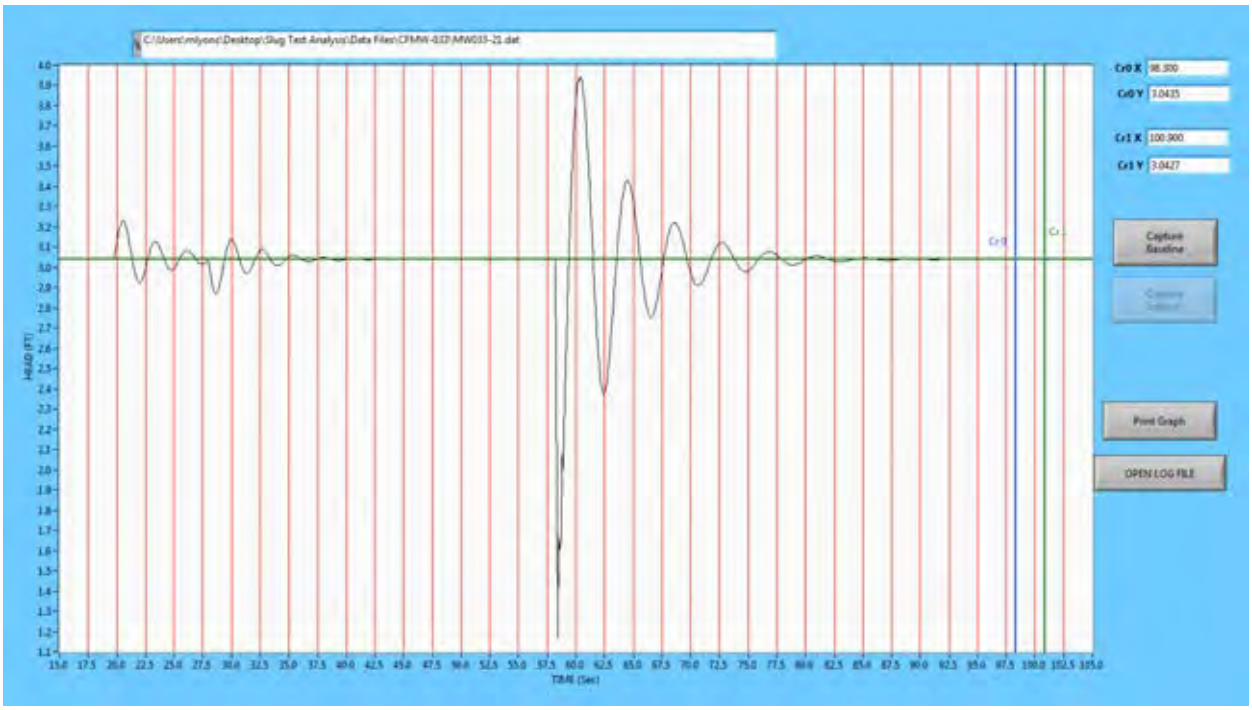
START DATE: 7/14/2017
START TIME: 12:12 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW033-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-033
1 Foot Displacement
Test #2





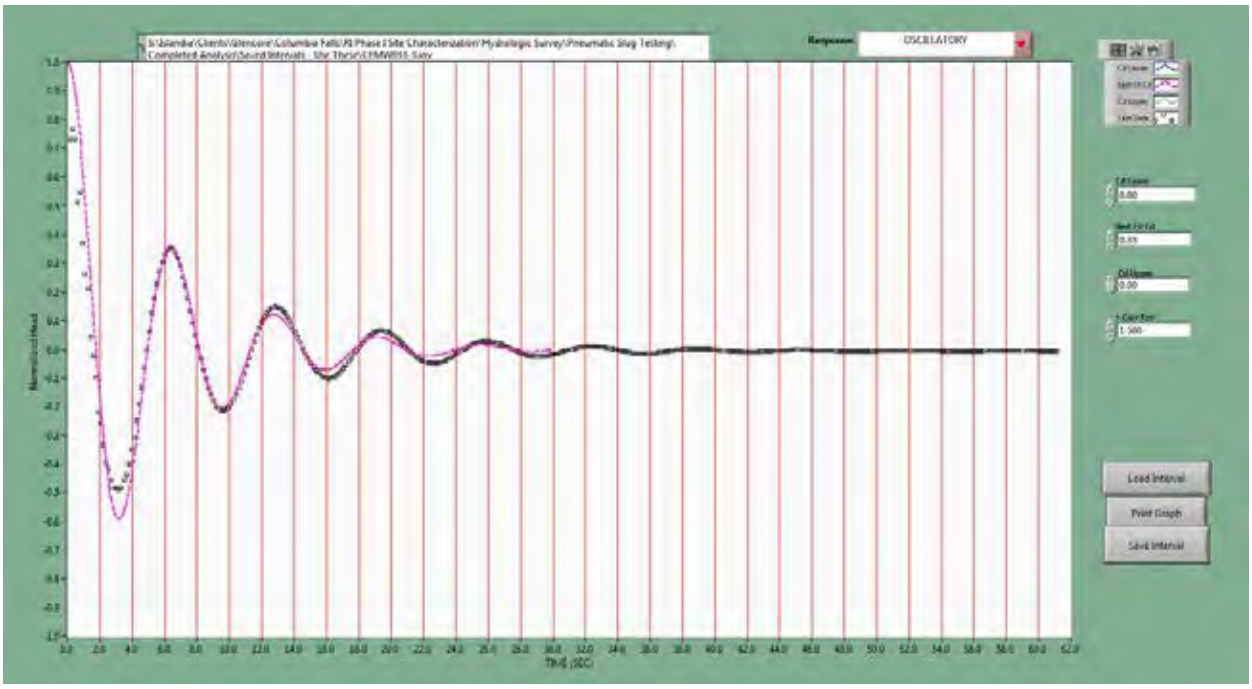
CFMW-033
2 Foot Displacement
Test #1

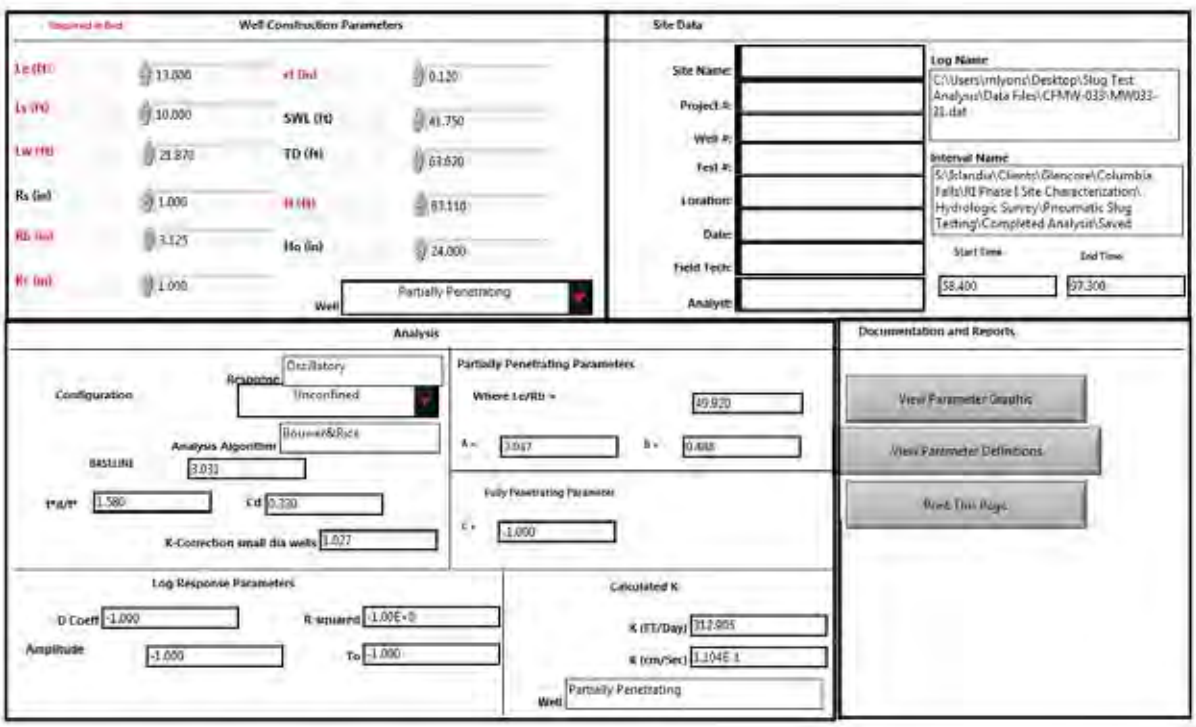


SITE INFORMATION -- SLUG TEST REV. 3.0

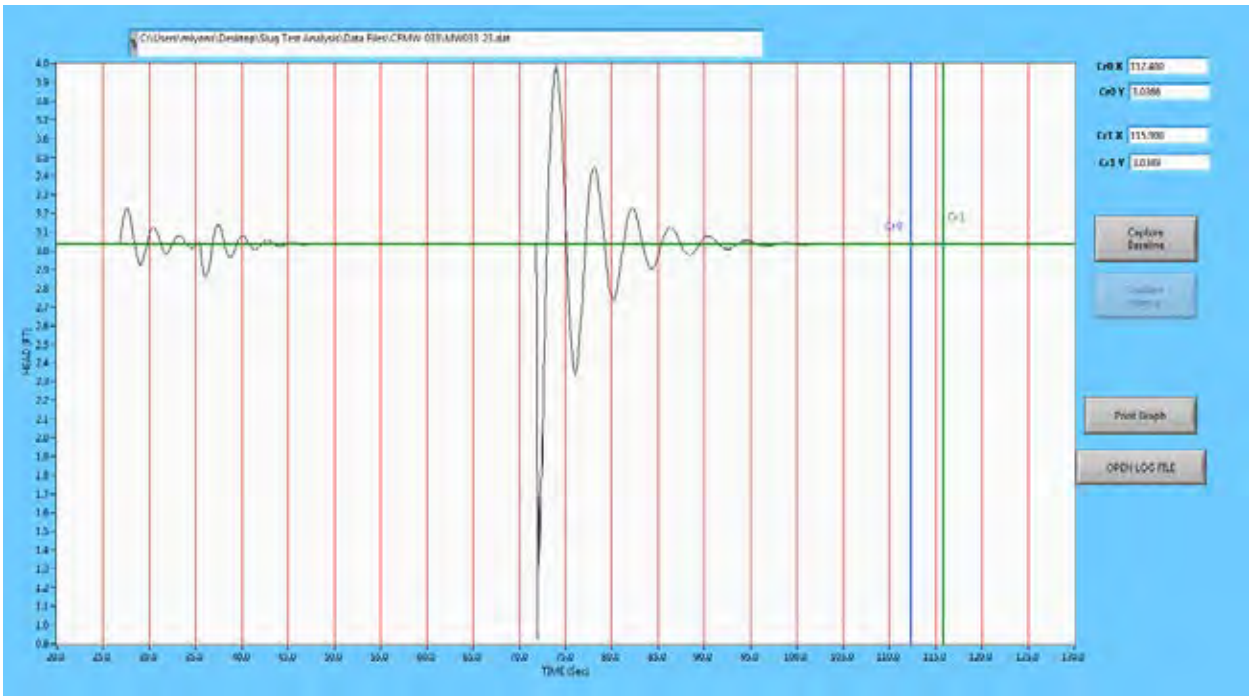
START DATE: 7/14/2017
START TIME: 12:14 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW033-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-033
2 Foot Displacement
Test #1





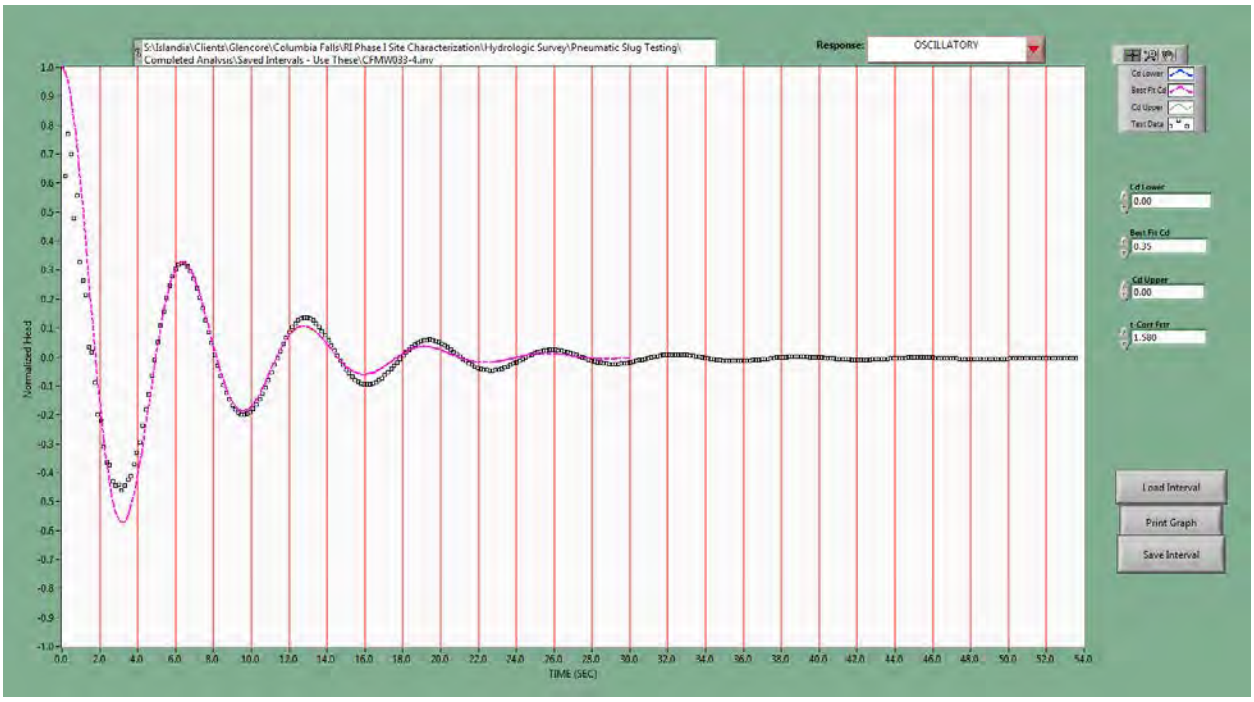
CFMW-033
2 Foot Displacement
Test #2



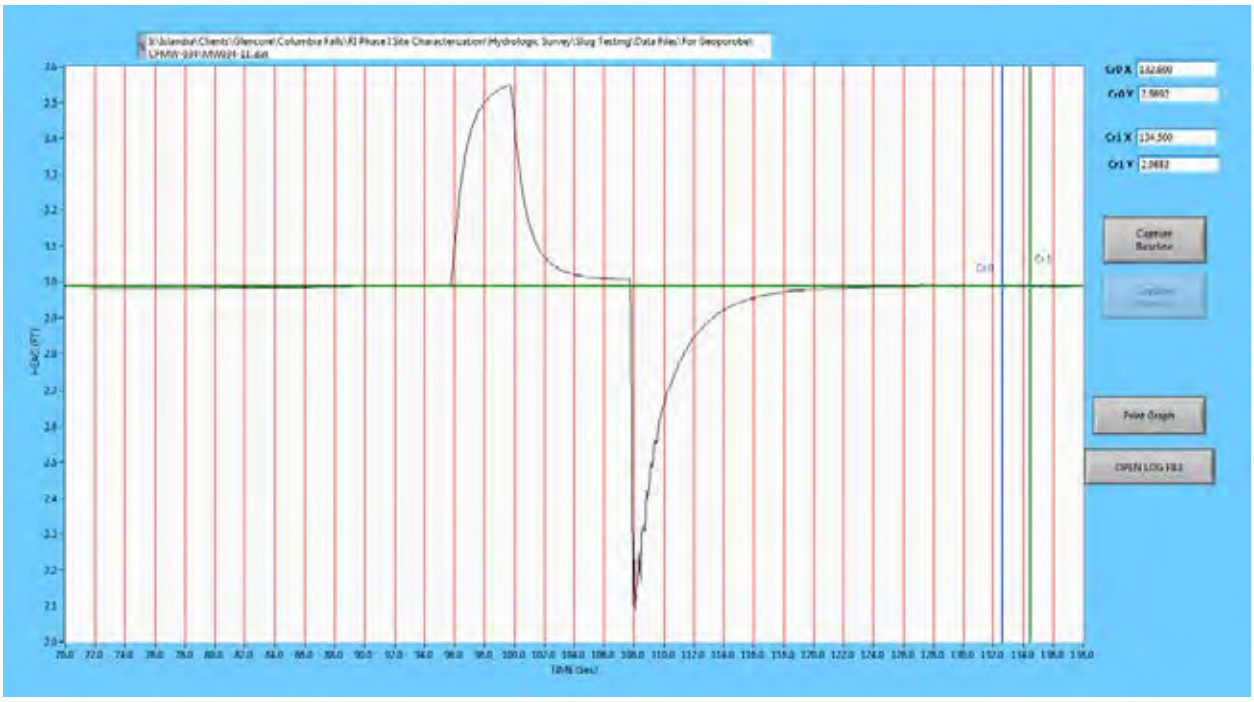
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/14/2017
START TIME: 12:18 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW033-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-033
2 Foot Displacement
Test #2



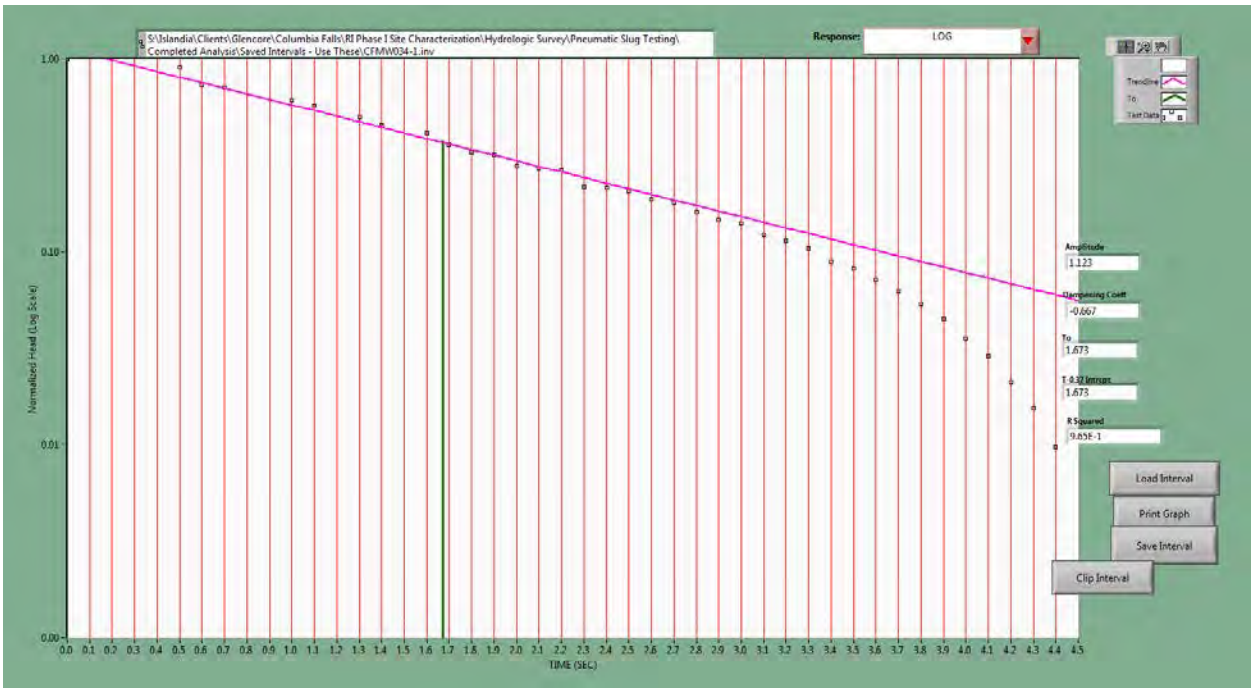
CFMW-034
1 Foot Displacement
Test #1



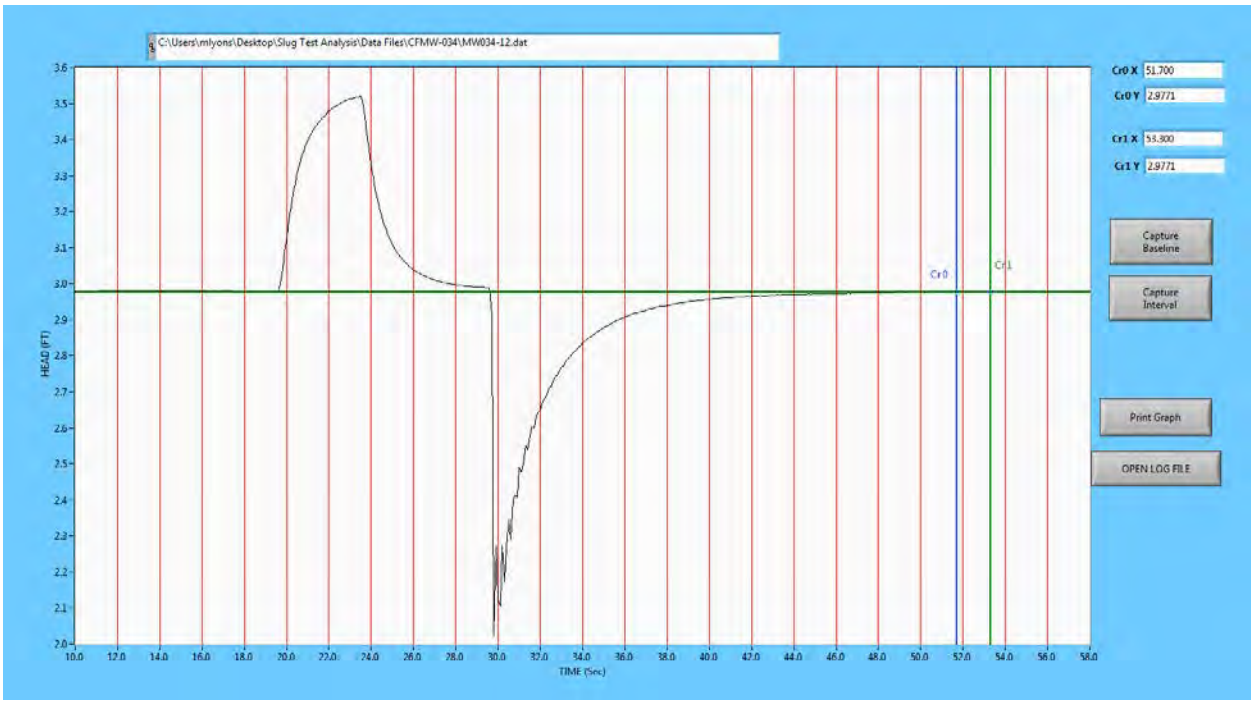
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/14/2017
START TIME: 12:43 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW034-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-034
1 Foot Displacement
Test #1



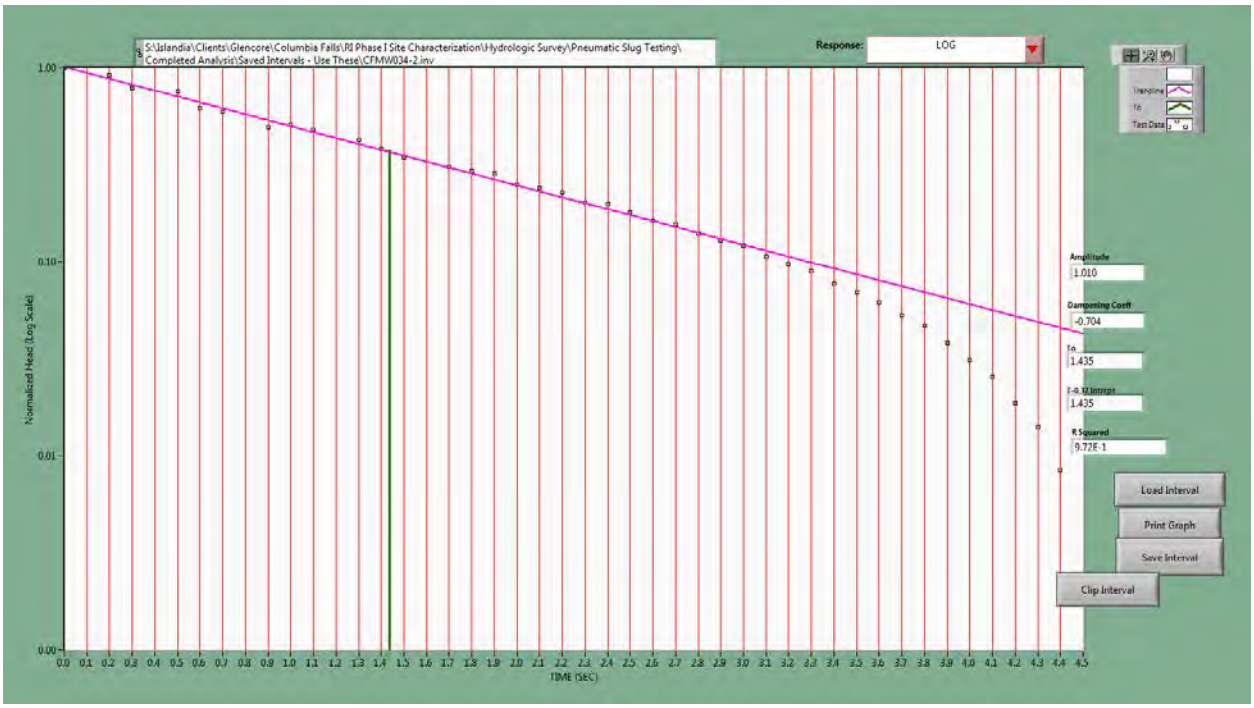
CFMW-034
1 Foot Displacement
Test #2

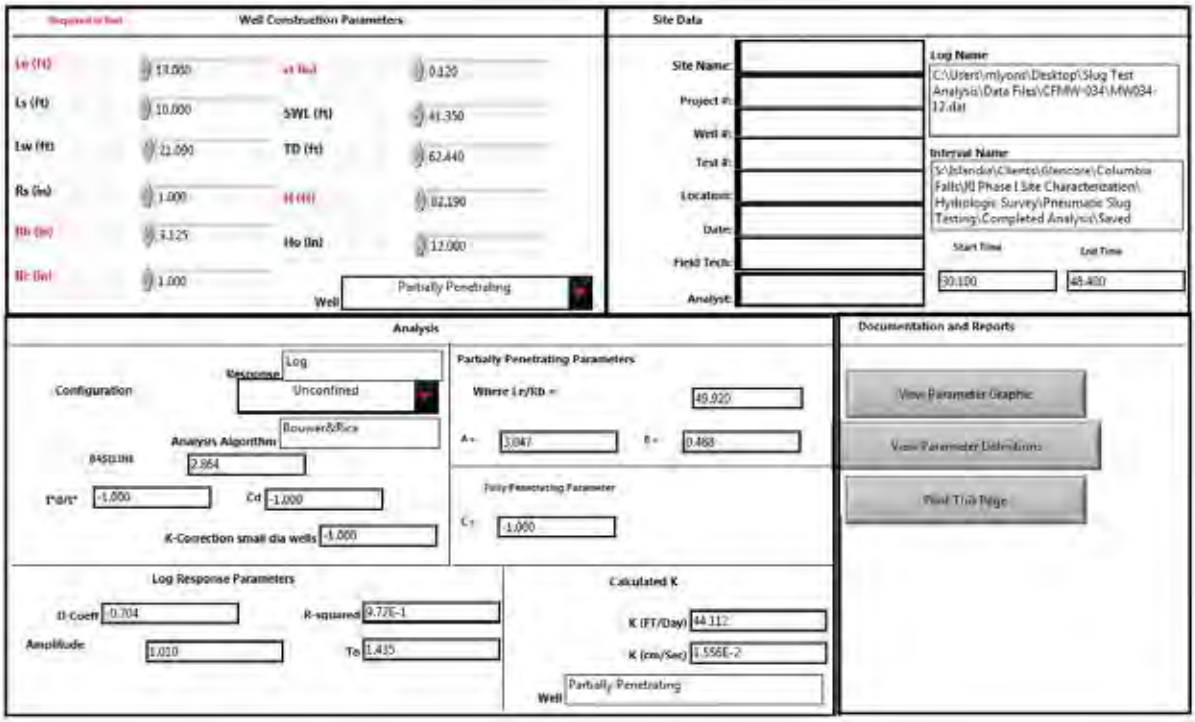


SITE INFORMATION -- SLUG TEST REV. 3.0

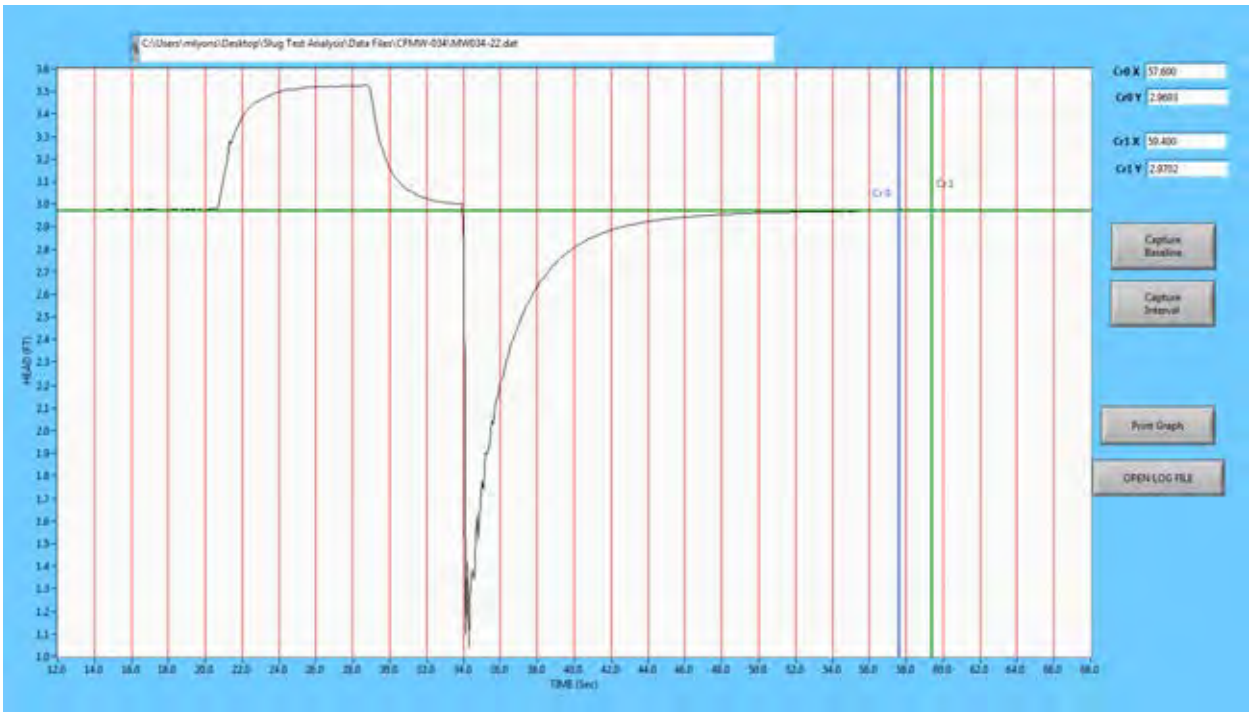
START DATE: 7/14/2017
START TIME: 12:45 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW034-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-034
1 Foot Displacement
Test #2





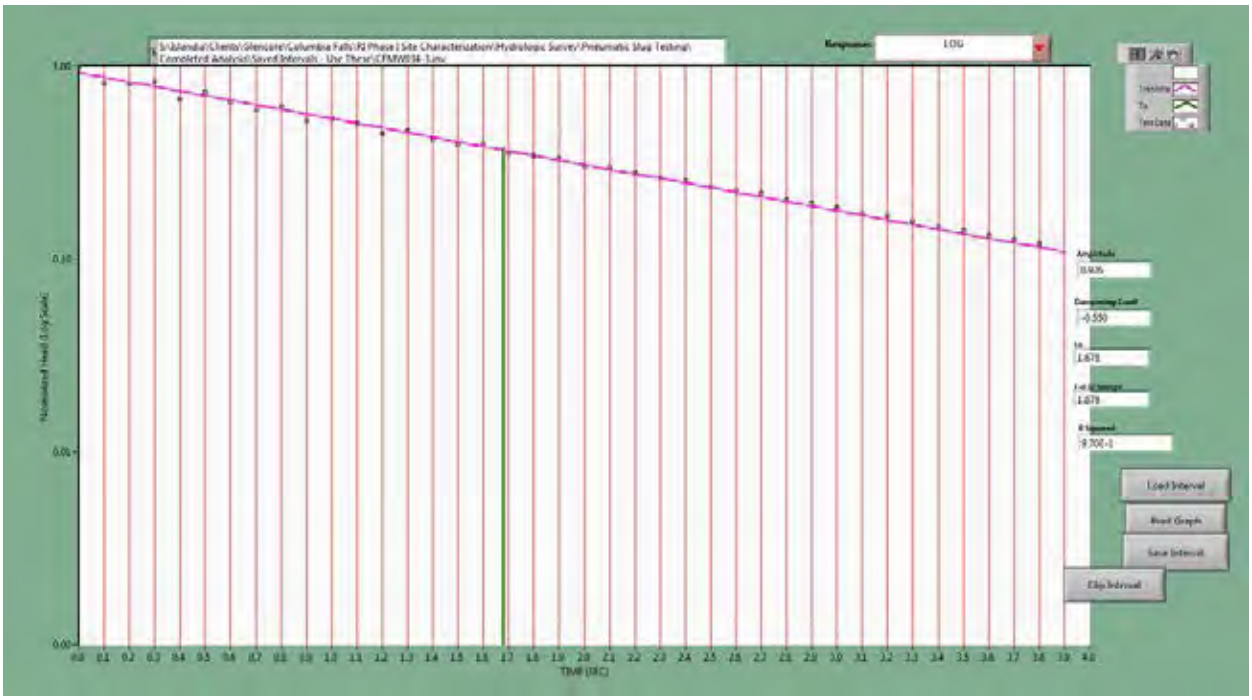
CFMW-034
2 Foot Displacement
Test #1

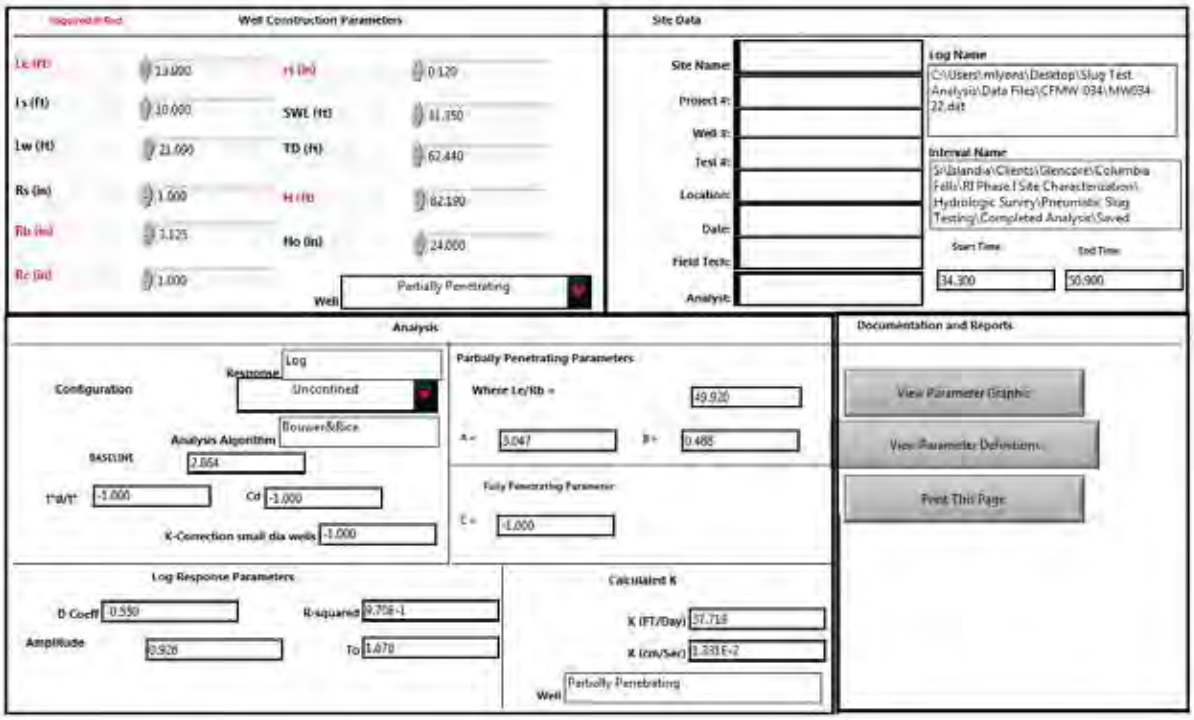


SITE INFORMATION -- SLUG TEST REV. 3.0

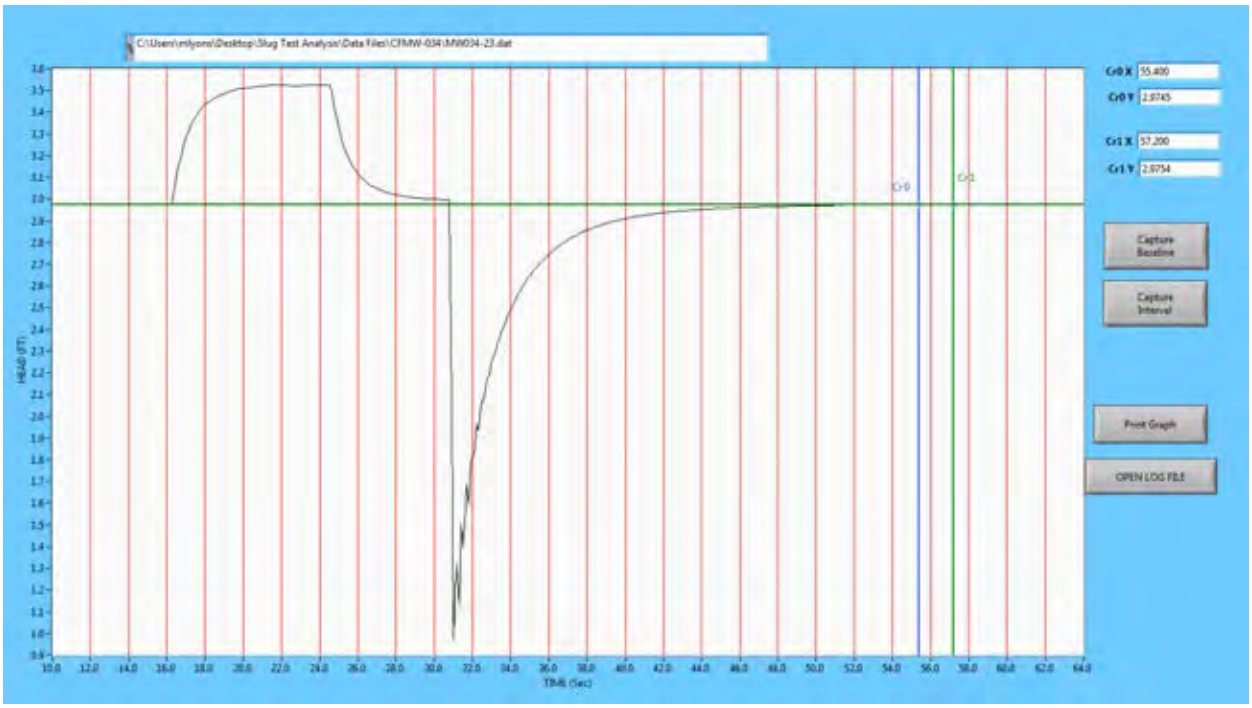
START DATE: 7/14/2017
START TIME: 12:47 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW034-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-034
2 Foot Displacement
Test #1





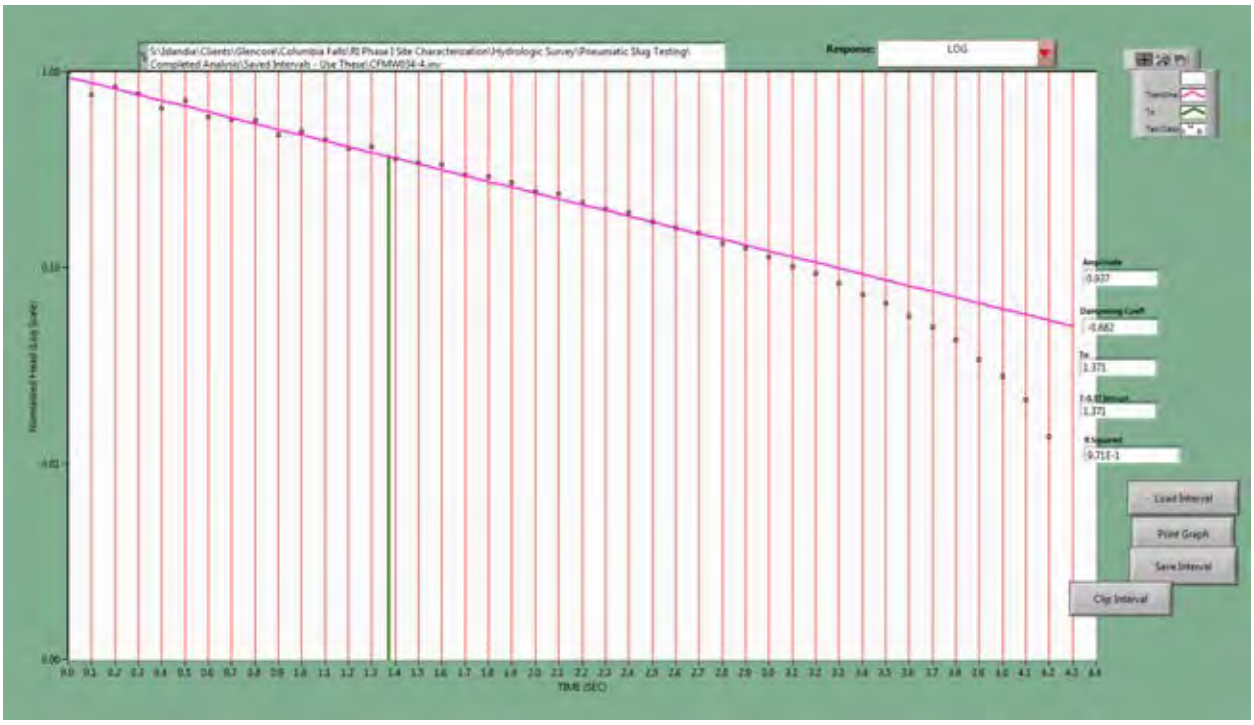
CFMW-034
2 Foot Displacement
Test #2

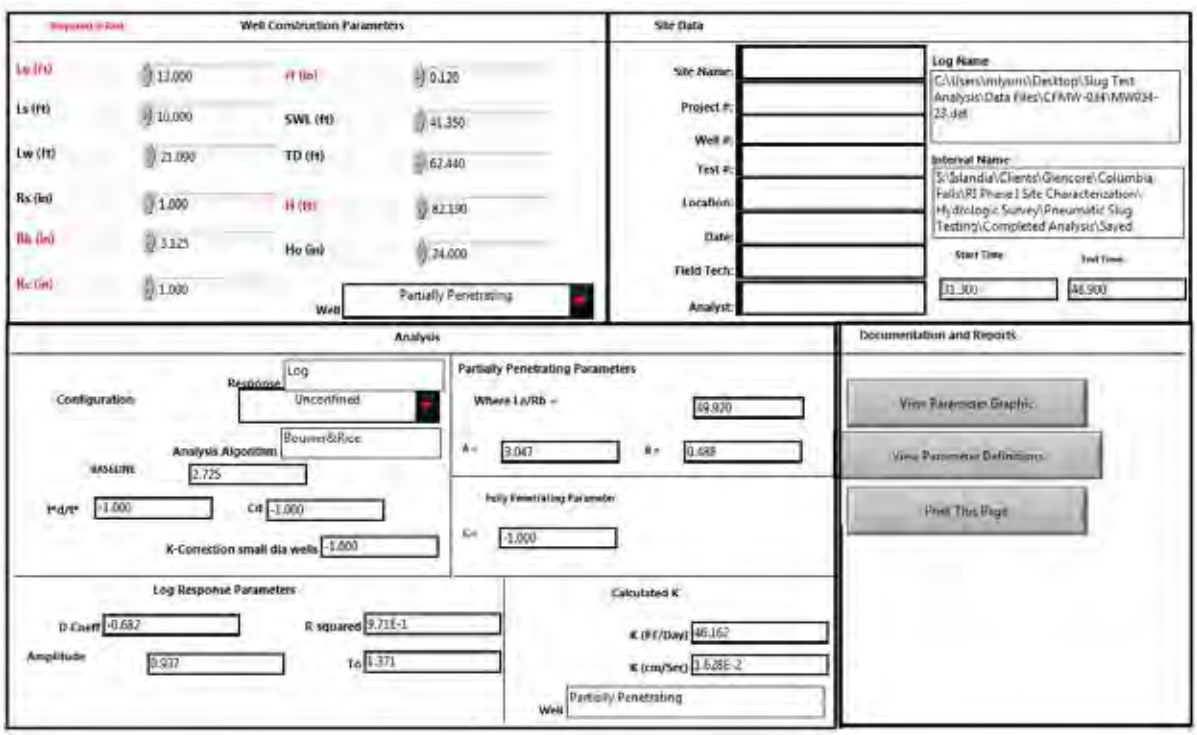


SITE INFORMATION -- SLUG TEST REV. 3.0

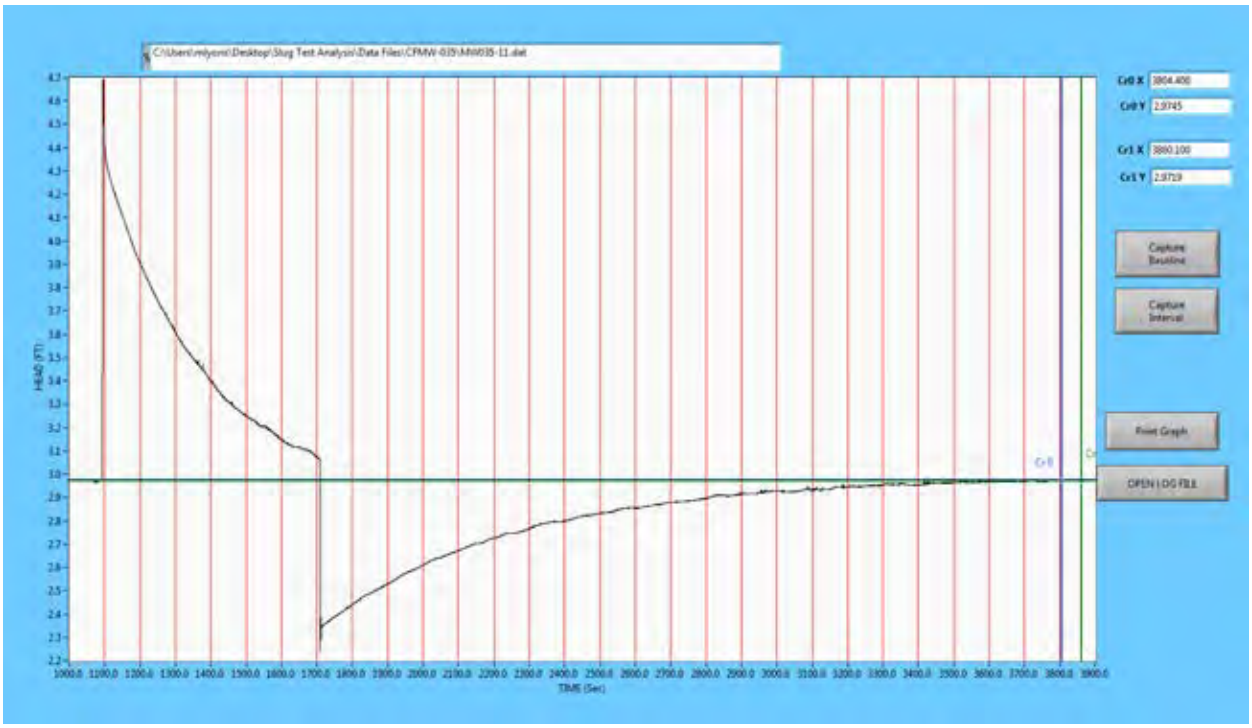
START DATE: 7/14/2017
START TIME: 12:48 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW034-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-034
2 Foot Displacement
Test #2





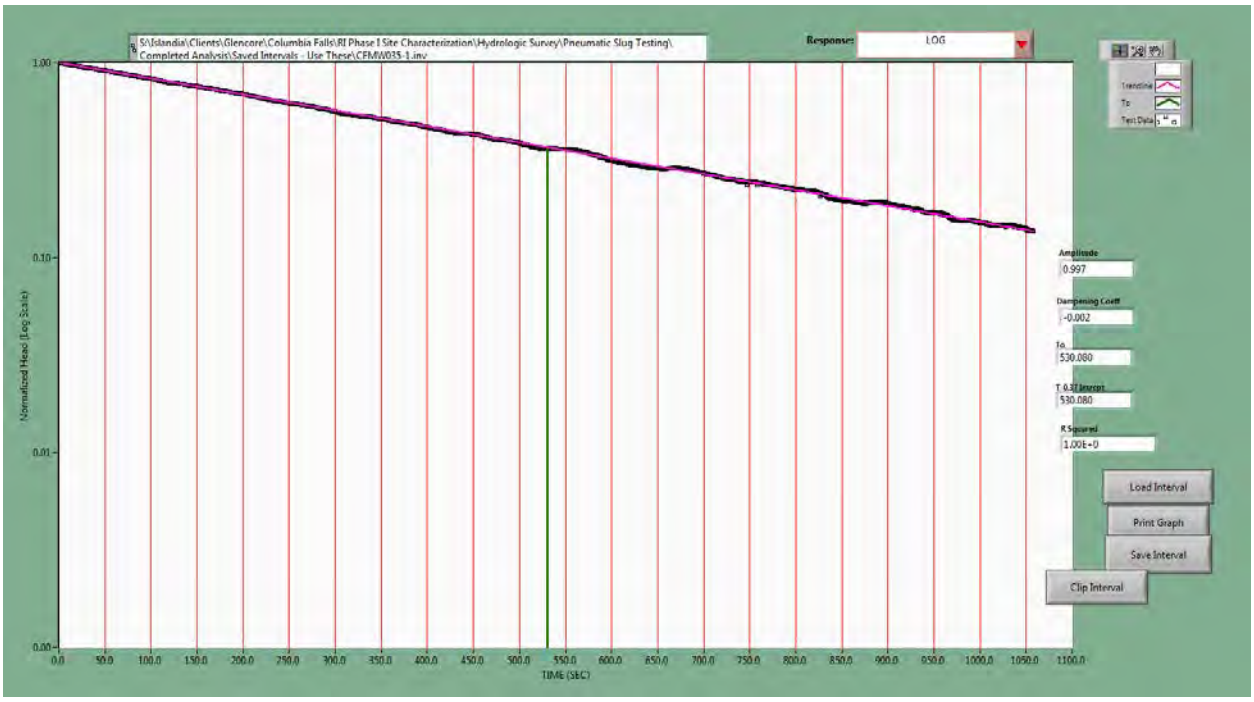
CFMW-035
1 Foot Displacement
Test #1

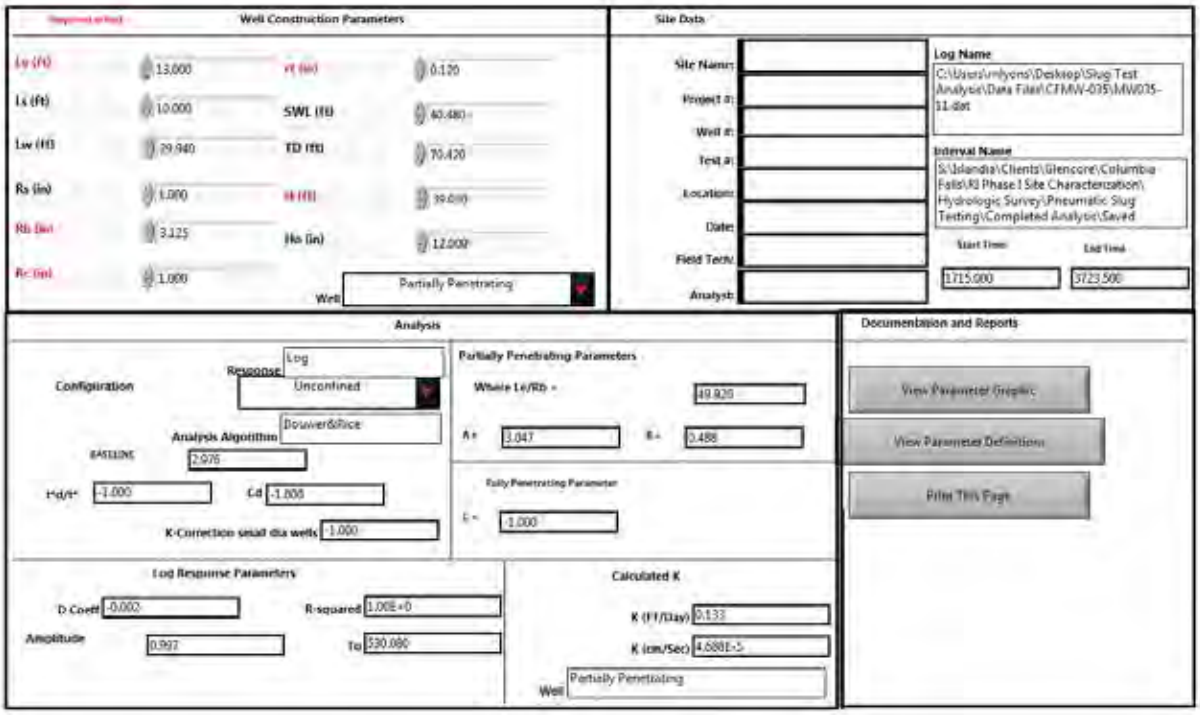


SITE INFORMATION -- SLUG TEST REV. 3.0

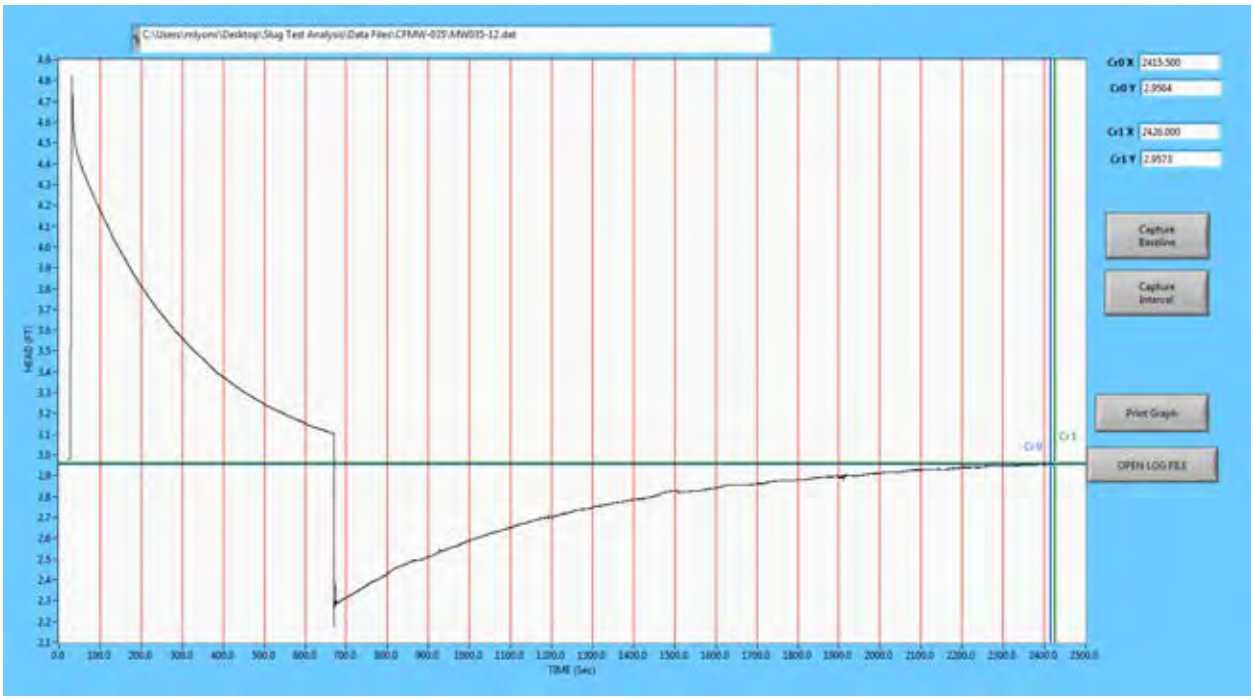
START DATE: 7/14/2017
START TIME: 1:08 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW035-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-035
1 Foot Displacement
Test #1





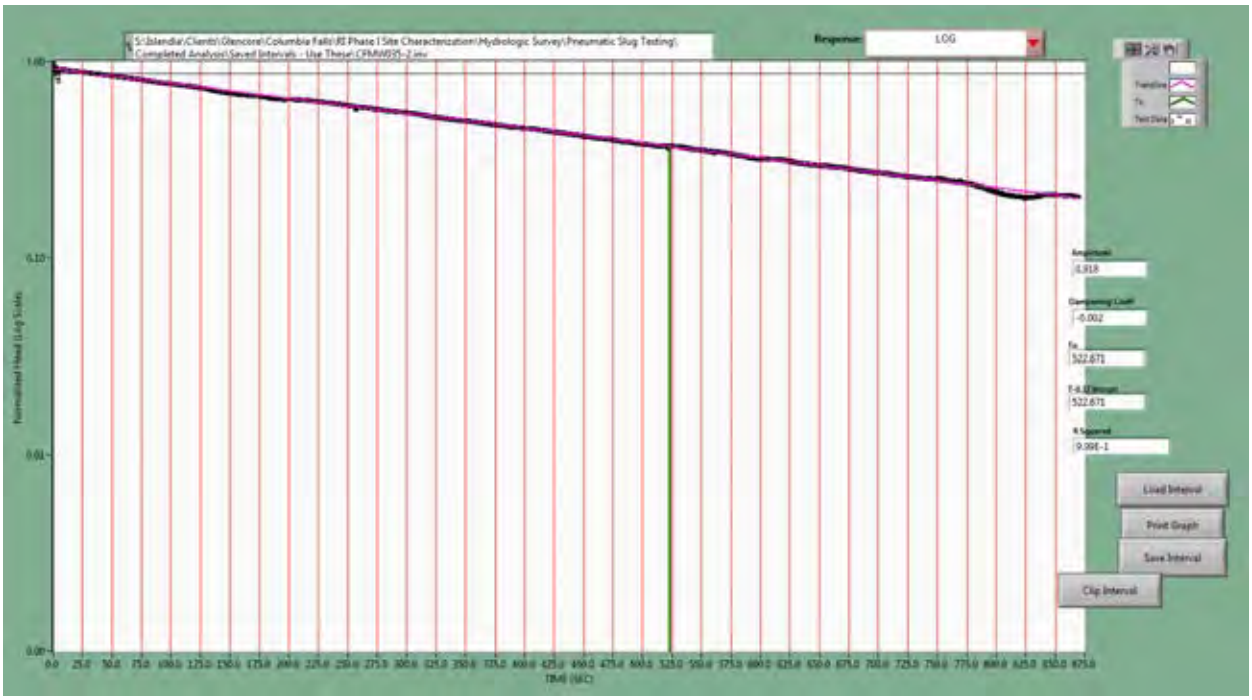
CFMW-035
1 Foot Displacement
Test #2

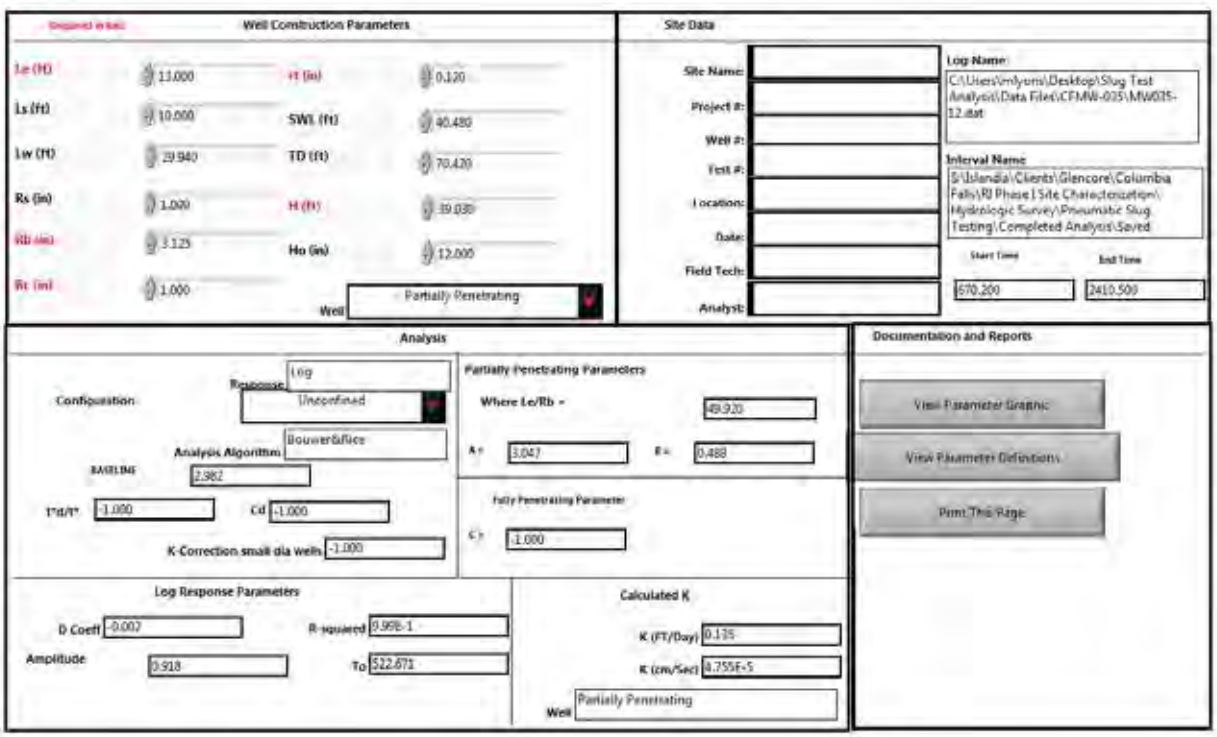


SITE INFORMATION -- SLUG TEST REV. 3.0

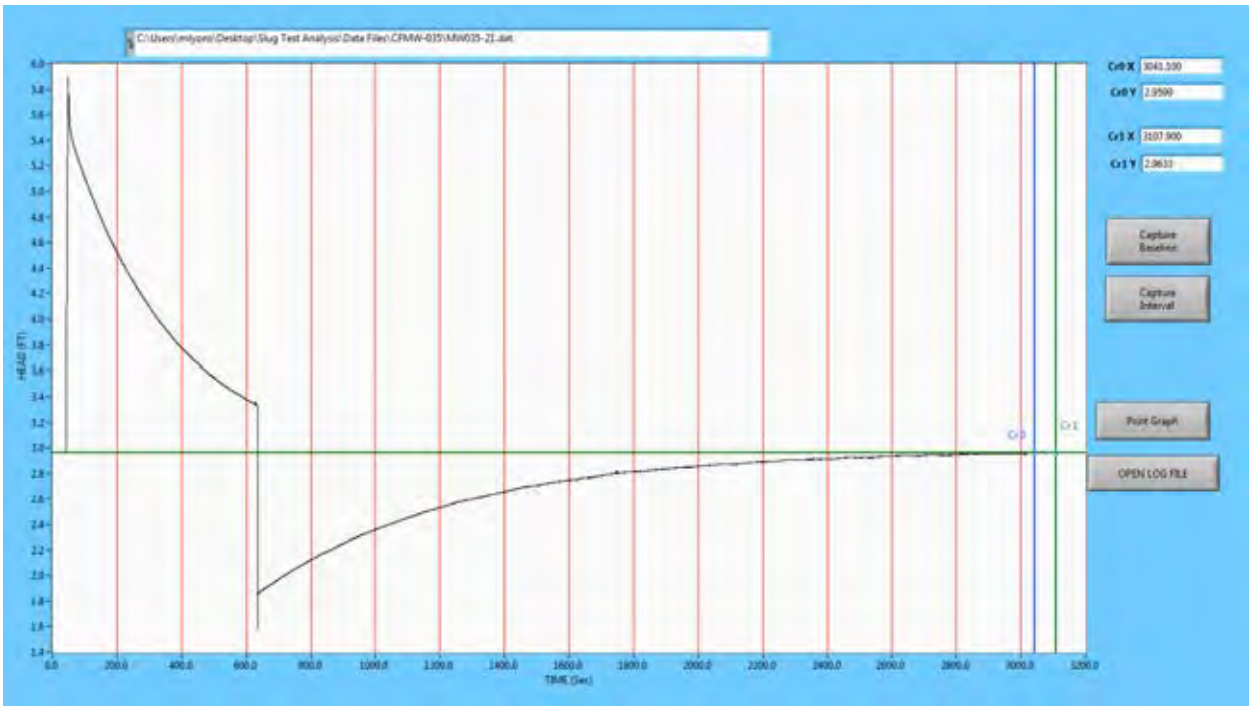
START DATE: 7/14/2017
START TIME: 2:14 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW035-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-035
1 Foot Displacement
Test #2





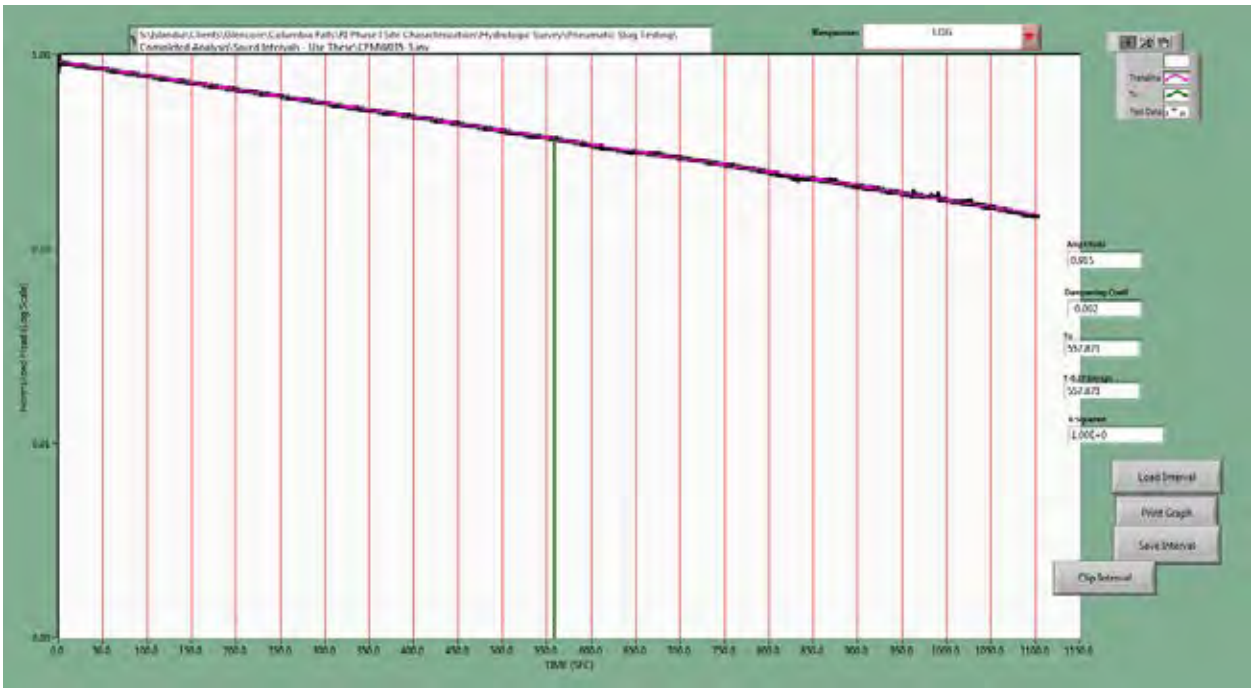
CFMW-035
2 Foot Displacement
Test #1

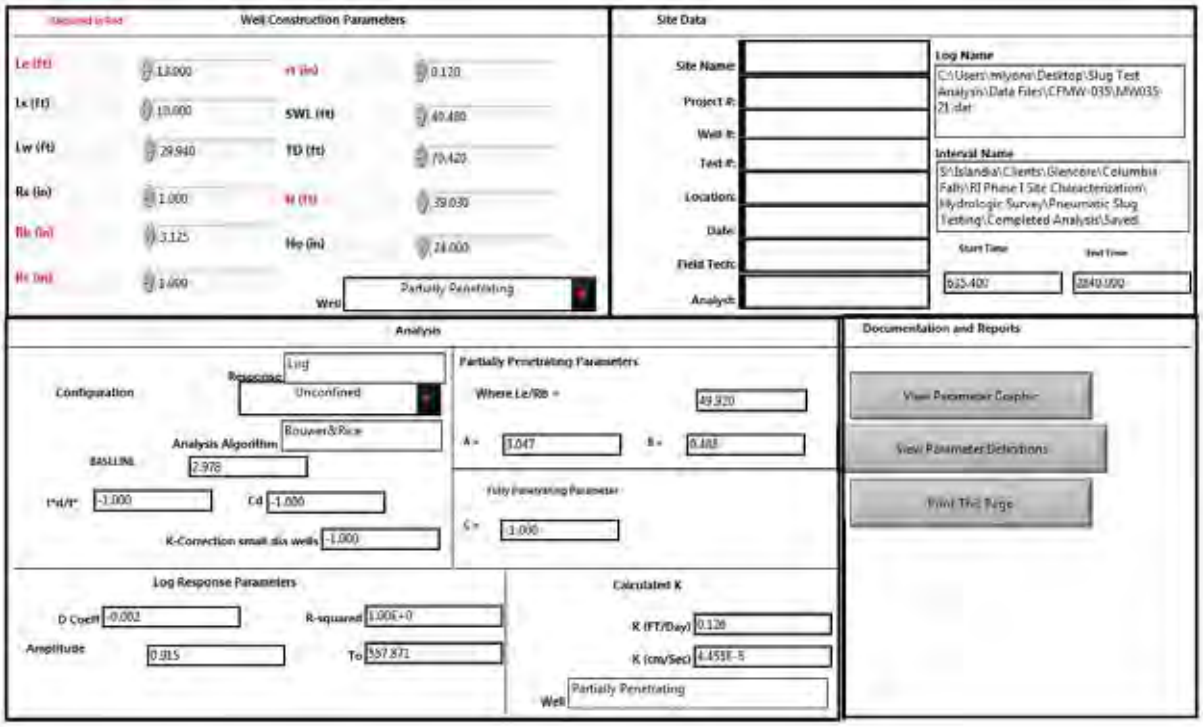


SITE INFORMATION -- SLUG TEST REV. 3.0

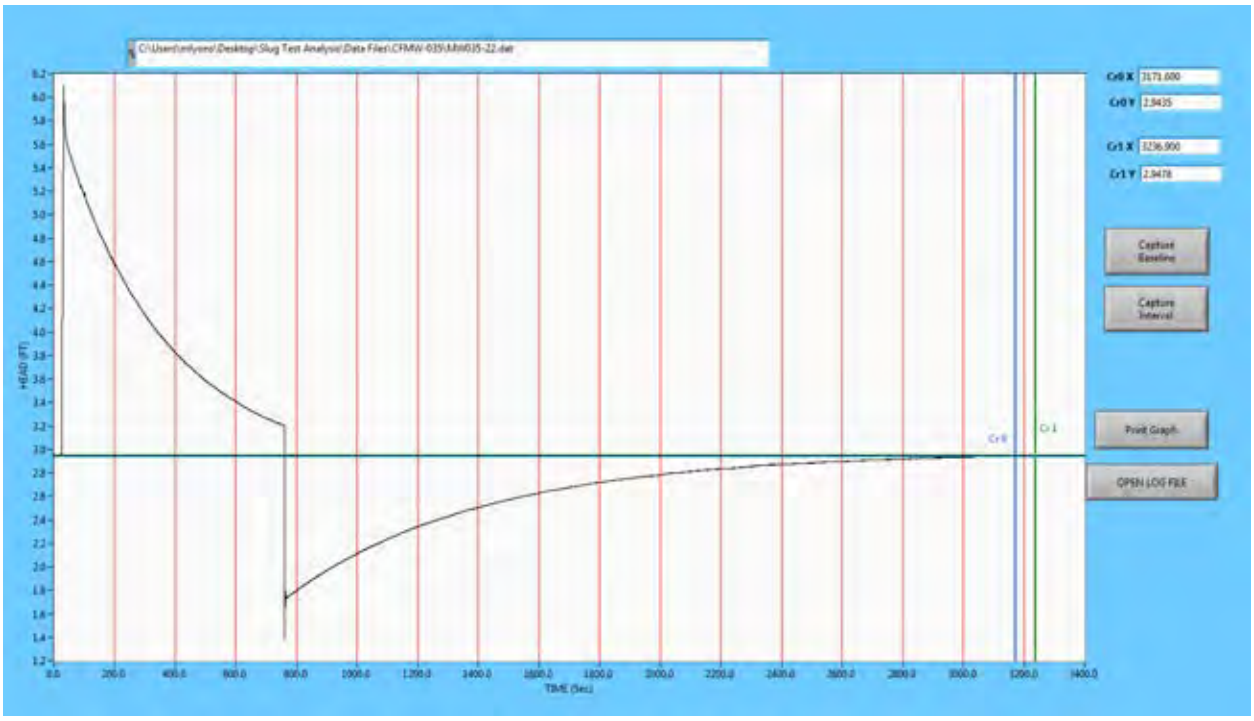
START DATE: 7/14/2017
START TIME: 2:56 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW035-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-035
2 Foot Displacement
Test #1





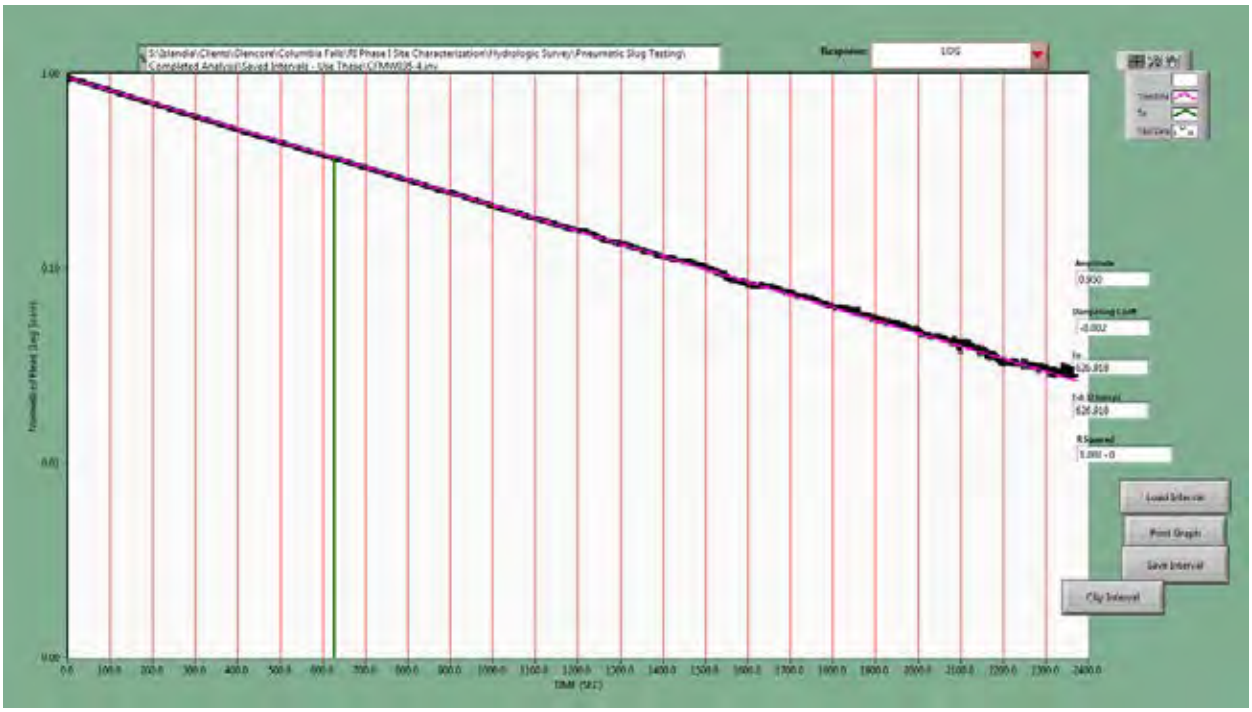
CFMW-035
2 Foot Displacement
Test #2

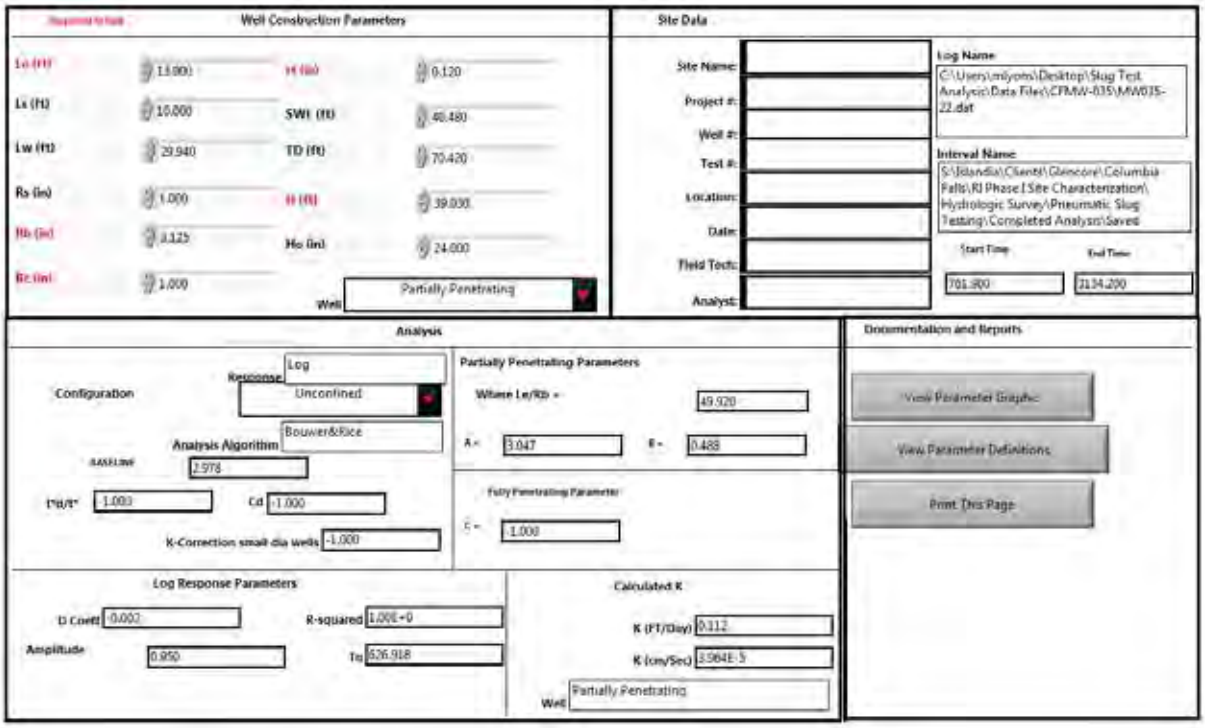


SITE INFORMATION -- SLUG TEST REV. 3.0

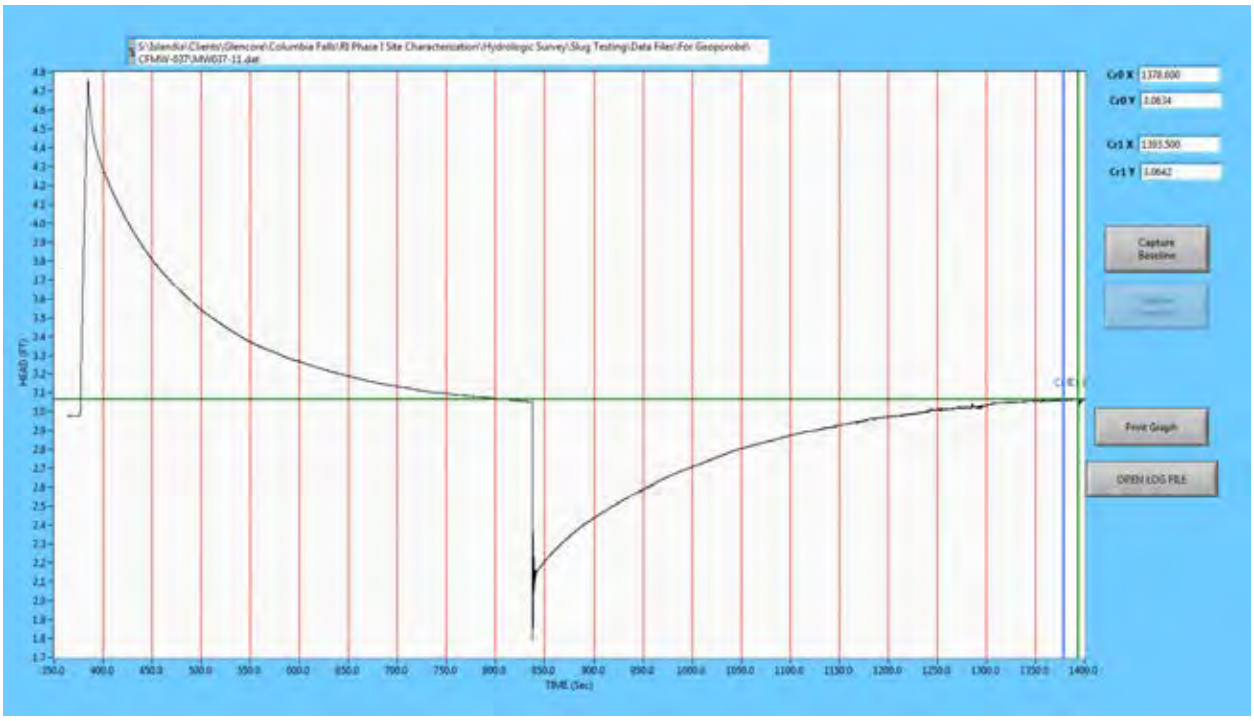
START DATE: 7/14/2017
START TIME: 3:49 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW035-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-035
2 Foot Displacement
Test #2





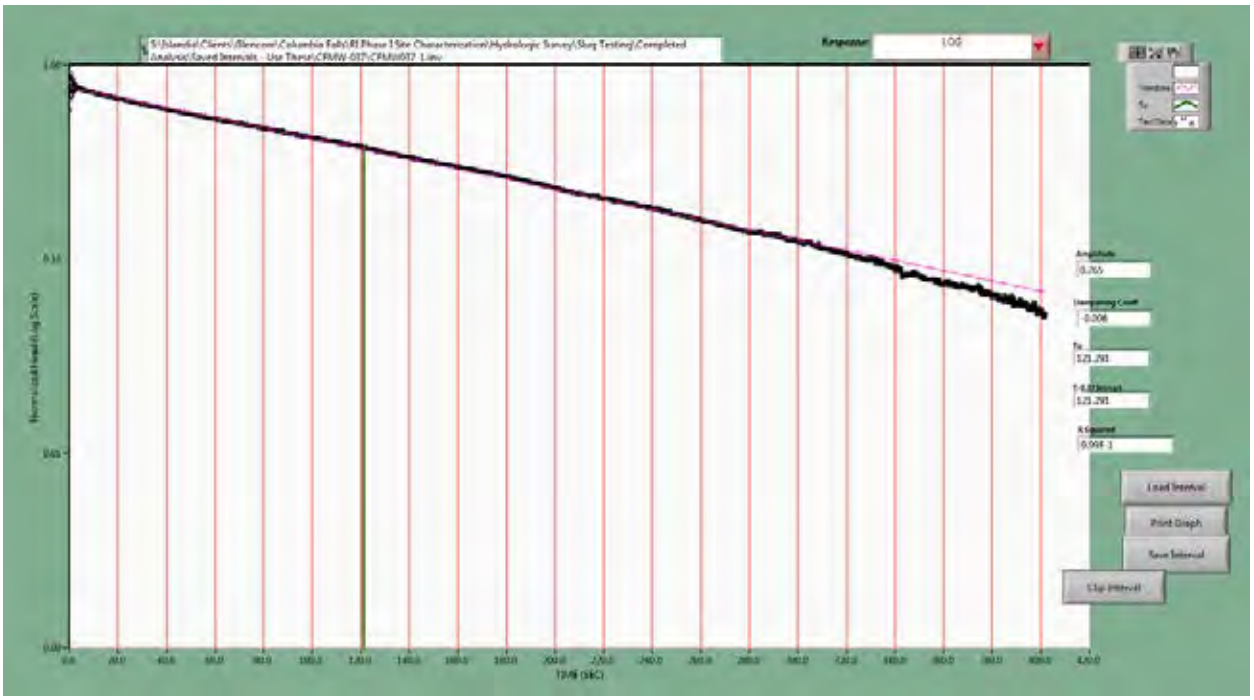
CFMW-037
1 Foot Displacement
Test #1

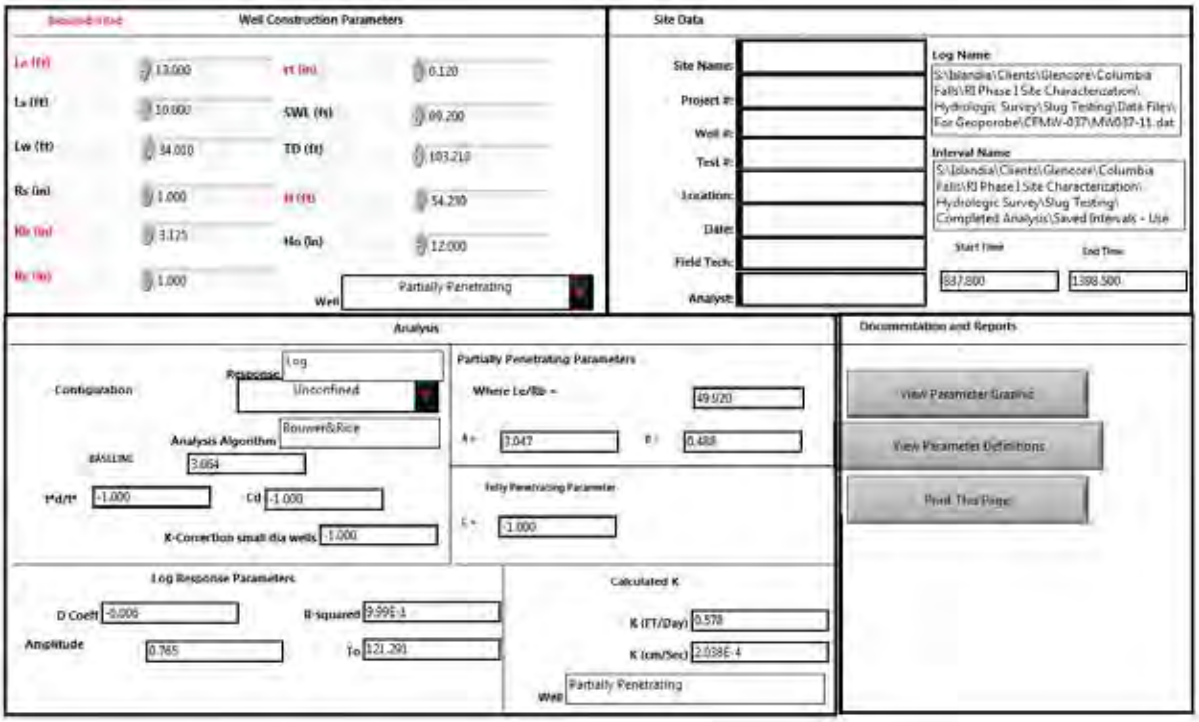


SITE INFORMATION -- SLUG TEST REV. 3.0

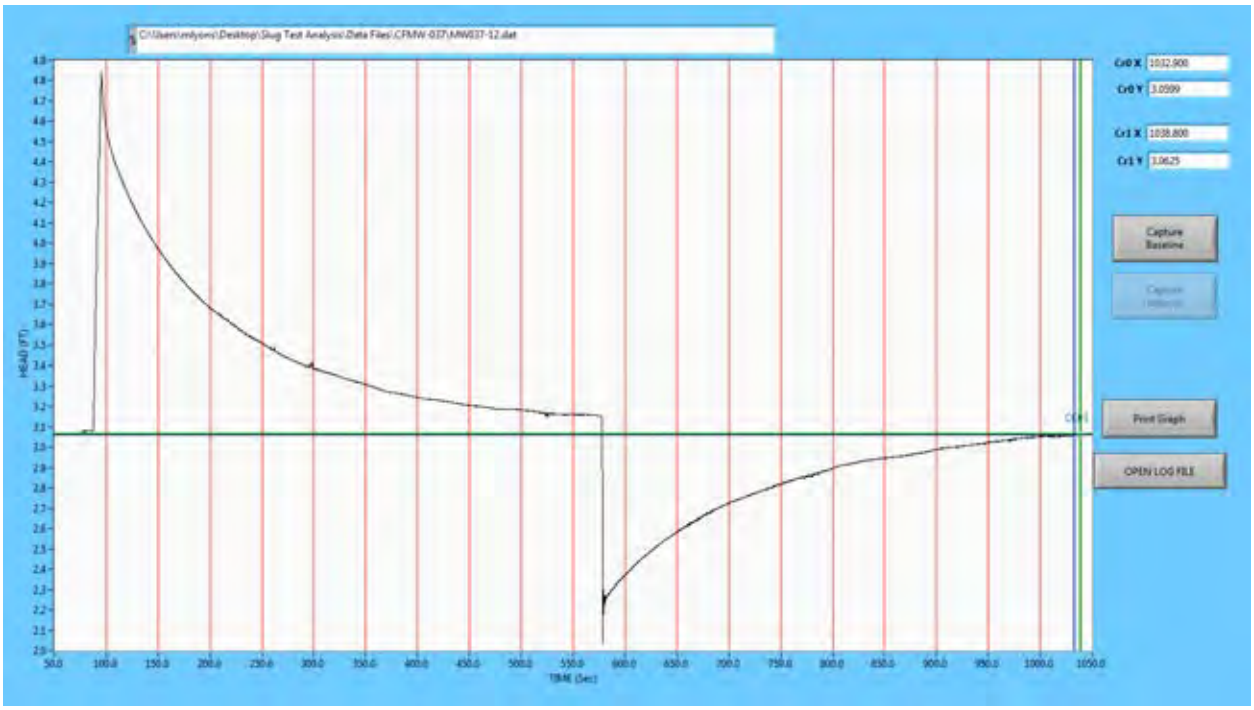
START DATE: 7/13/2017
START TIME: 3:59 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW037-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-037
1 Foot Displacement
Test #1





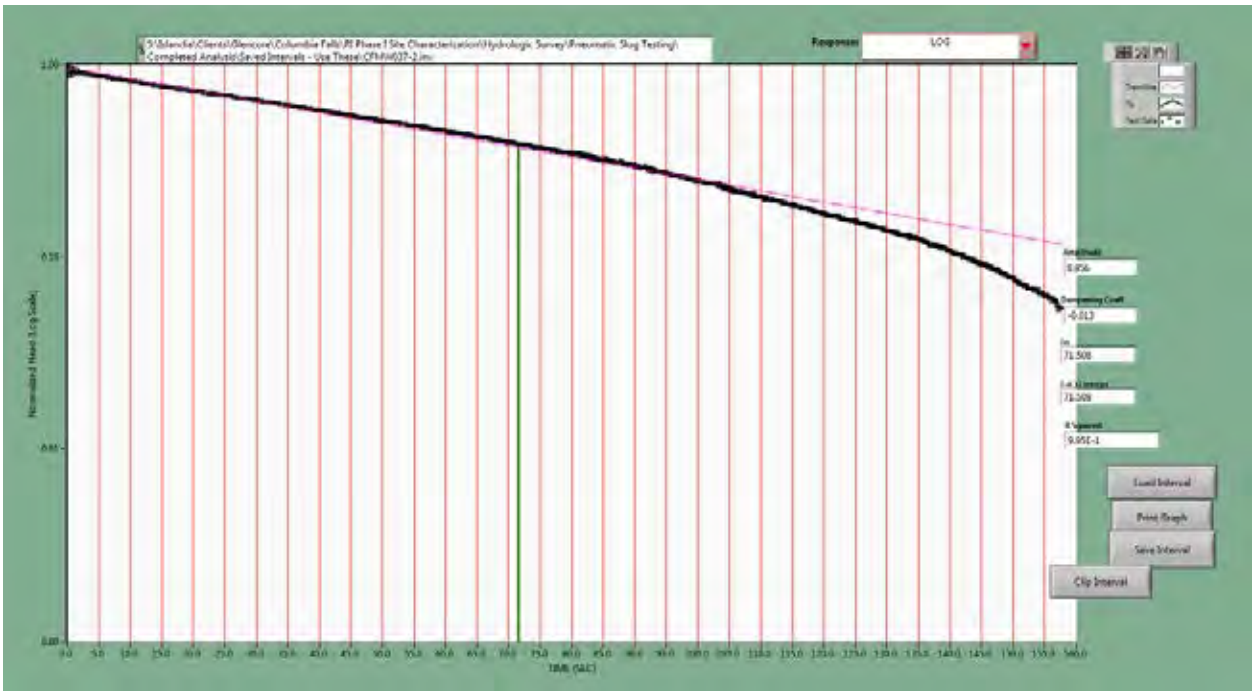
CFMW-037
1 Foot Displacement
Test #2

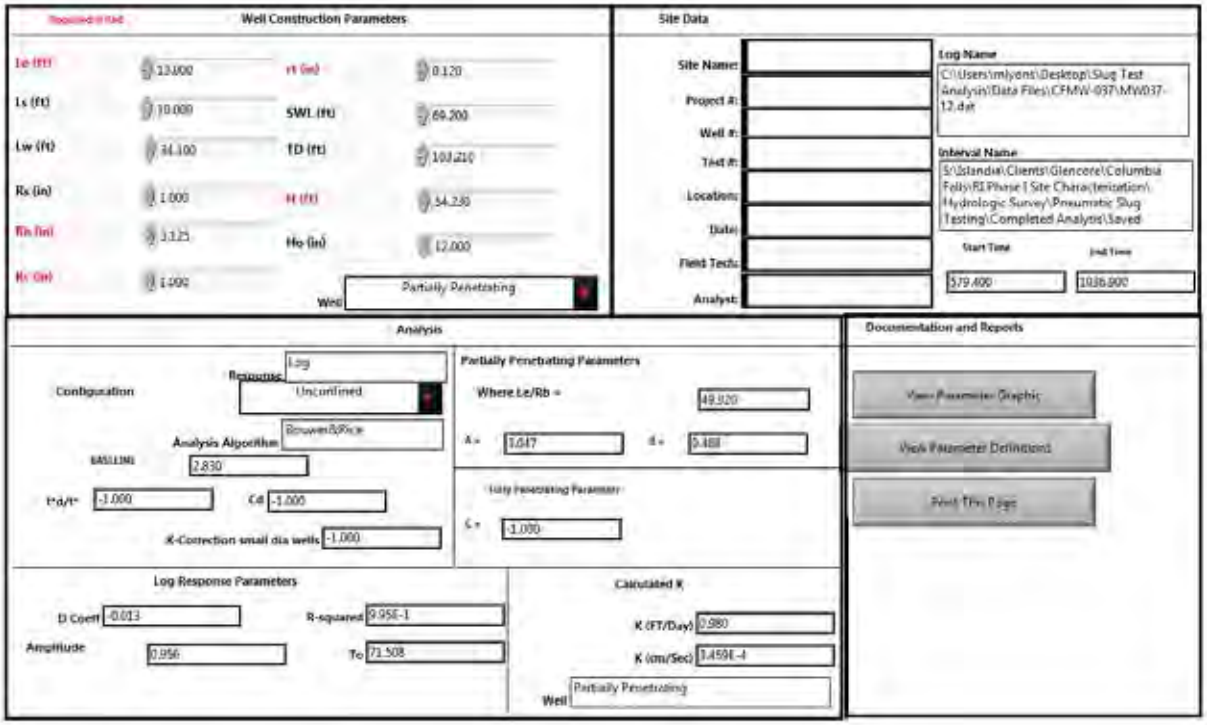


SITE INFORMATION -- SLUG TEST REV. 3.0

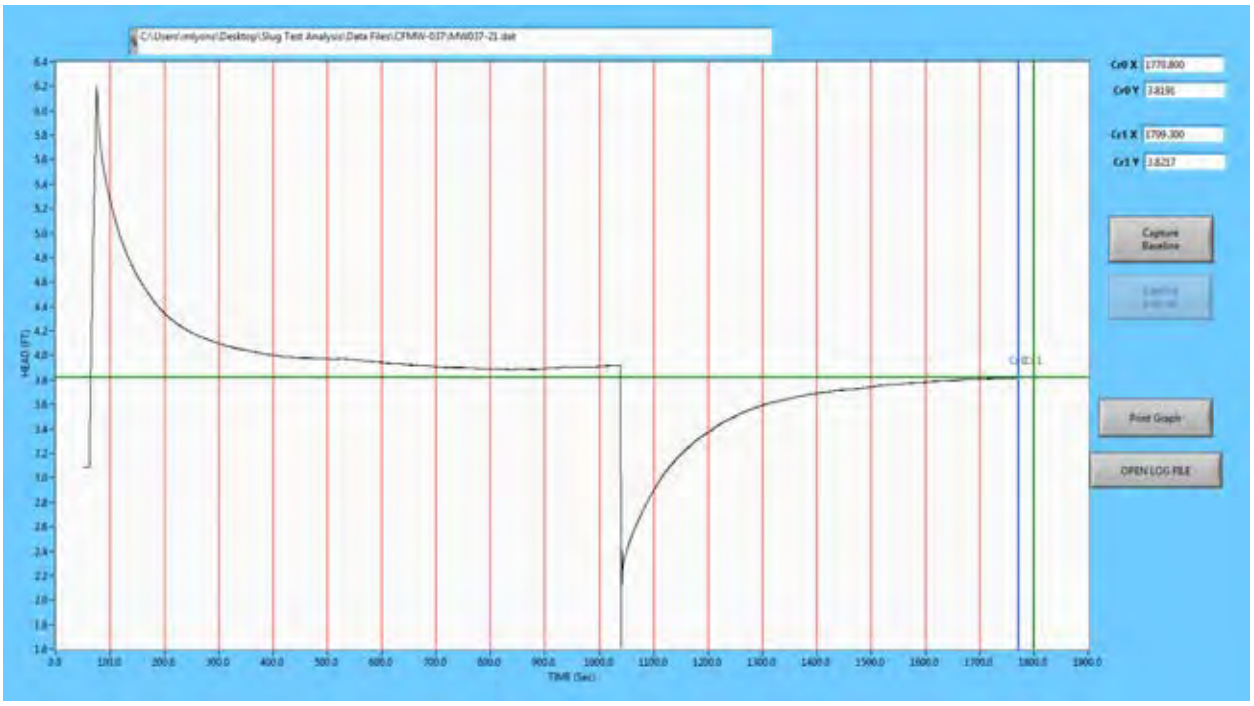
START DATE: 7/13/2017
START TIME: 4:23 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW037-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-037
1 Foot Displacement
Test #2





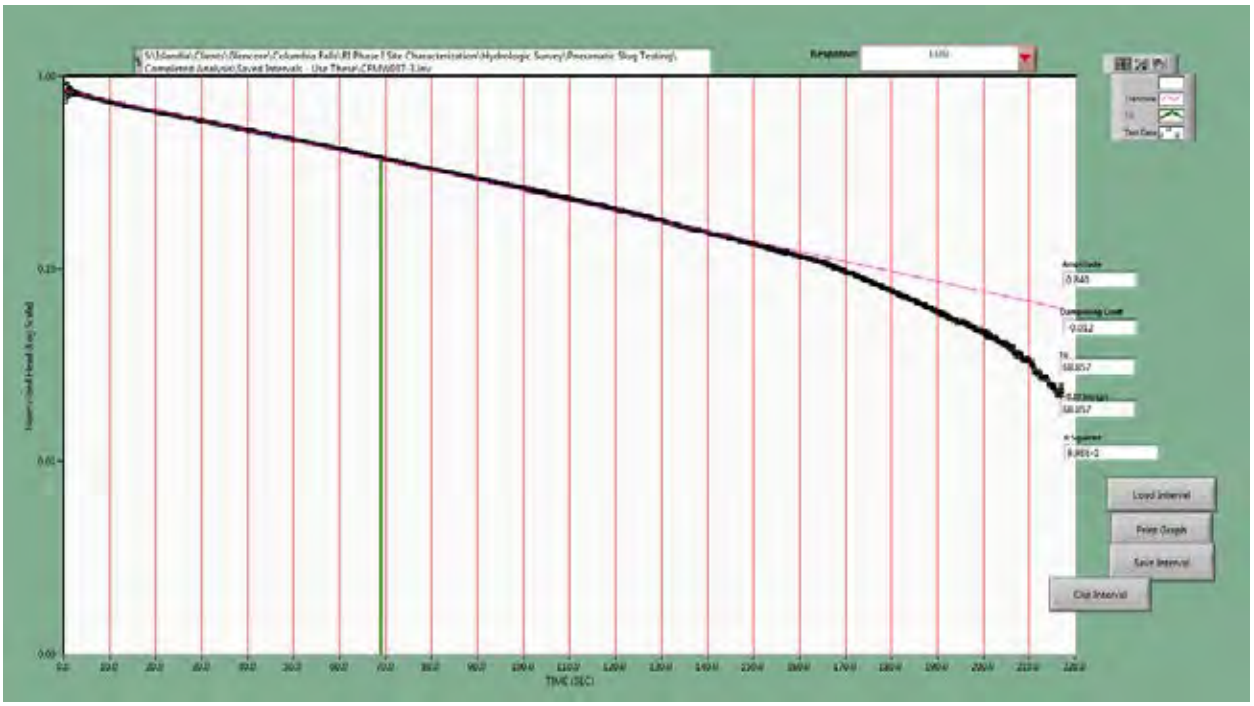
CFMW-037
2 Foot Displacement
Test #1



SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/13/2017
START TIME: 4:41 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW037-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-037
2 Foot Displacement
Test #1



Well Construction Parameters

Le (ft)	13.000	rc (in)	0.120
Ls (ft)	10.000	SWL (ft)	69.200
Lw (ft)	34.100	TD (ft)	103.210
Rs (in)	1.000	H (ft)	54.230
Rb (in)	4.125	Ho (in)	24.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:
Project #:
Well #:
Test #:
Location:
Date:
Field Tech:
Analyst:

Log Name: C:\Users\mlyons\Desktop\Slug Test Analysis\Data Files\CFMW-037\MW037-2f.dat

Interval Name: S:\Islandia\Clients\Glenzene\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Pneumatic Slug Testing\Completed Analysis\Saved

Start Time: 1040.500
End Time: 1800.100

Analysis

Response: Log
Contouation: Uncontined
Analysis Algorithm: Bouwer&Rice
BASELINE: 3.555
t*d/t*: -1.000
C#: -1.000
K Correction small dia wells: -1.000

Partially Penetrating Parameters

Where Le/Rb =: 49.920
A =: 3.047
B =: 0.488

Fully Penetrating Parameters

C =: -1.000

Log Response Parameters

D Coeff: -0.012
R-squared: 9.98E-1
Amplitude: 0.840
To: 68.857

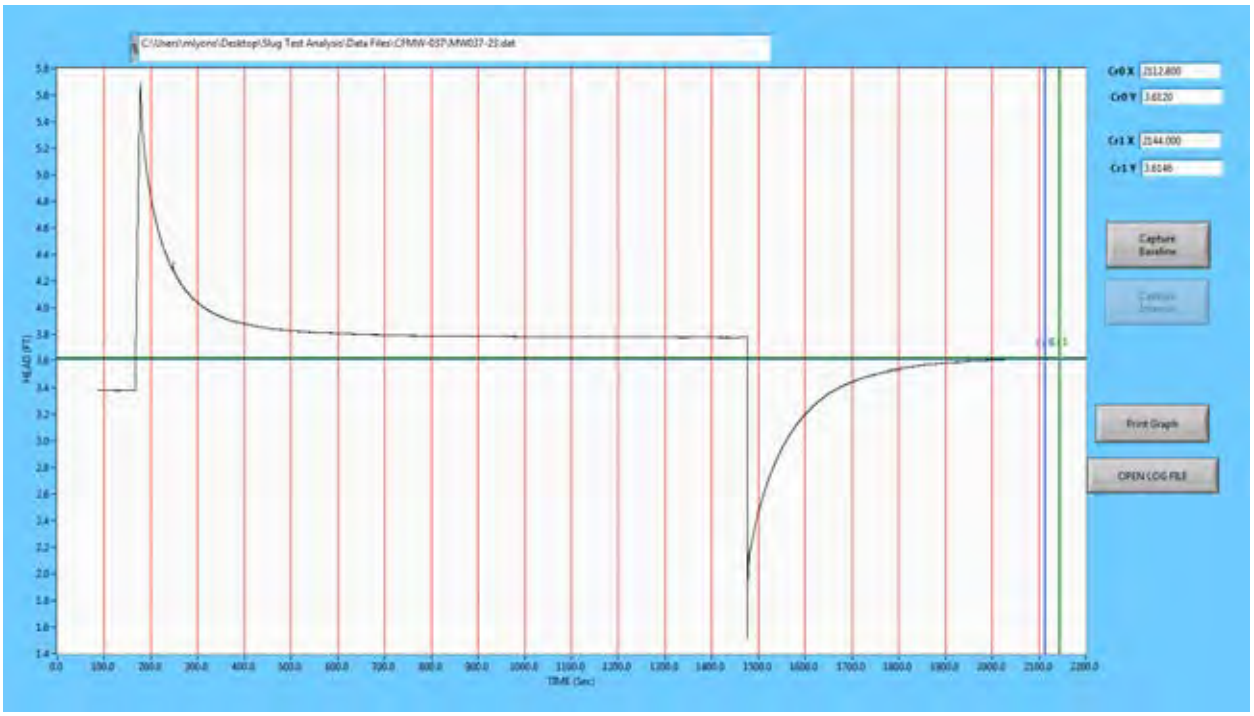
Calculated K

K (FT/Day): 1.018
K (cm/Sec): 3.592E-4
Well: Partially Penetrating

Documentation and Reports

View Parameter Graphic
View Parameter Definitions
Print This Page

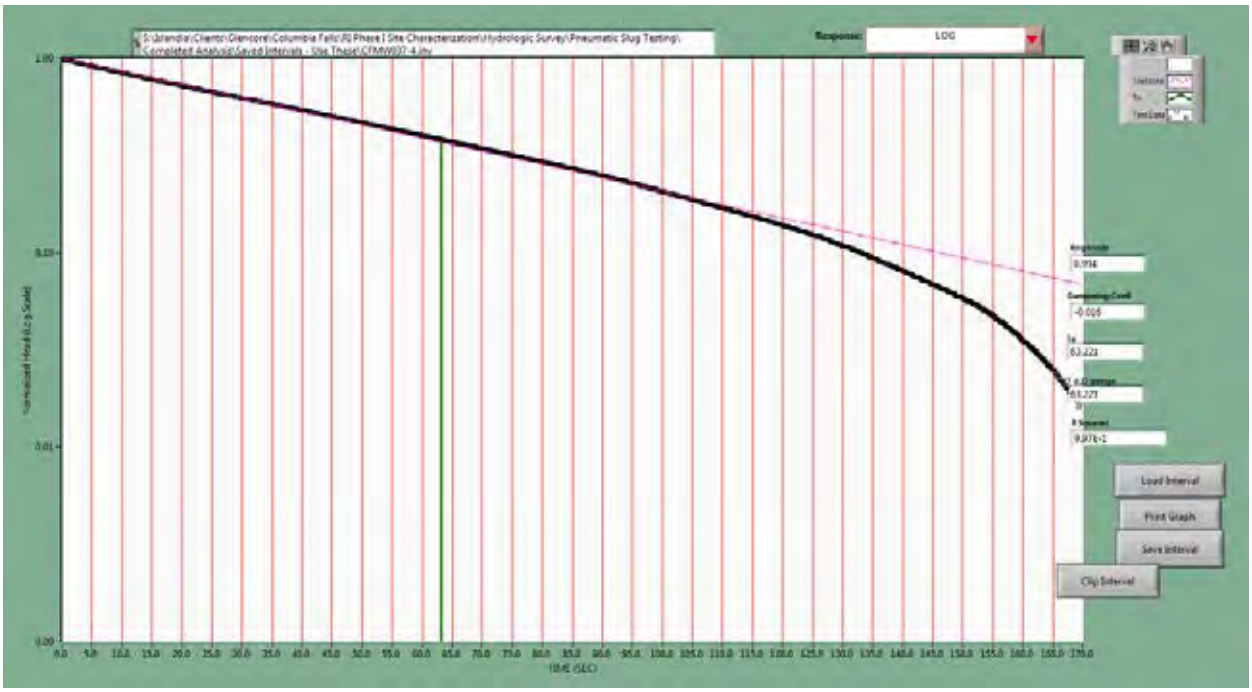
CFMW-037
2 Foot Displacement
Test #2



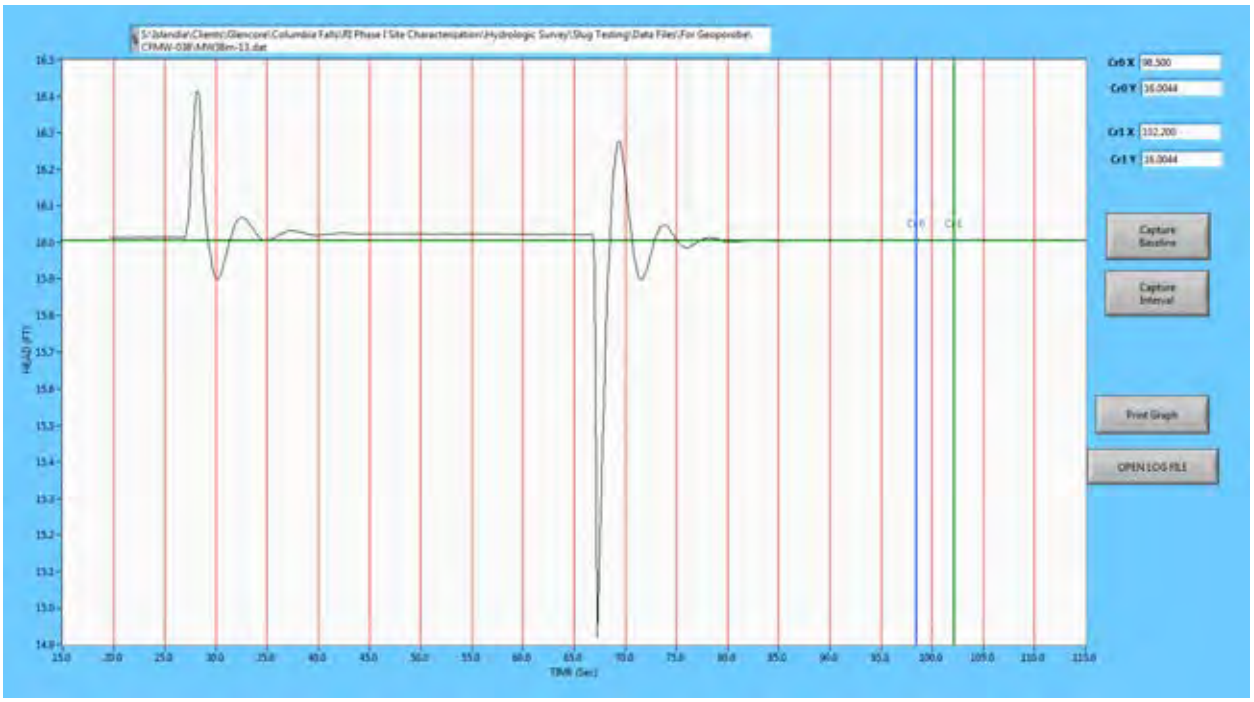
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/14/2017
START TIME: 9:11 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW037-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-037
2 Foot Displacement
Test #2



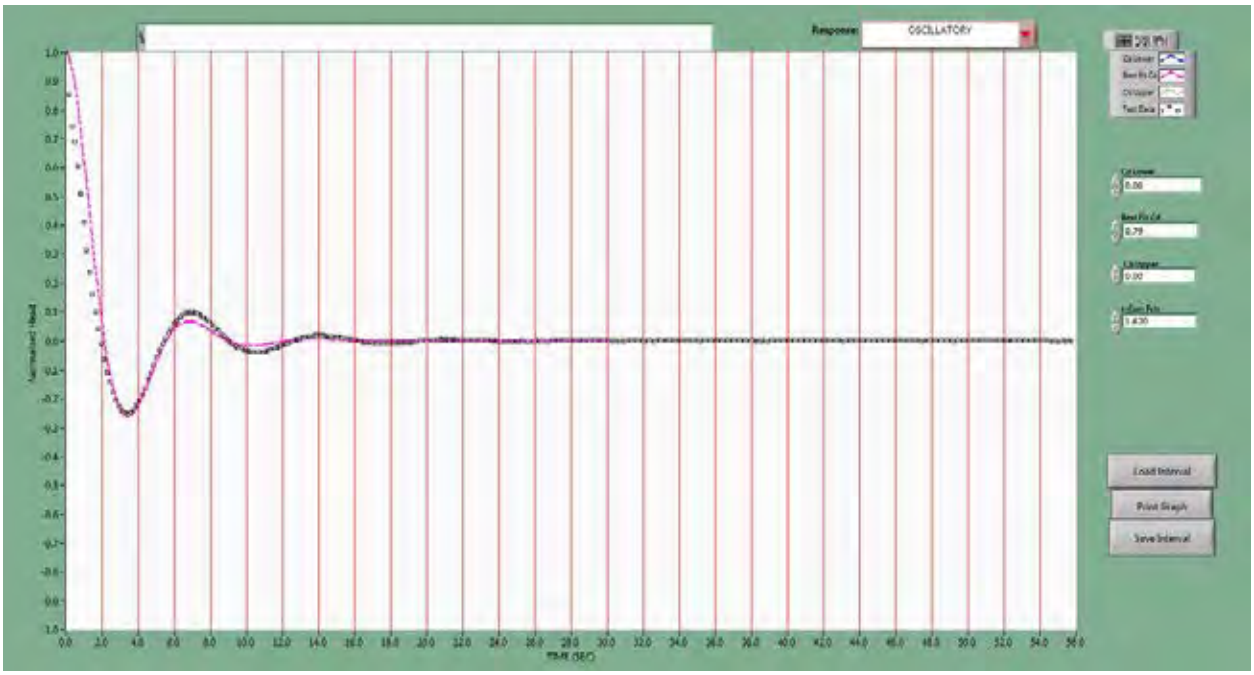
CFMW-038
1 Foot Displacement
Test #1

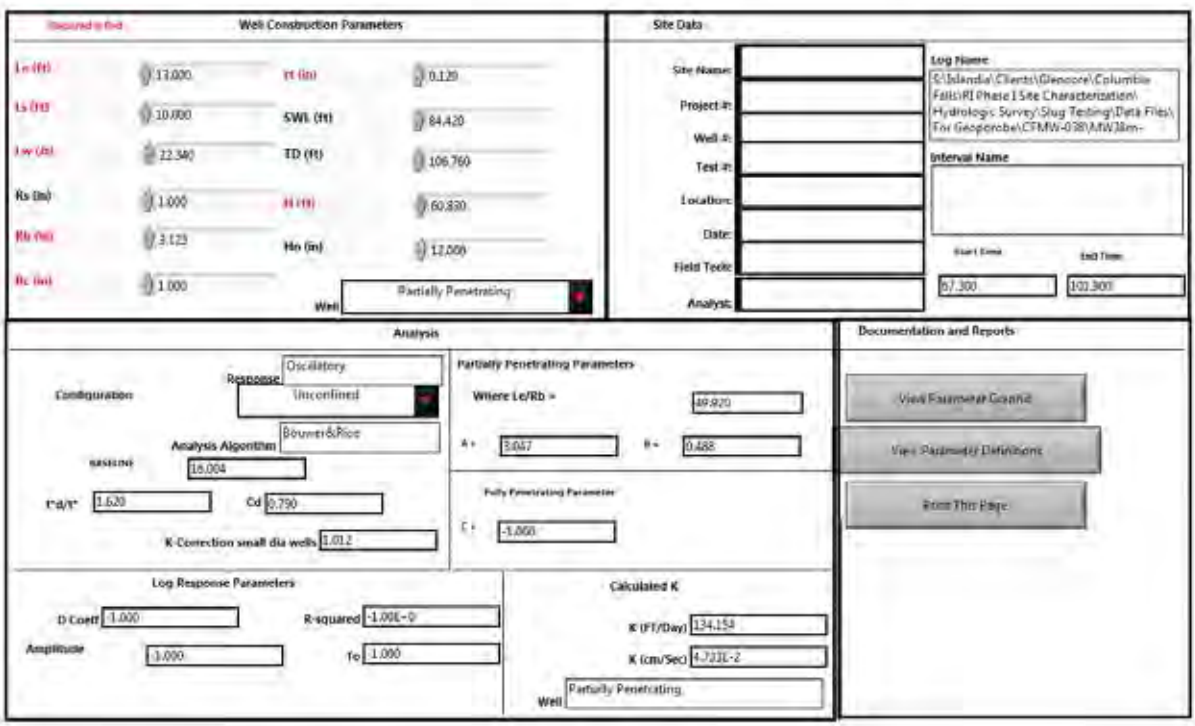


SITE INFORMATION -- SLUG TEST REV. 3.0

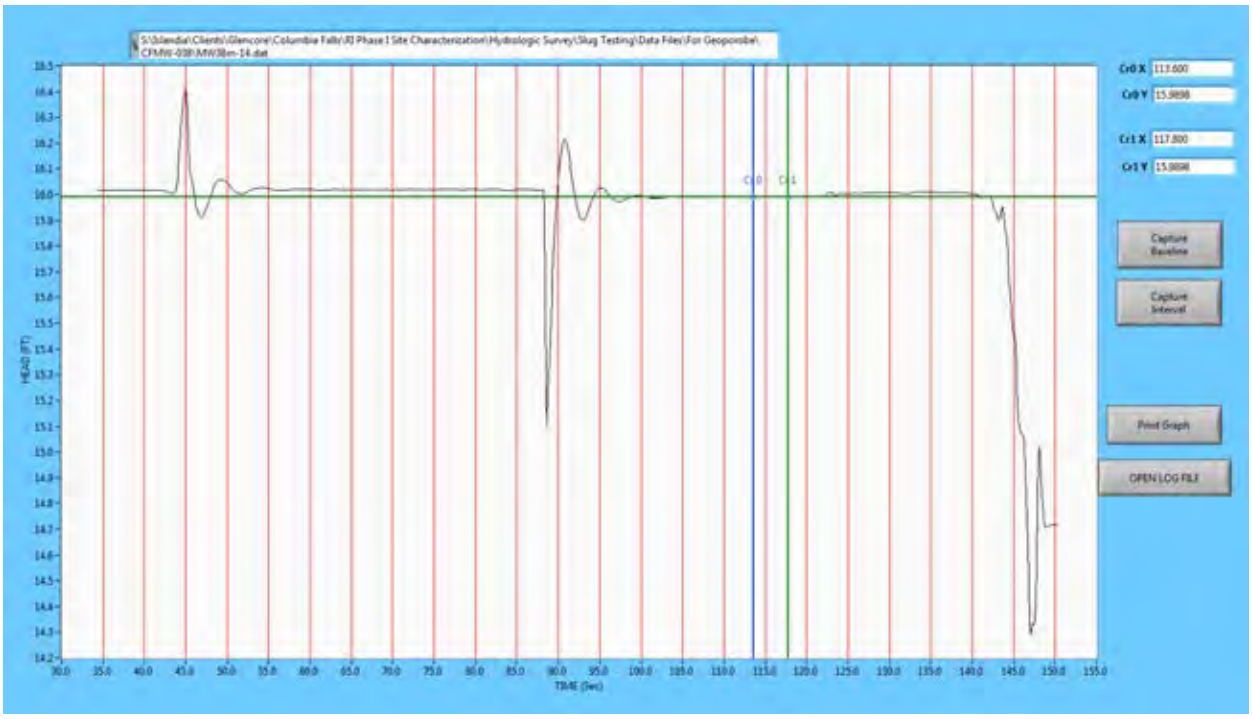
START DATE: 7/19/2017
START TIME: 11:25 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW38M-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-038
1 Foot Displacement
Test #1





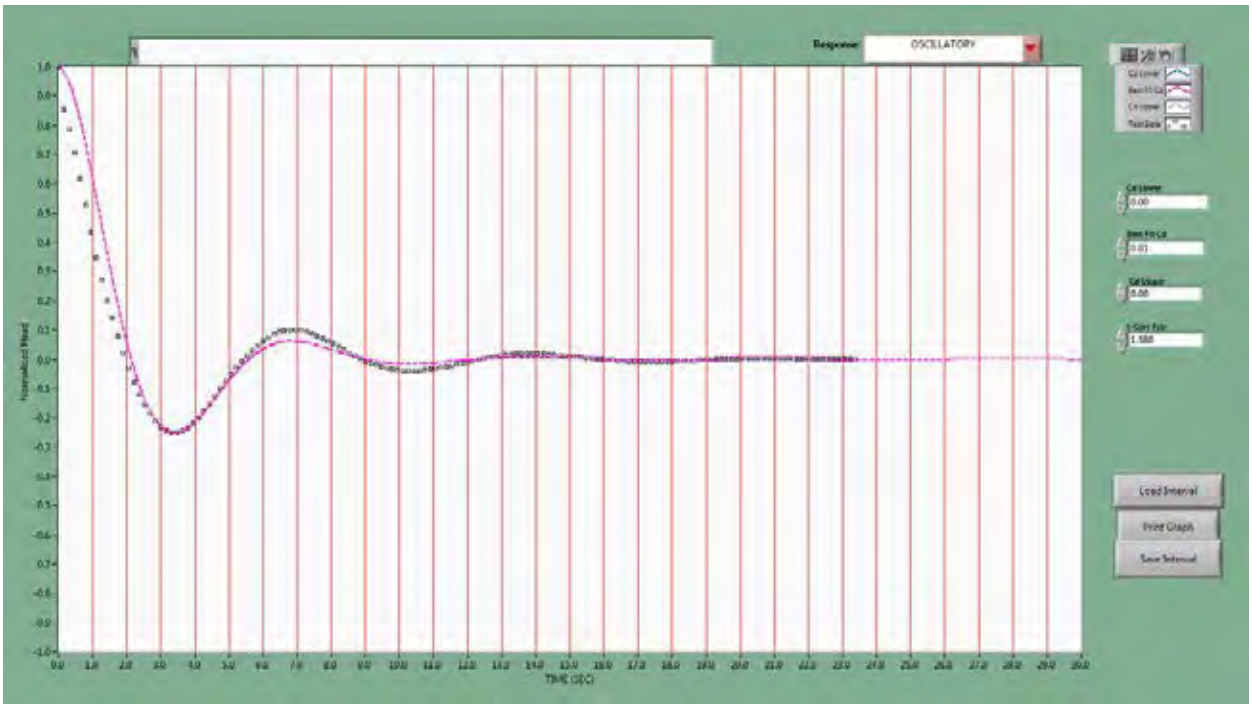
CFMW-038
1 Foot Displacement
Test #2

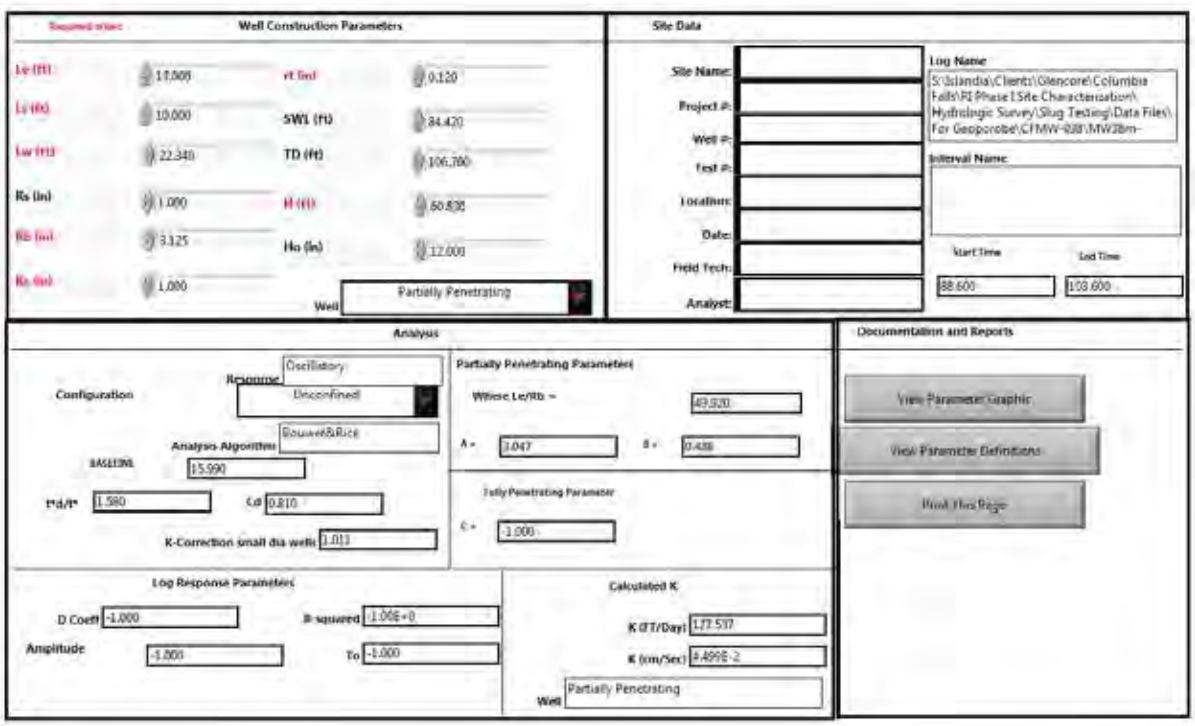


SITE INFORMATION -- SLUG TEST REV. 3.0

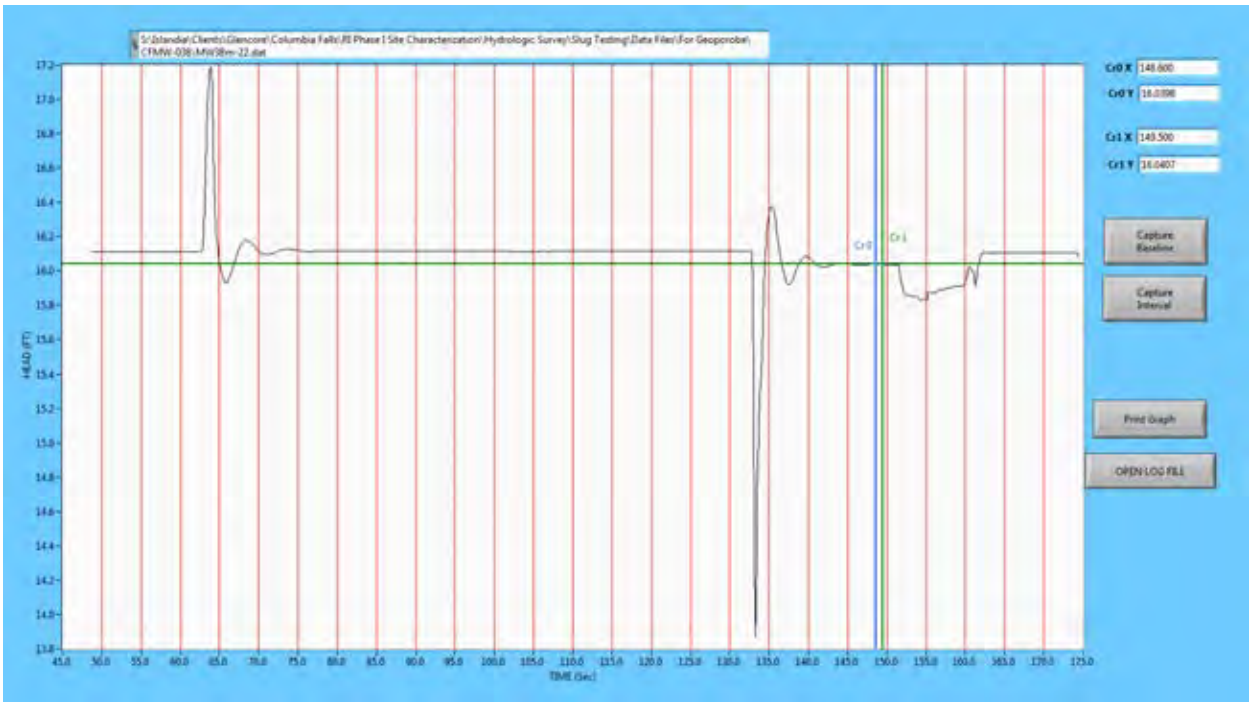
START DATE: 7/19/2017
START TIME: 11:32 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW38M-14.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-038
1 Foot Displacement
Test #2





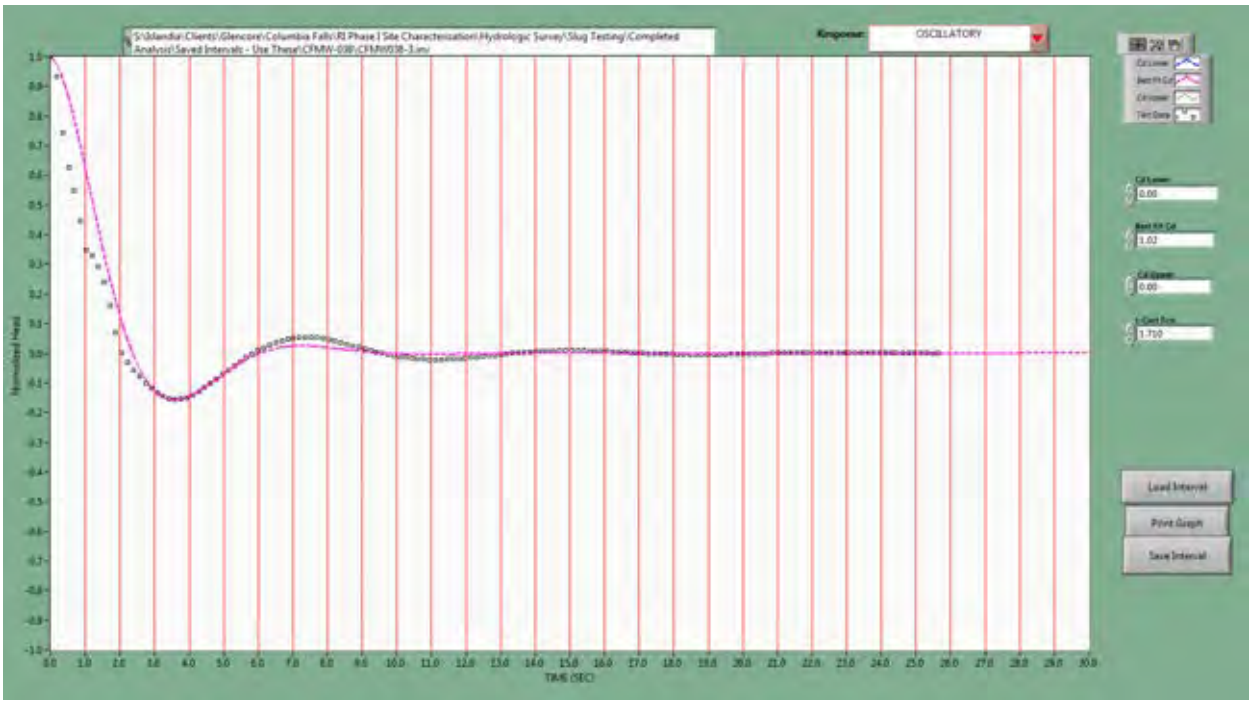
CFMW-038
2 Foot Displacement
Test #1

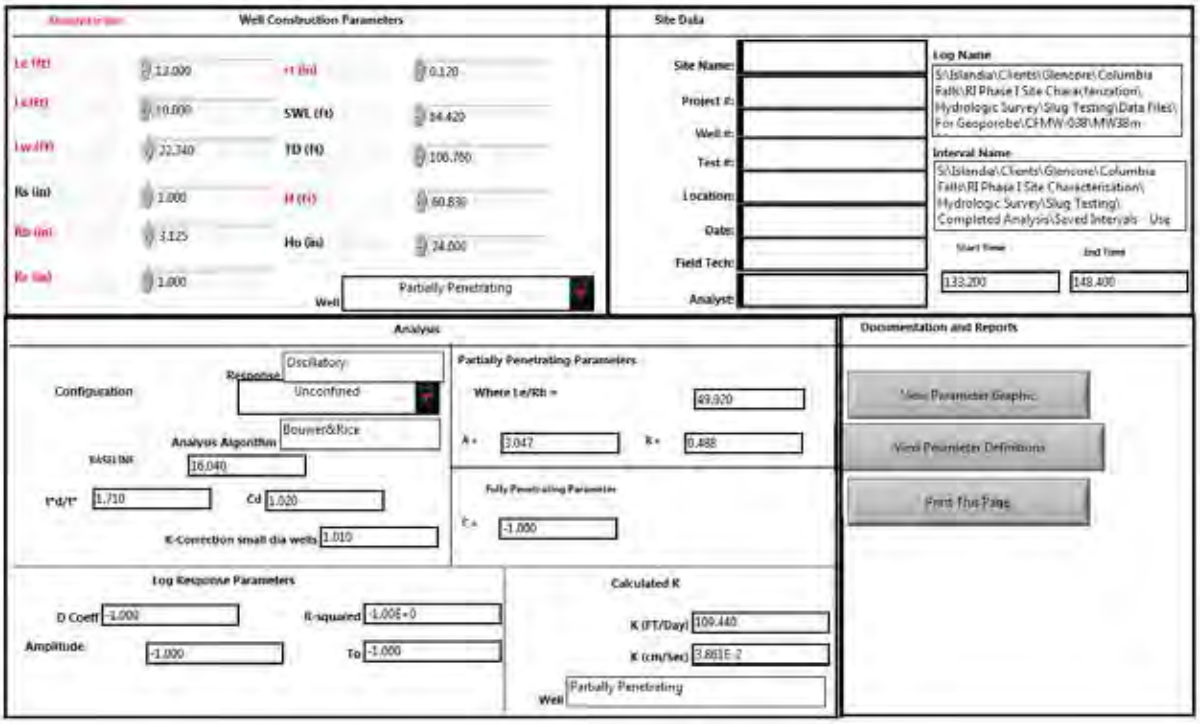


SITE INFORMATION -- SLUG TEST REV. 3.0

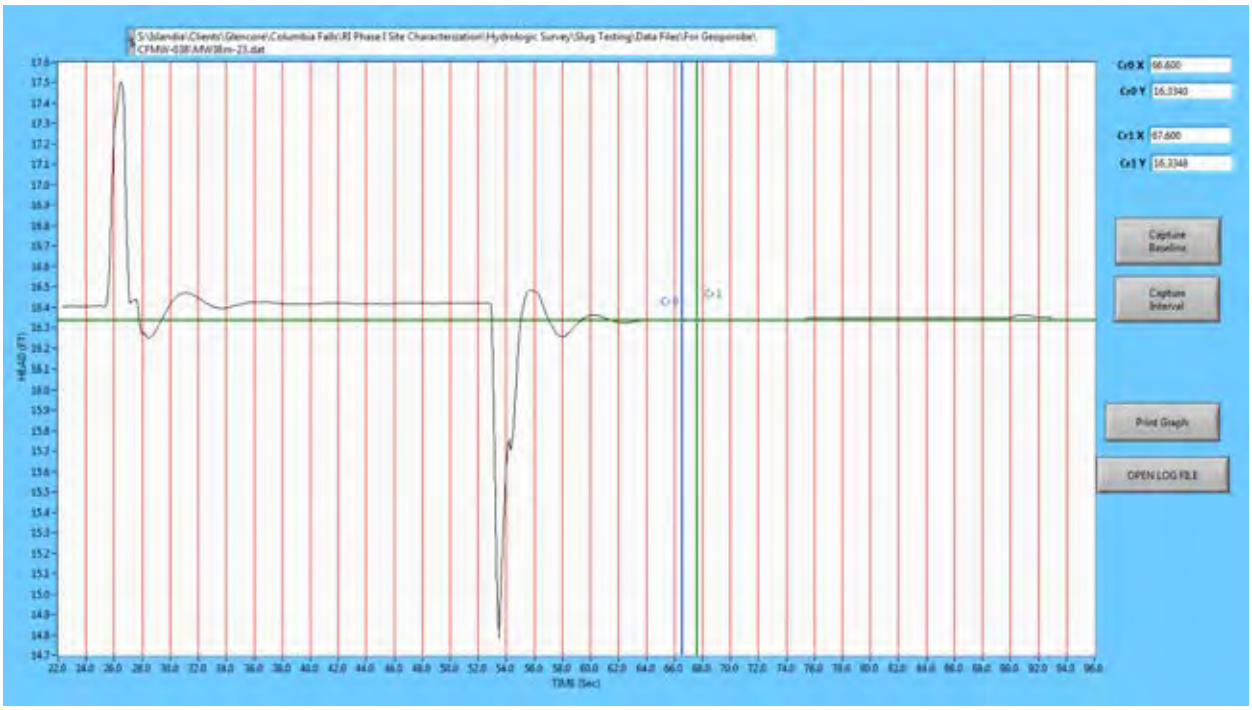
START DATE: 7/19/2017
START TIME: 11:41 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW38M-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-038
2 Foot Displacement
Test #1





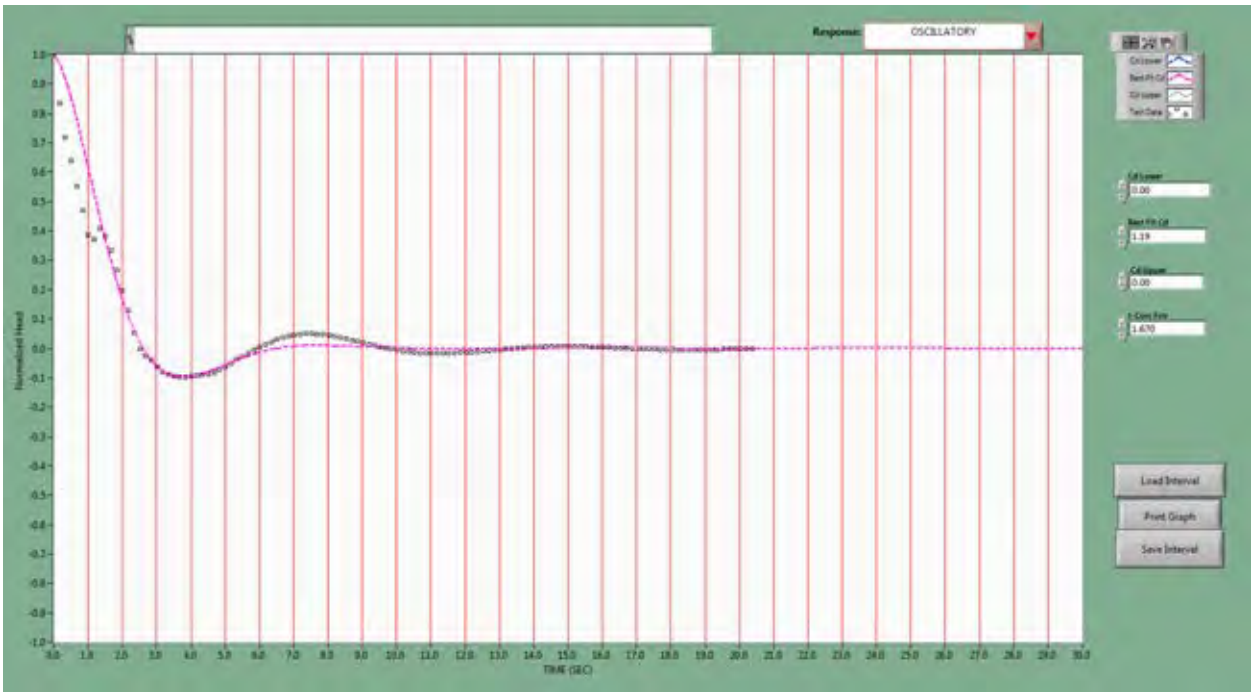
CFMW-038
2 Foot Displacement
Test #2

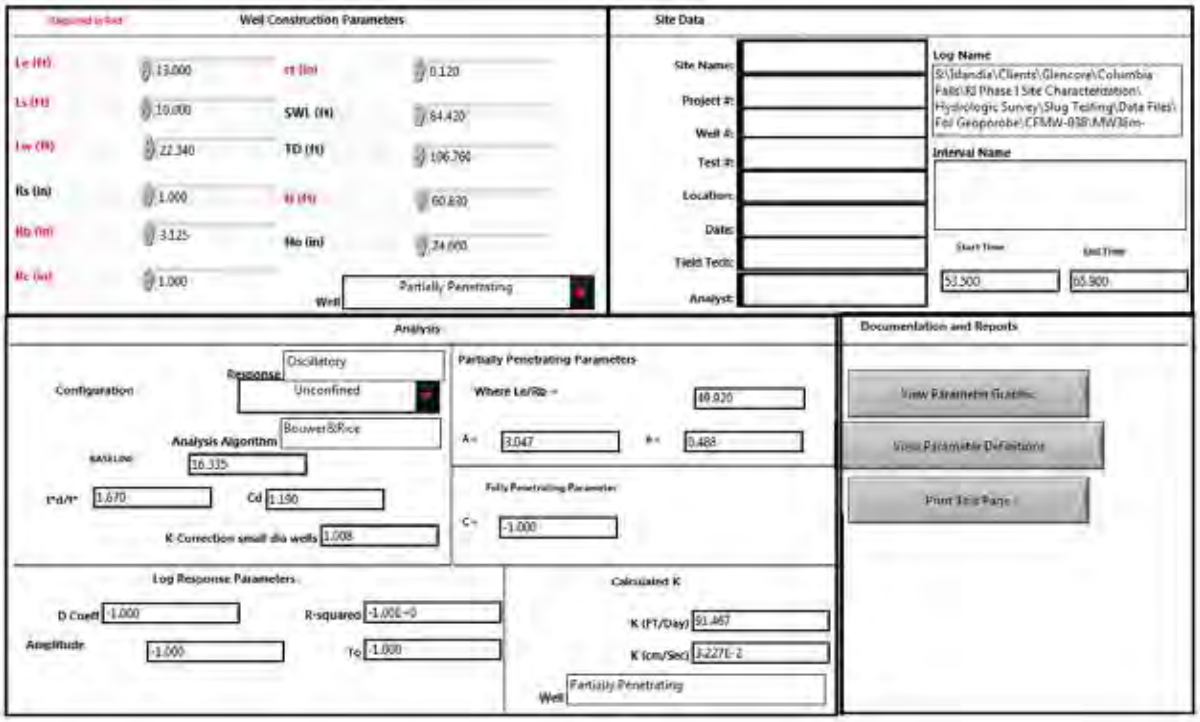


SITE INFORMATION -- SLUG TEST REV. 3.0

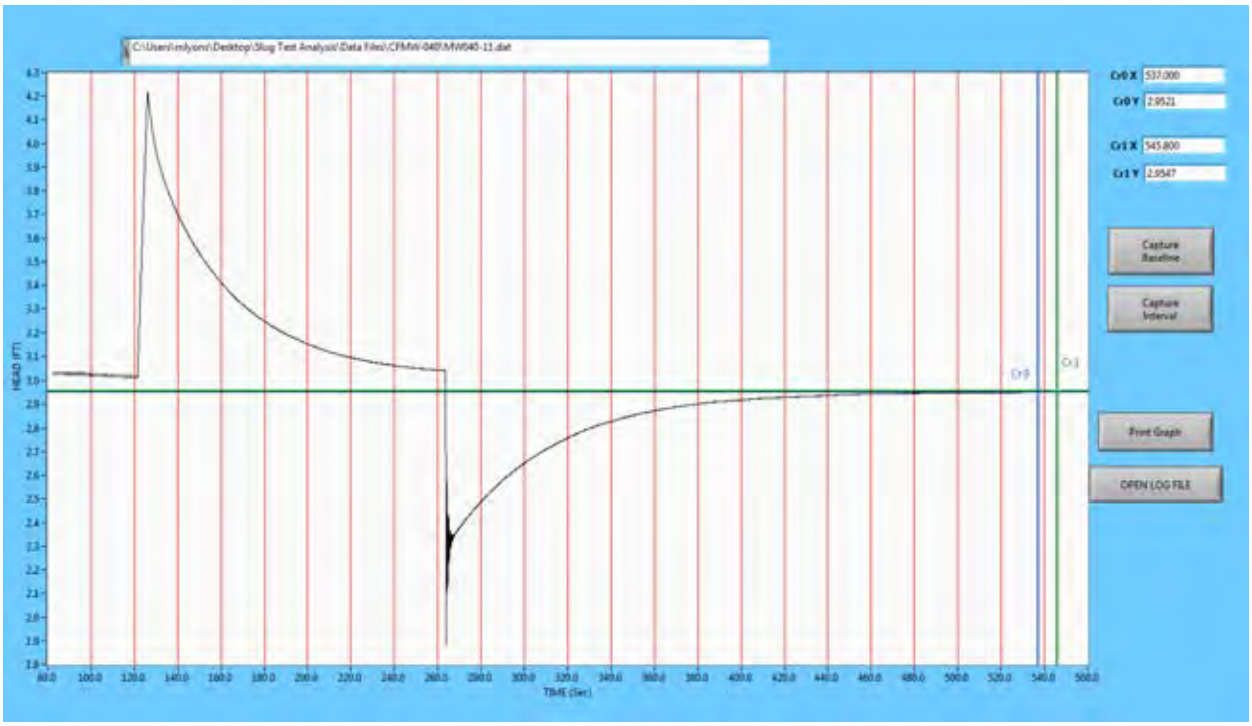
START DATE: 7/19/2017
START TIME: 11:55 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW38M-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-038
2 Foot Displacement
Test #2





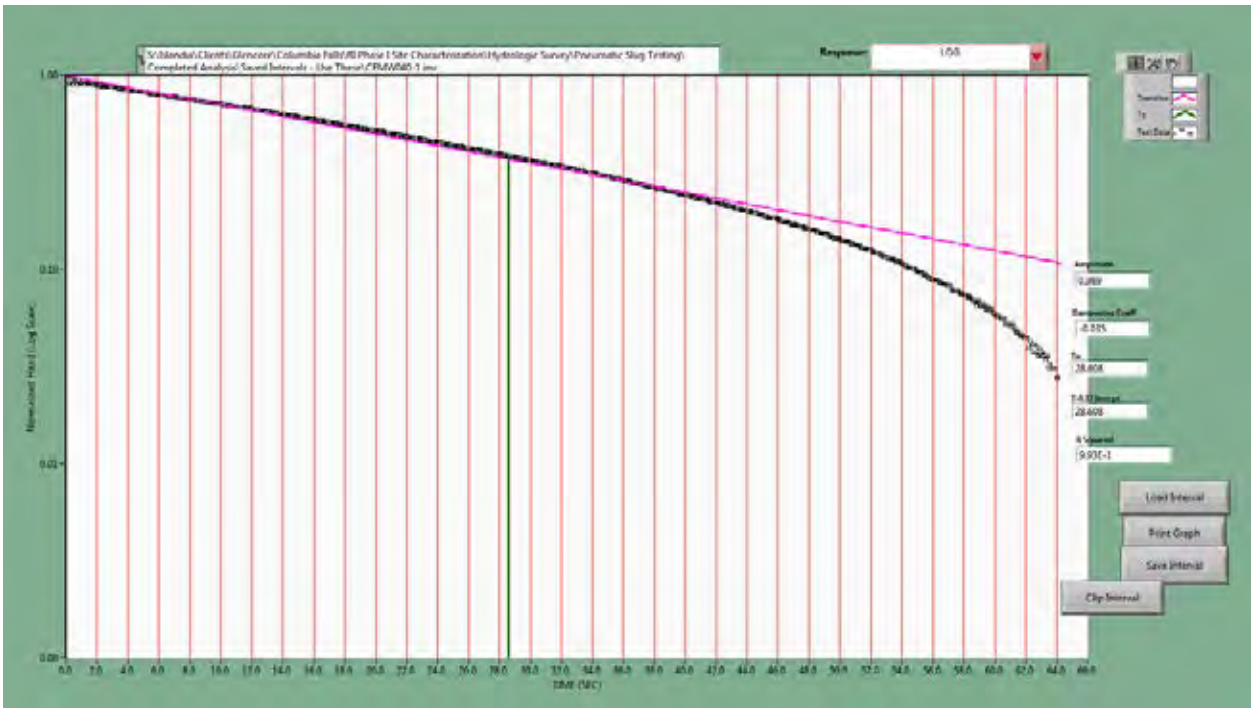
CFMW-040
1 Foot Displacement
Test #1

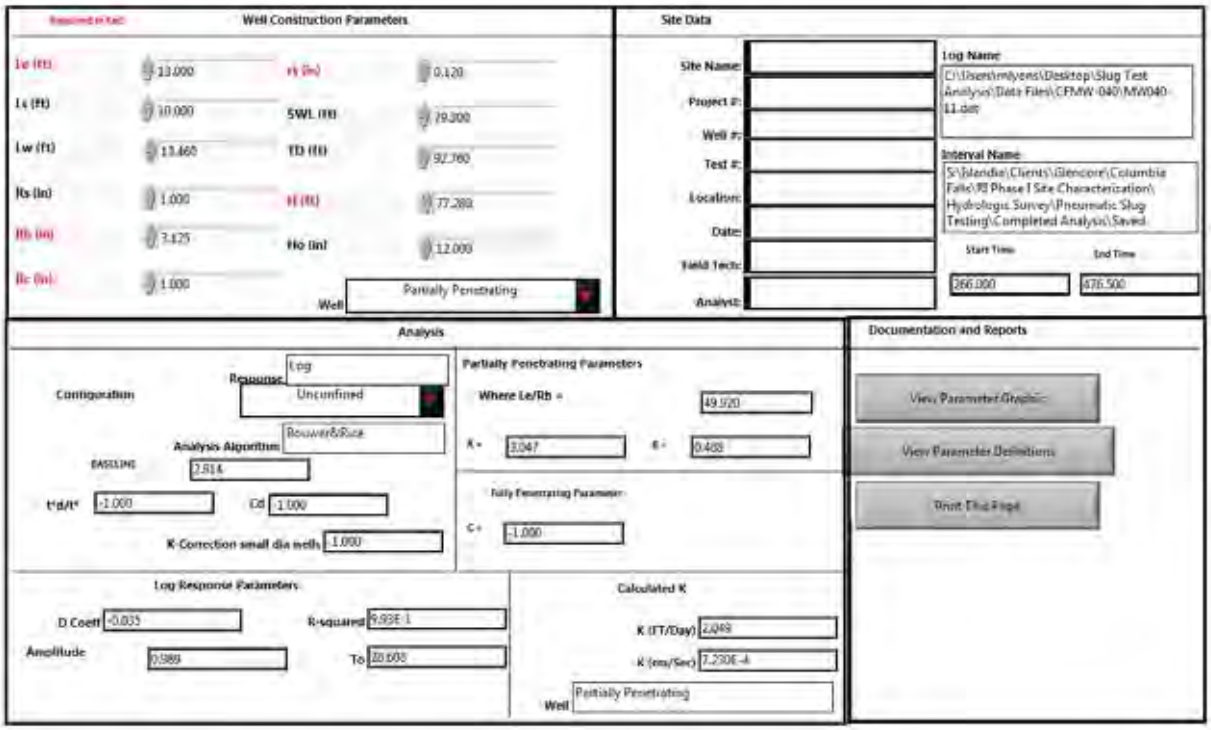


SITE INFORMATION -- SLUG TEST REV. 3.0

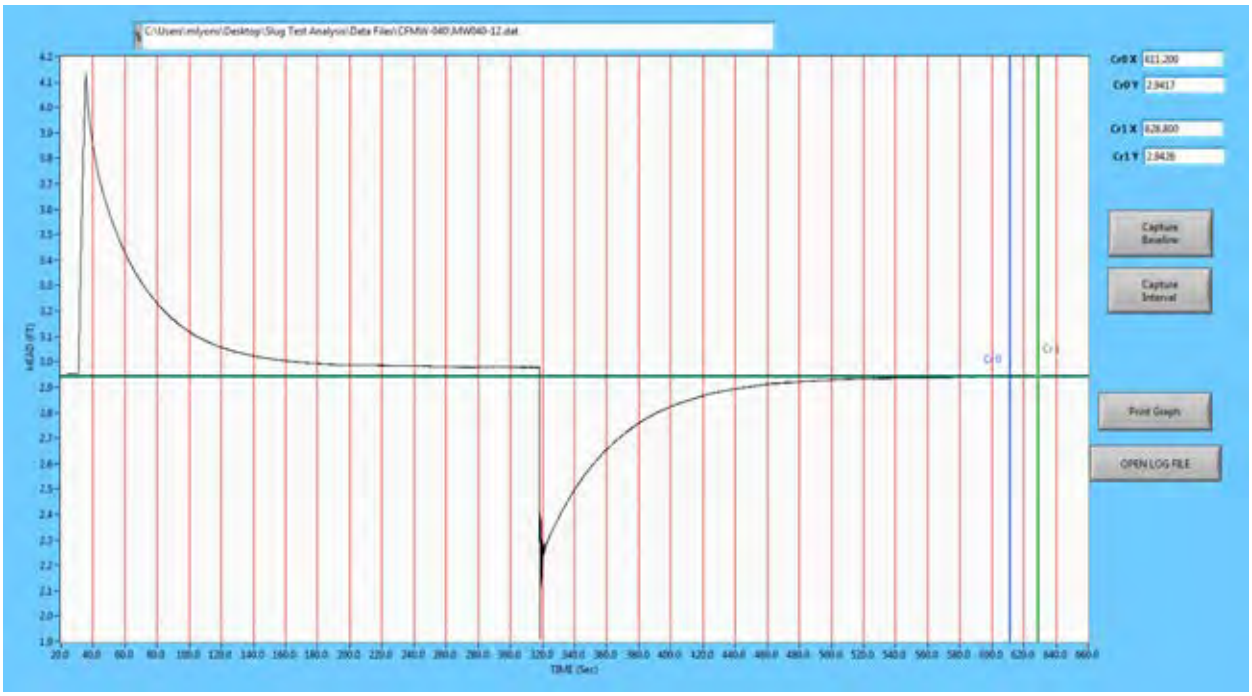
START DATE: 7/14/2017
START TIME: 10:32 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW040-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-040
1 Foot Displacement
Test #1





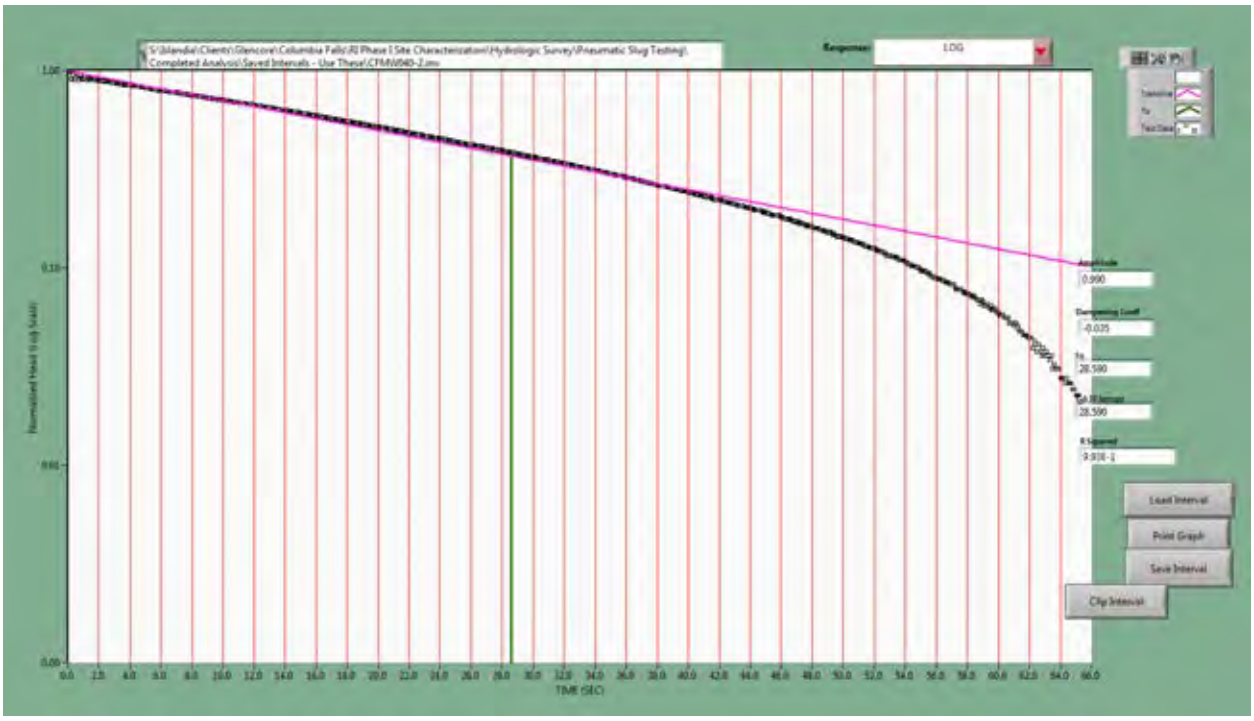
CFMW-040
1 Foot Displacement
Test #2

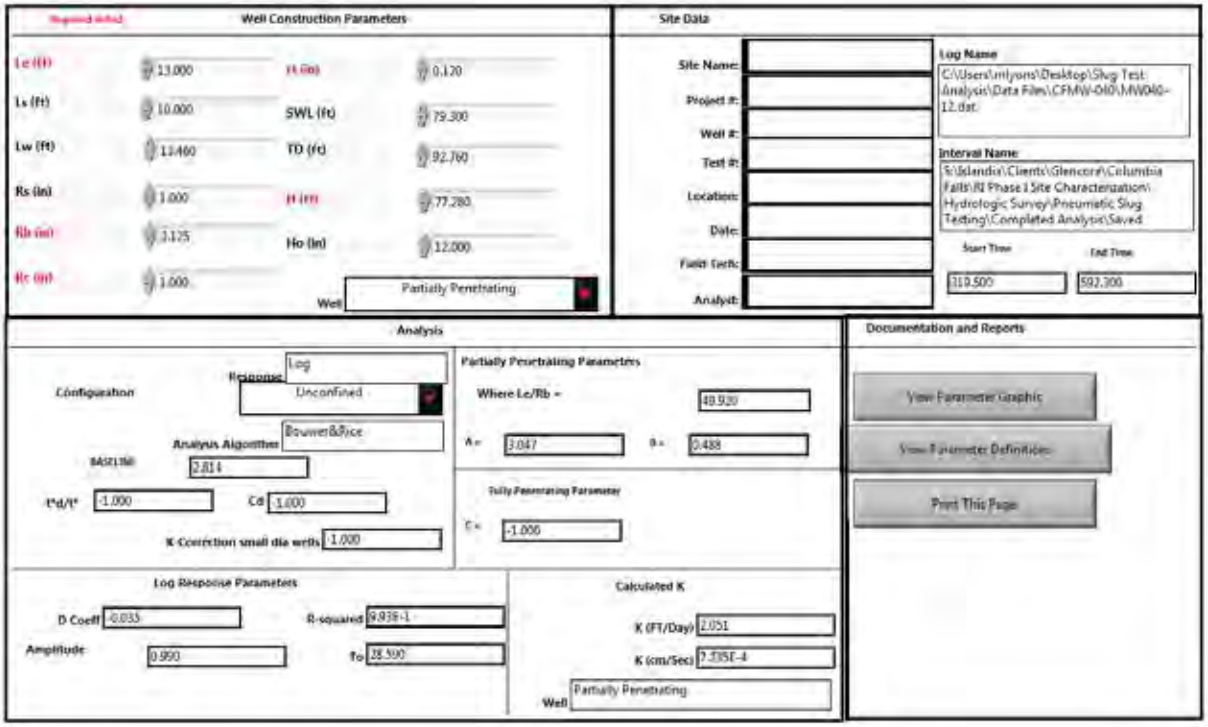


SITE INFORMATION -- SLUG TEST REV. 3.0

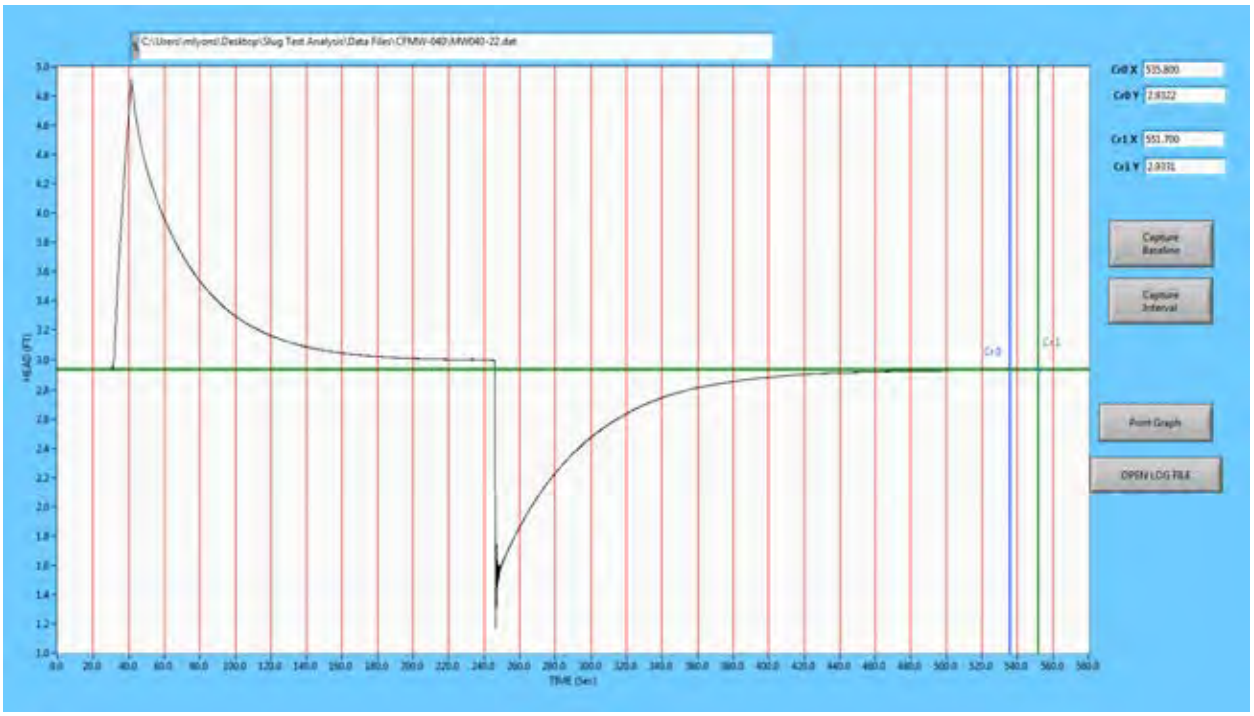
START DATE: 7/14/2017
START TIME: 10:41 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW040-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-040
1 Foot Displacement
Test #2





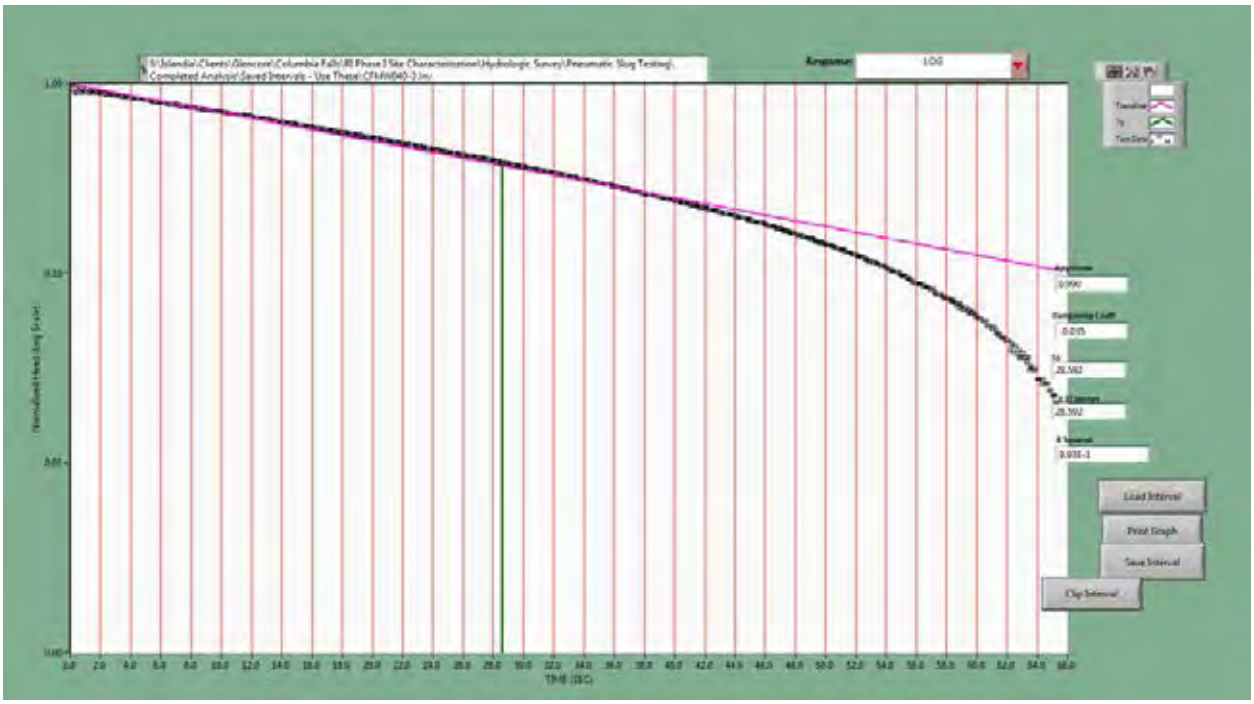
CFMW-040
2 Foot Displacement
Test #1

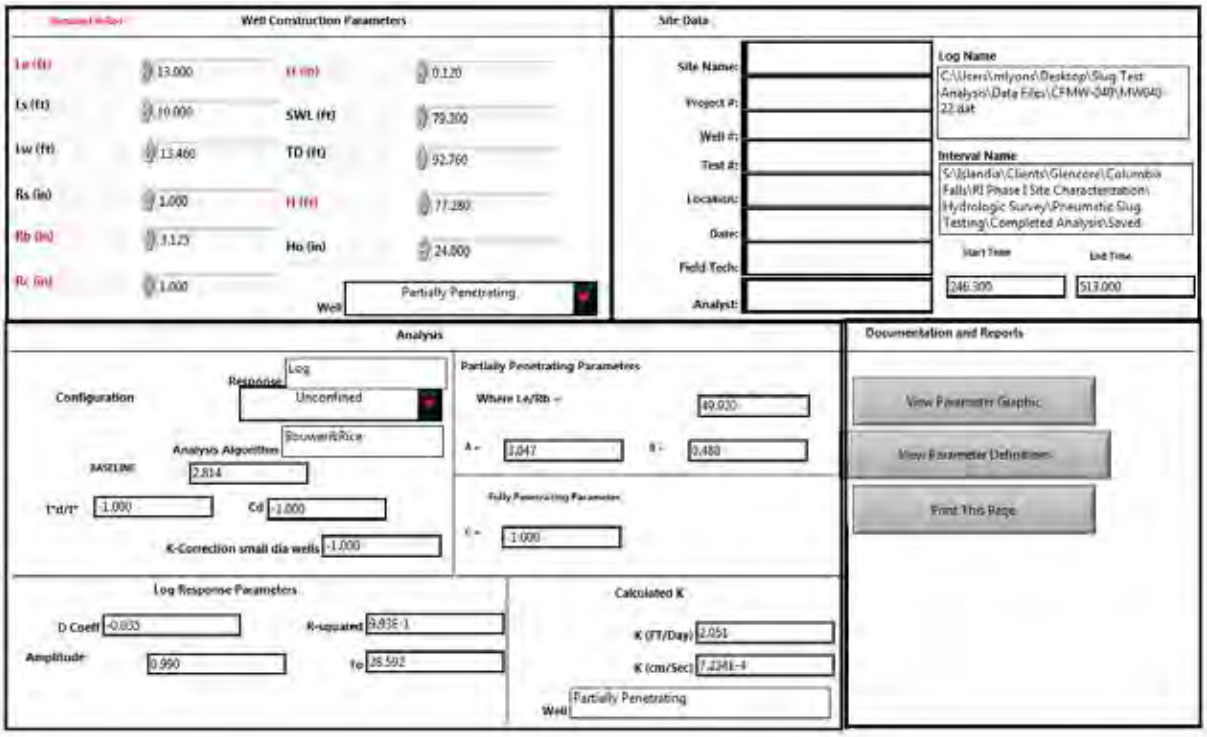


SITE INFORMATION -- SLUG TEST REV. 3.0

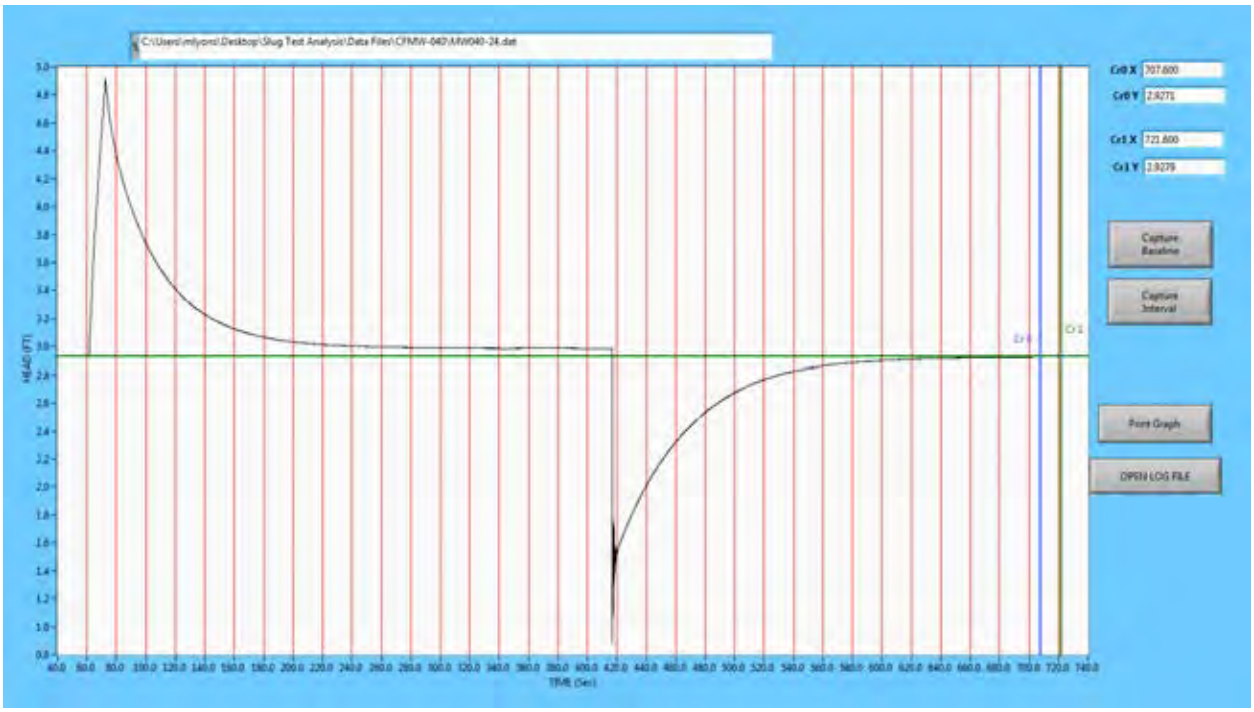
START DATE: 7/14/2017
START TIME: 11:00 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW040-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-040
2 Foot Displacement
Test #1





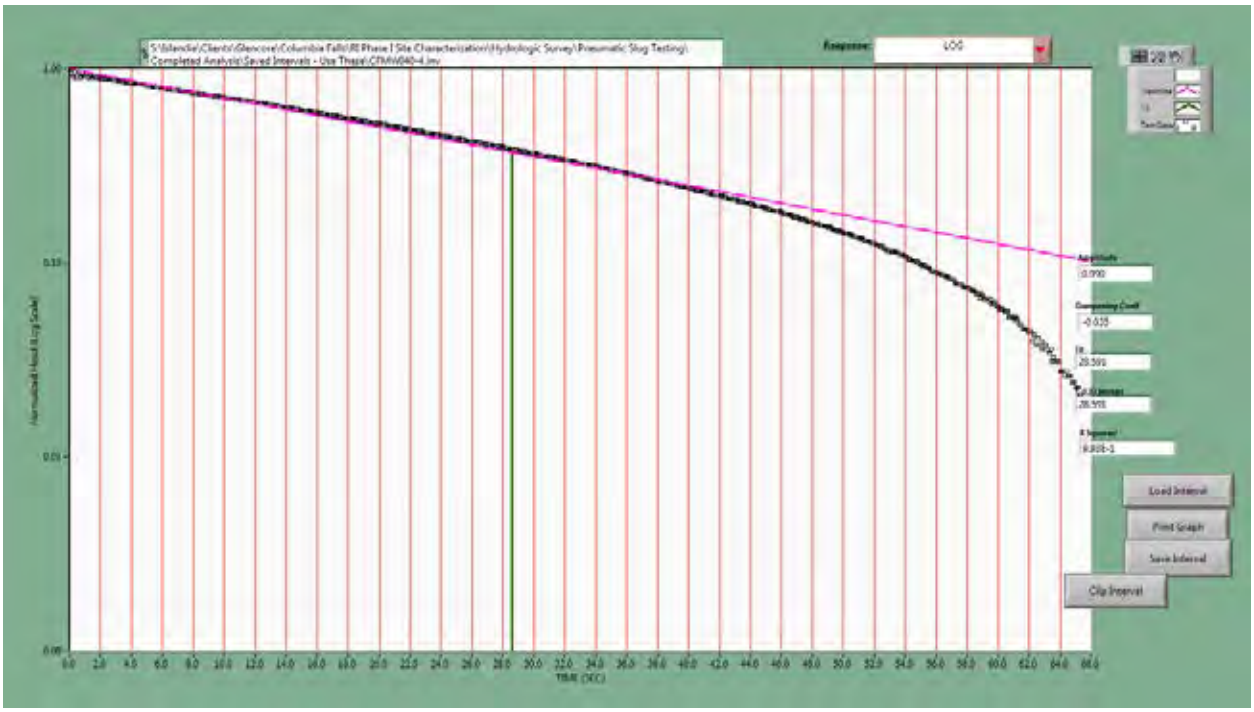
CFMW-040
2 Foot Displacement
Test #2

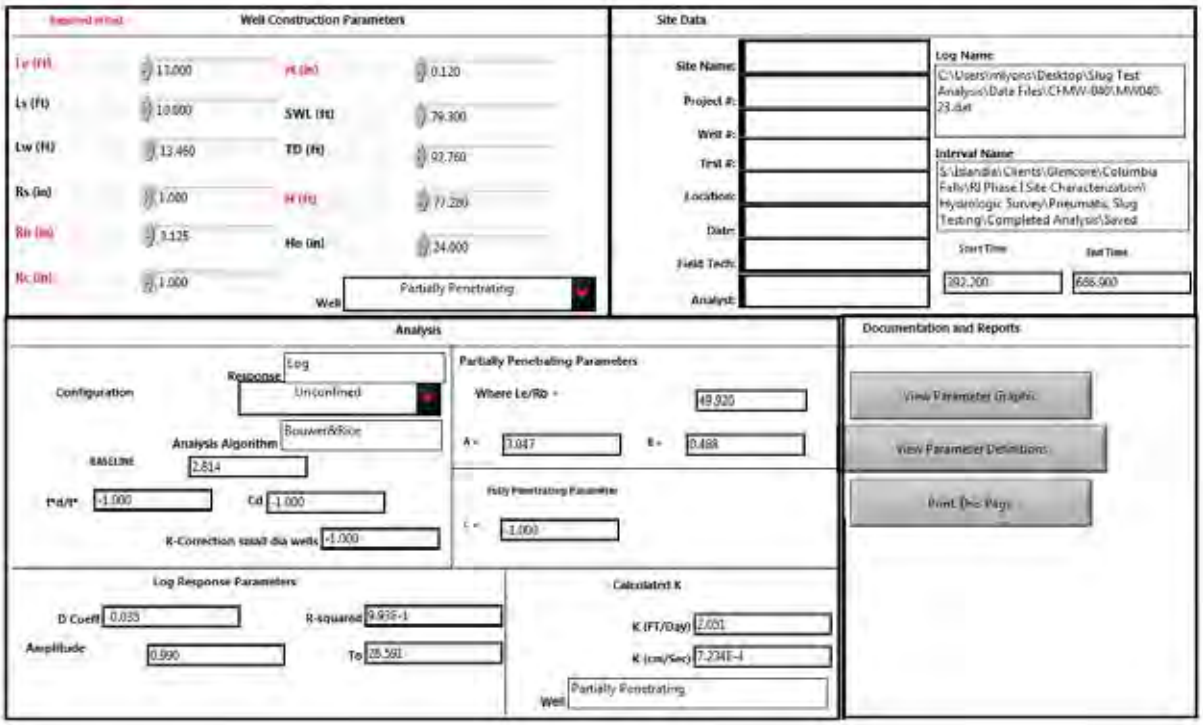


SITE INFORMATION -- SLUG TEST REV. 3.0

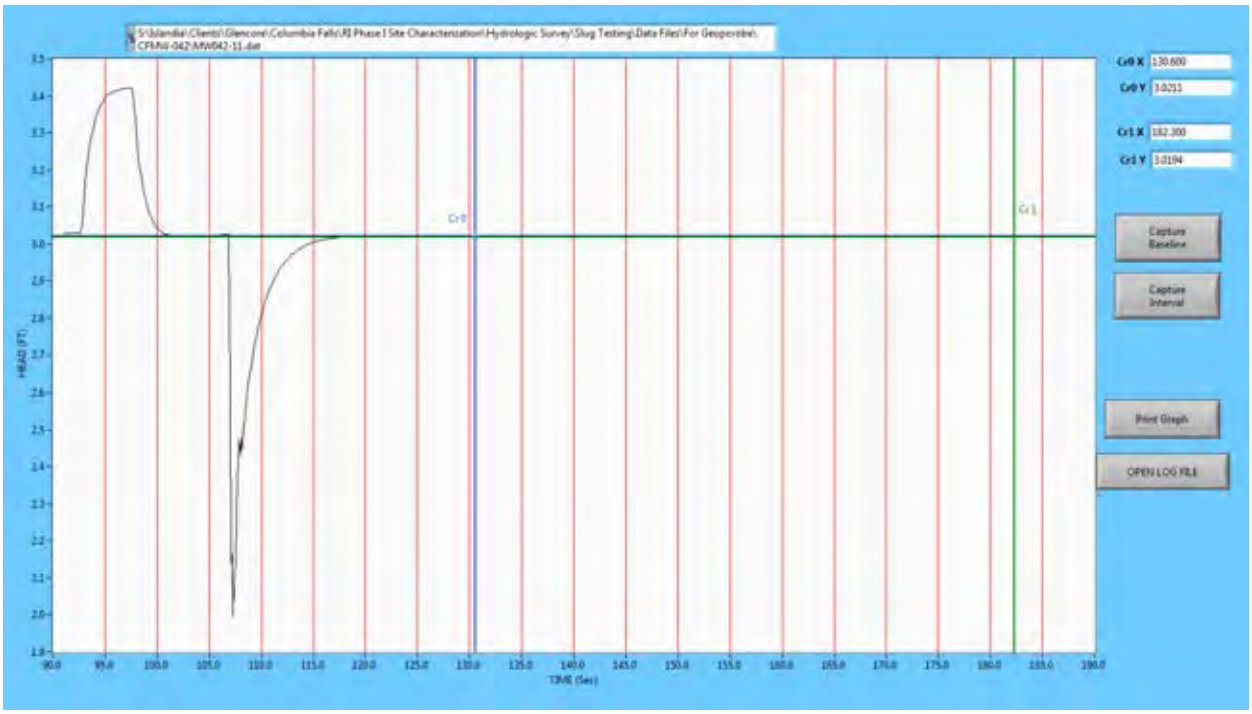
START DATE: 7/14/2017
START TIME: 11:22 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW040-24.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-040
2 Foot Displacement
Test #2





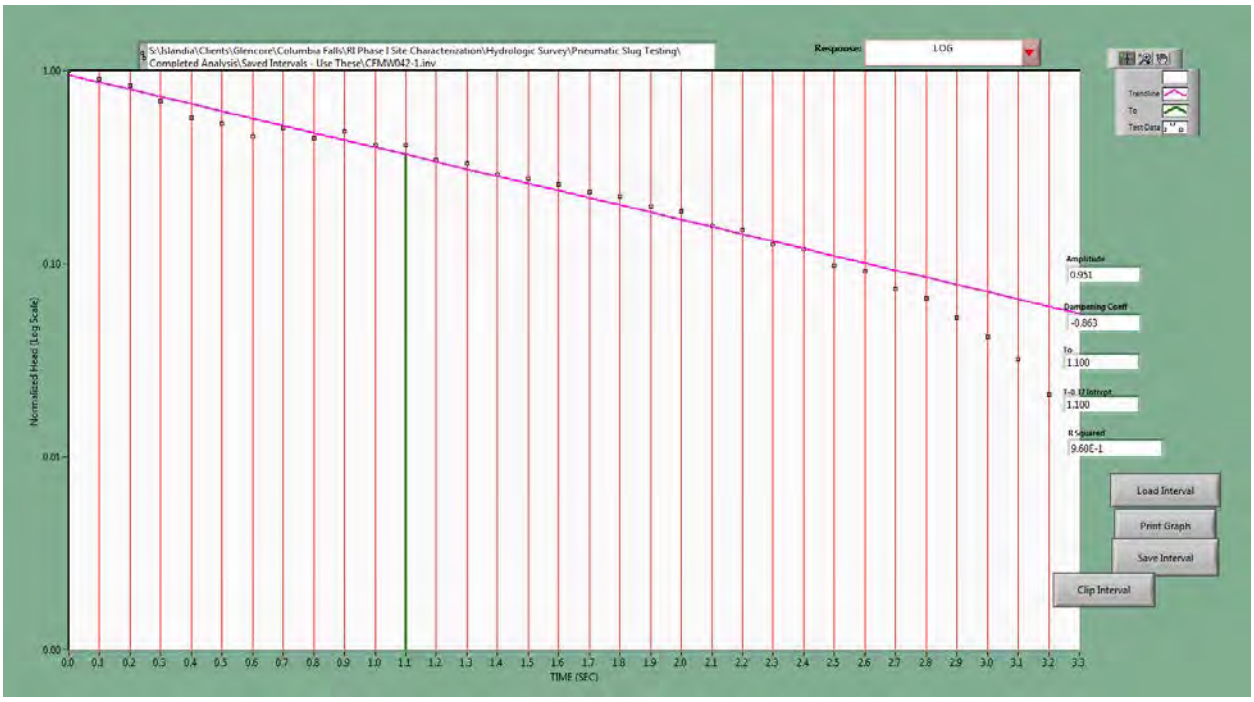
CFMW-042
1 Foot Displacement
Test #1

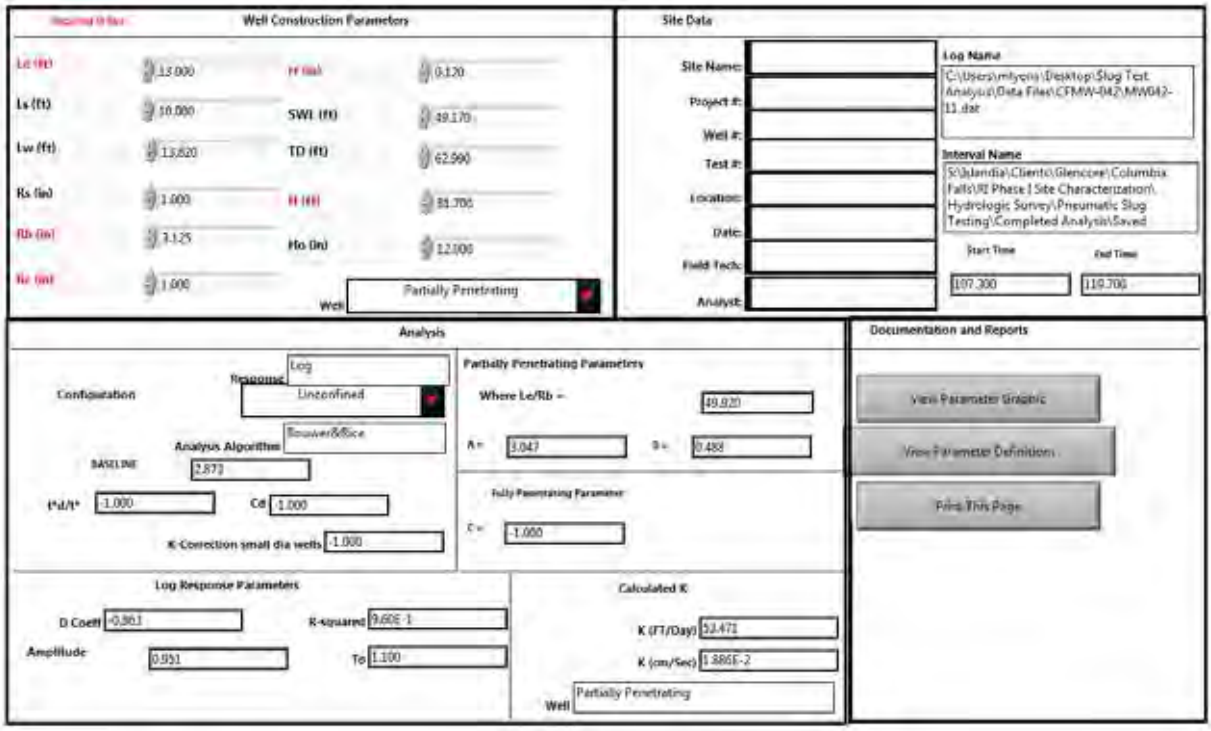


SITE INFORMATION -- SLUG TEST REV. 3.0

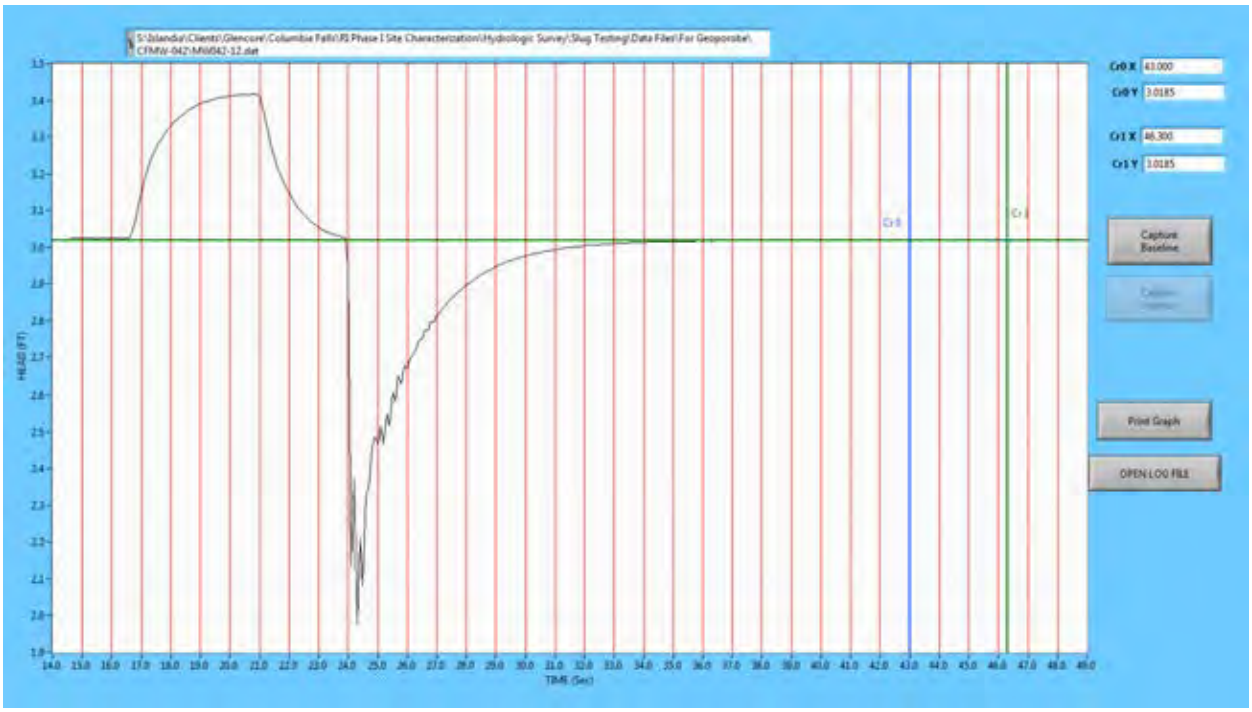
START DATE: 7/11/2017
START TIME: 10:28 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW042-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-042
1 Foot Displacement
Test #1





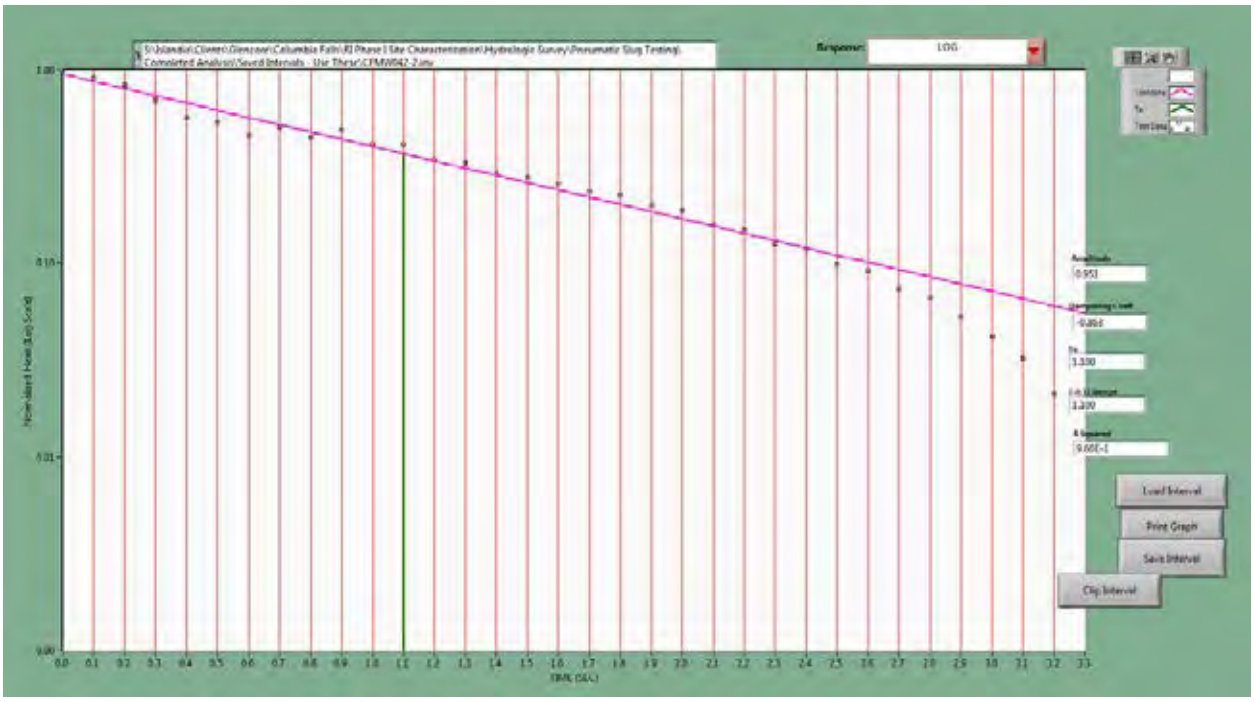
CFMW-042
1 Foot Displacement
Test #2

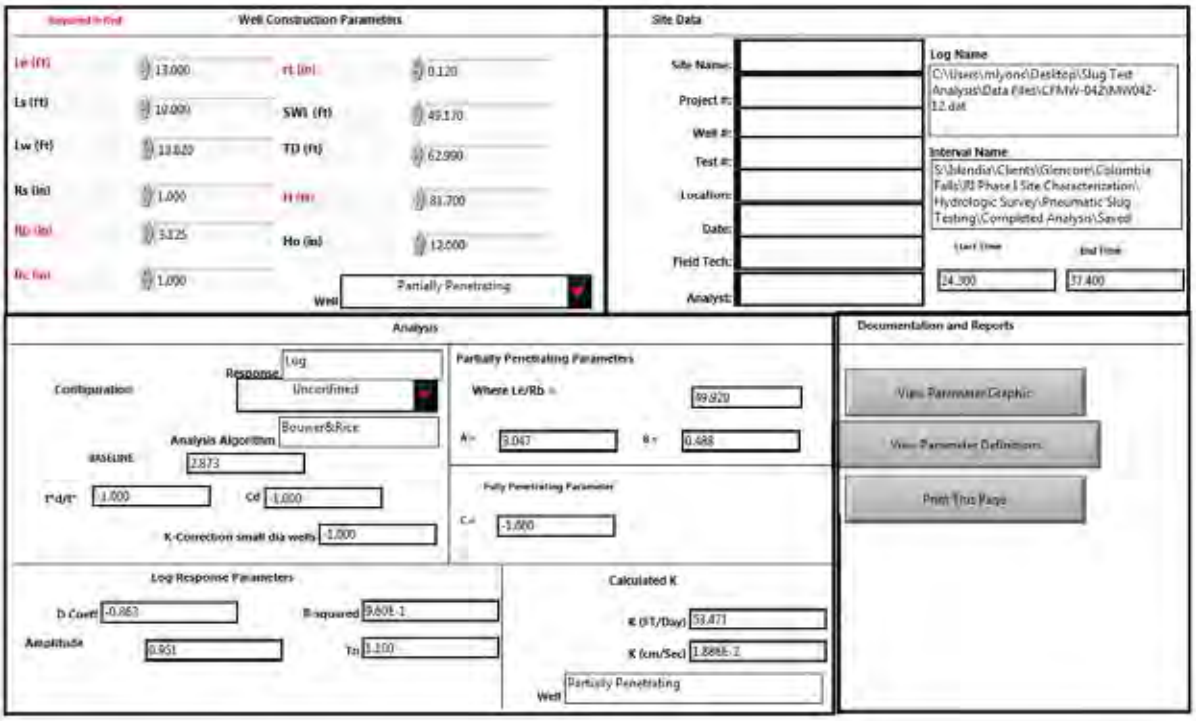


SITE INFORMATION -- SLUG TEST REV. 3.0

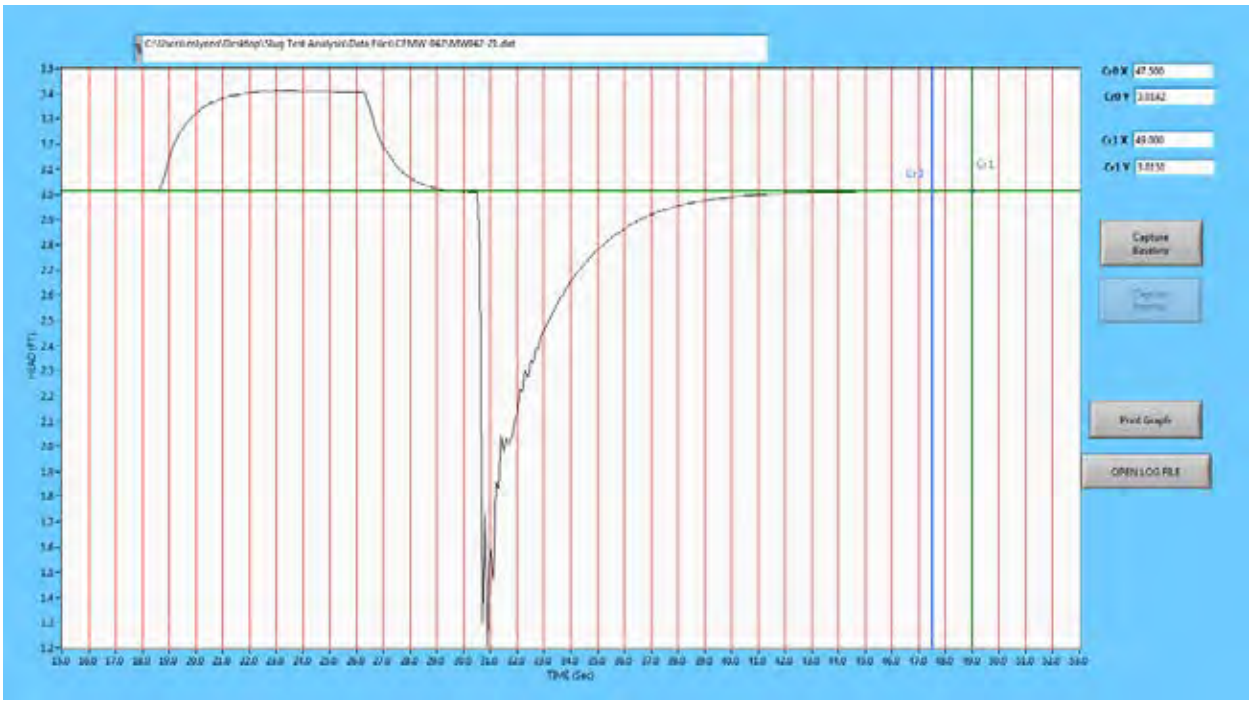
START DATE: 7/11/2017
START TIME: 10:32 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW042-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-042
1 Foot Displacement
Test #2





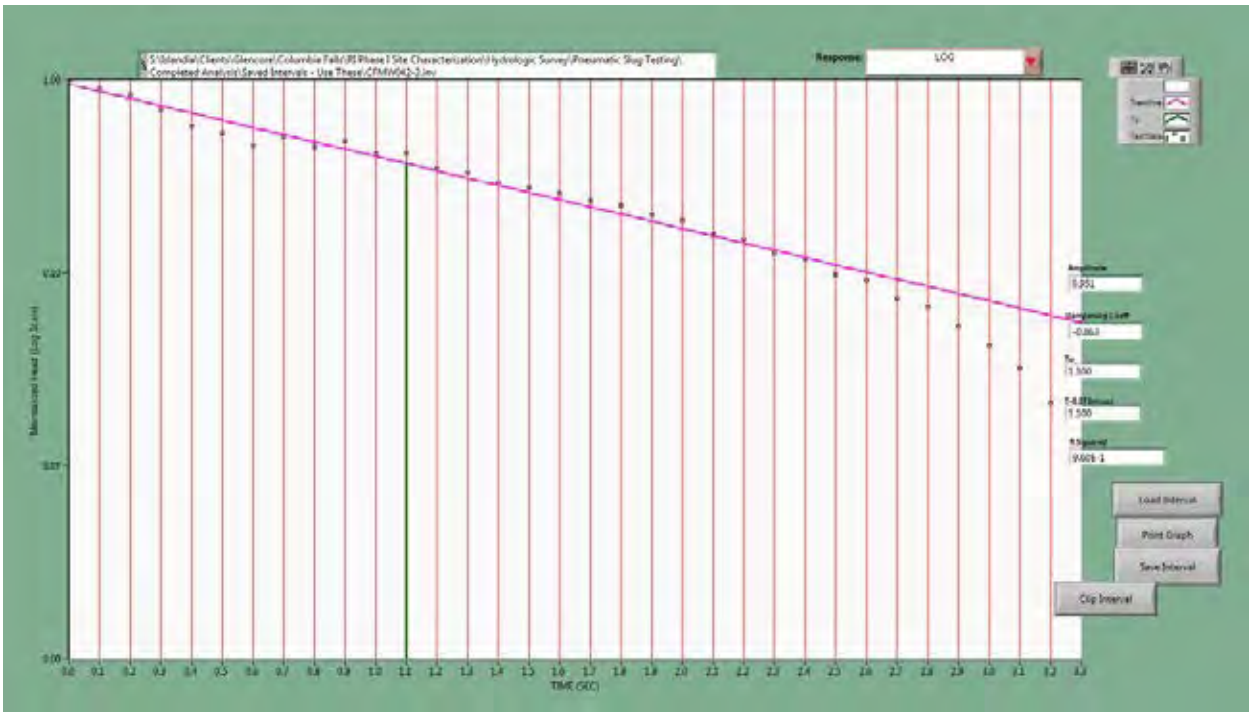
CFMW-042
2 Foot Displacement
Test #1



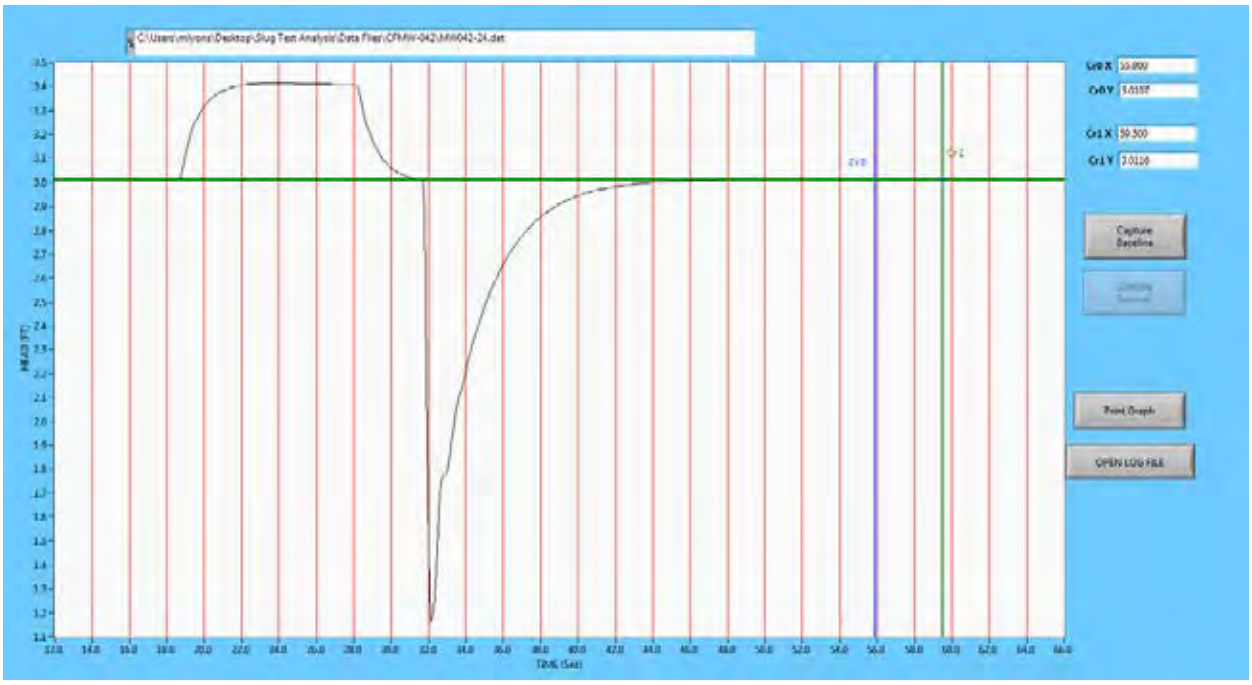
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/11/2017
START TIME: 10:34 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW042-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-042
2 Foot Displacement
Test #1



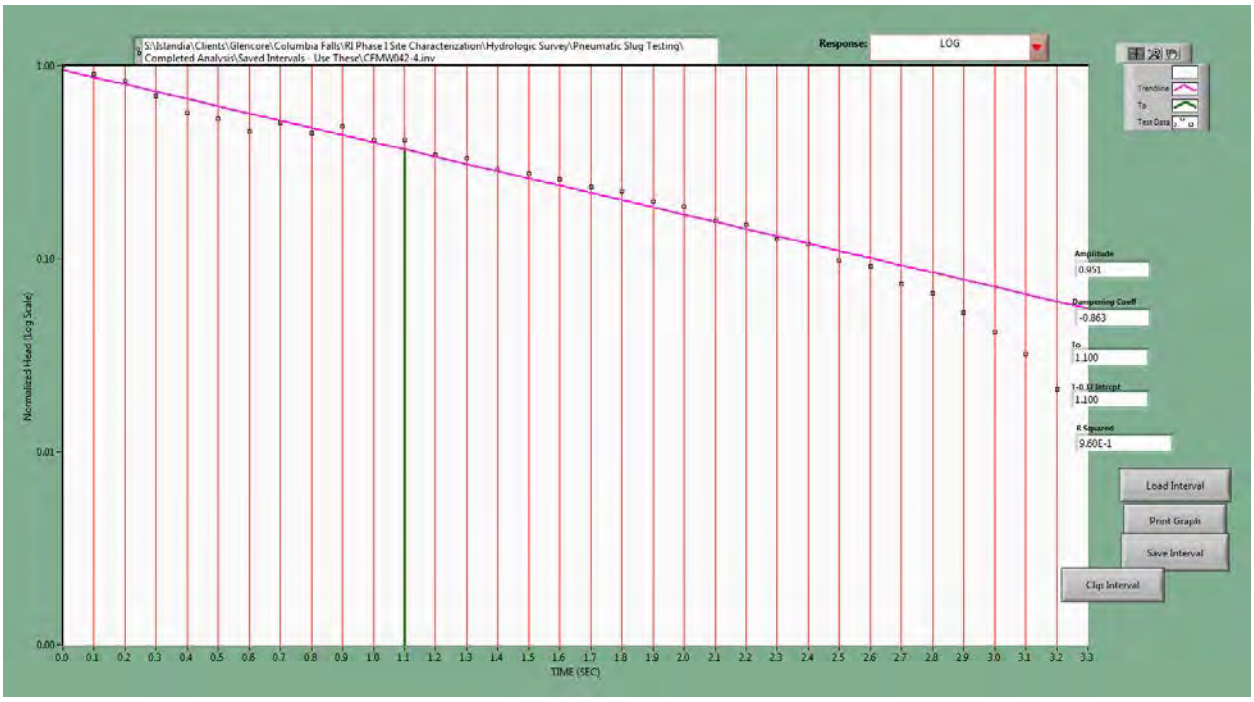
CFMW-042
2 Foot Displacement
Test #2

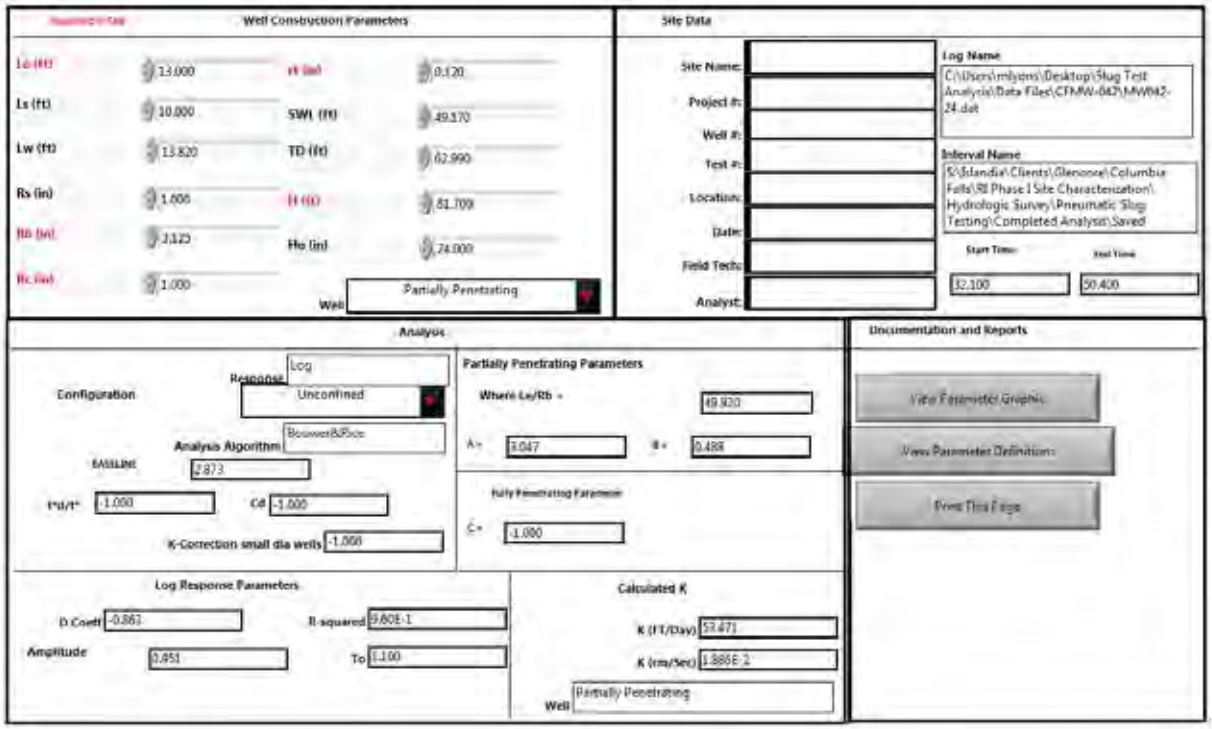


SITE INFORMATION -- SLUG TEST REV. 3.0

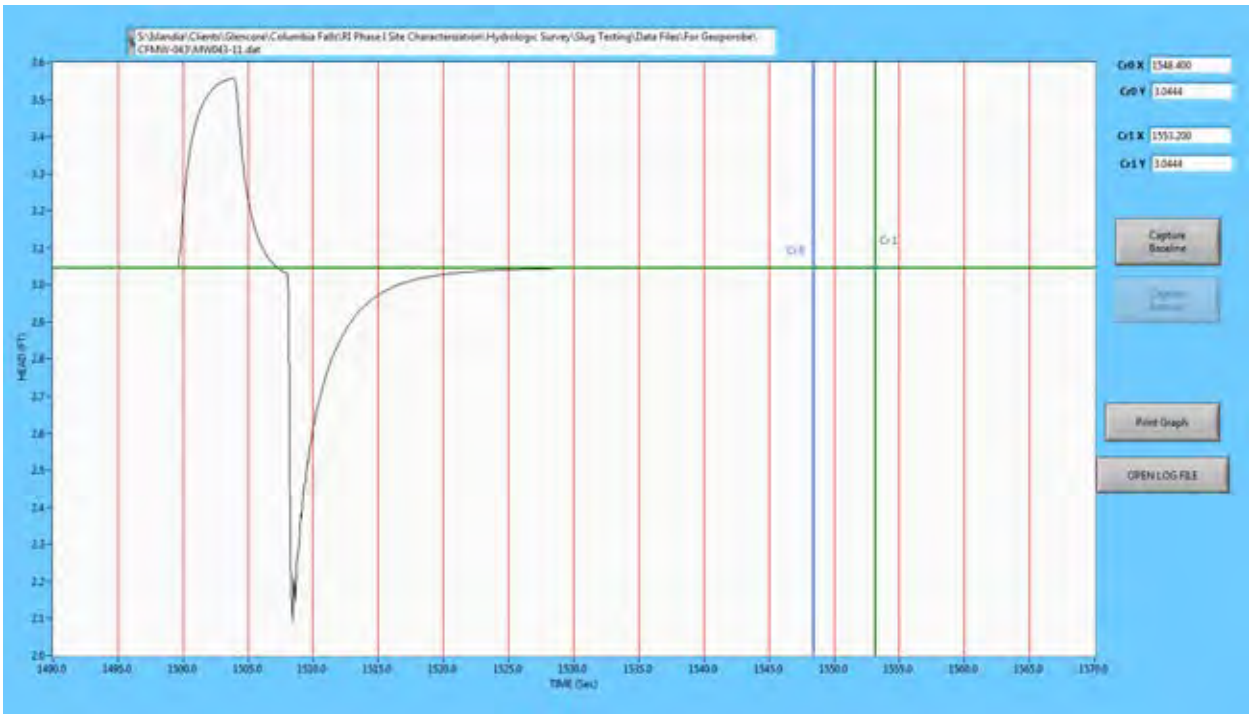
START DATE: 7/11/2017
START TIME: 10:39 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW042-24.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-042
2 Foot Displacement
Test #2





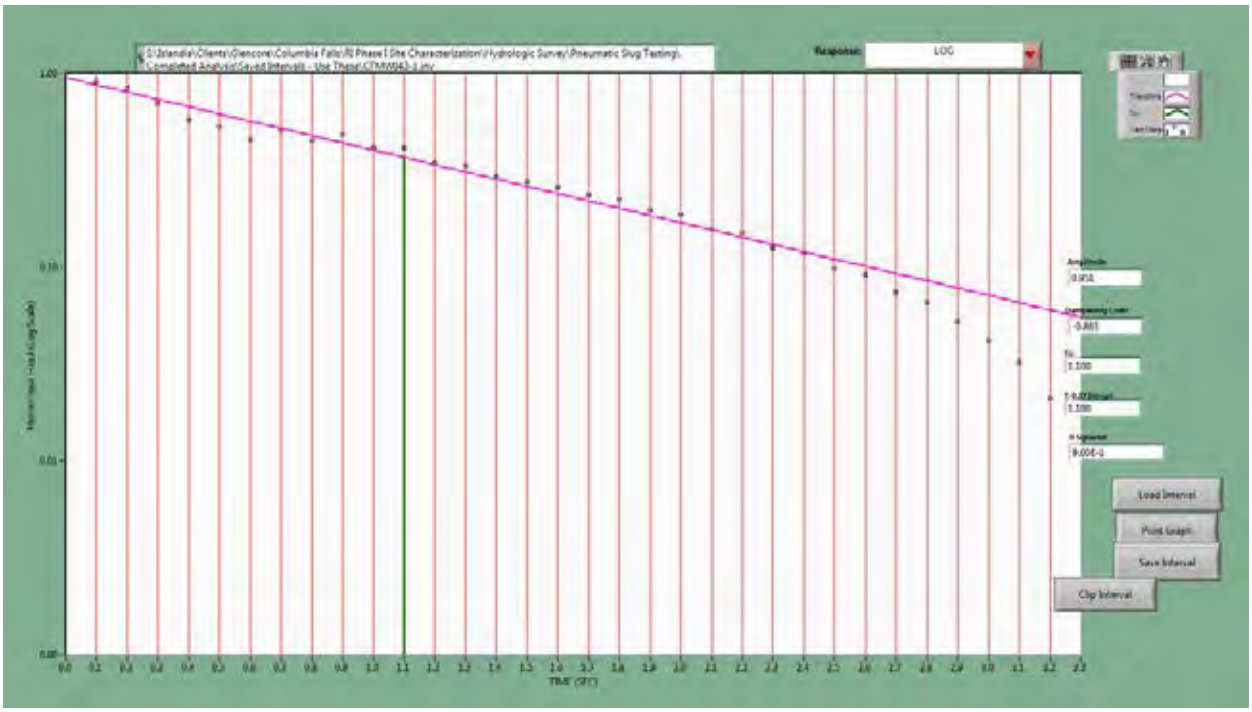
CFMW-043
1 Foot Displacement
Test #1



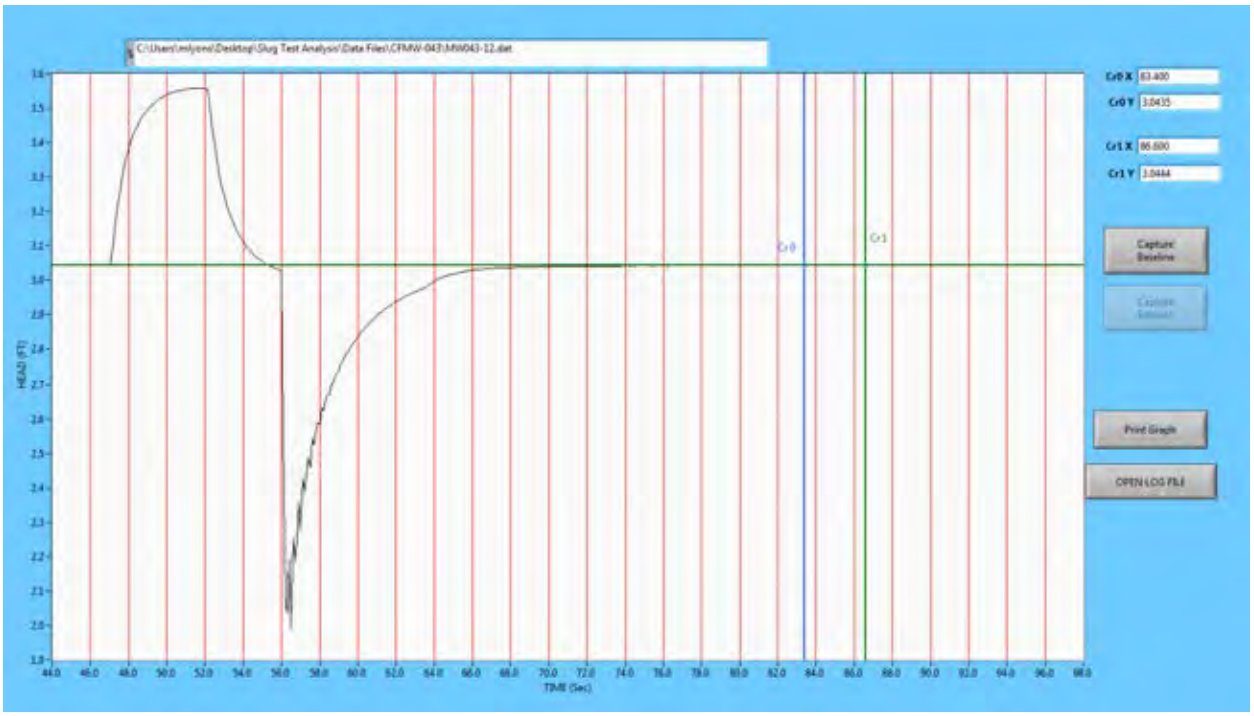
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/10/2017
START TIME: 9:18 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW043-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-043
1 Foot Displacement
Test #1



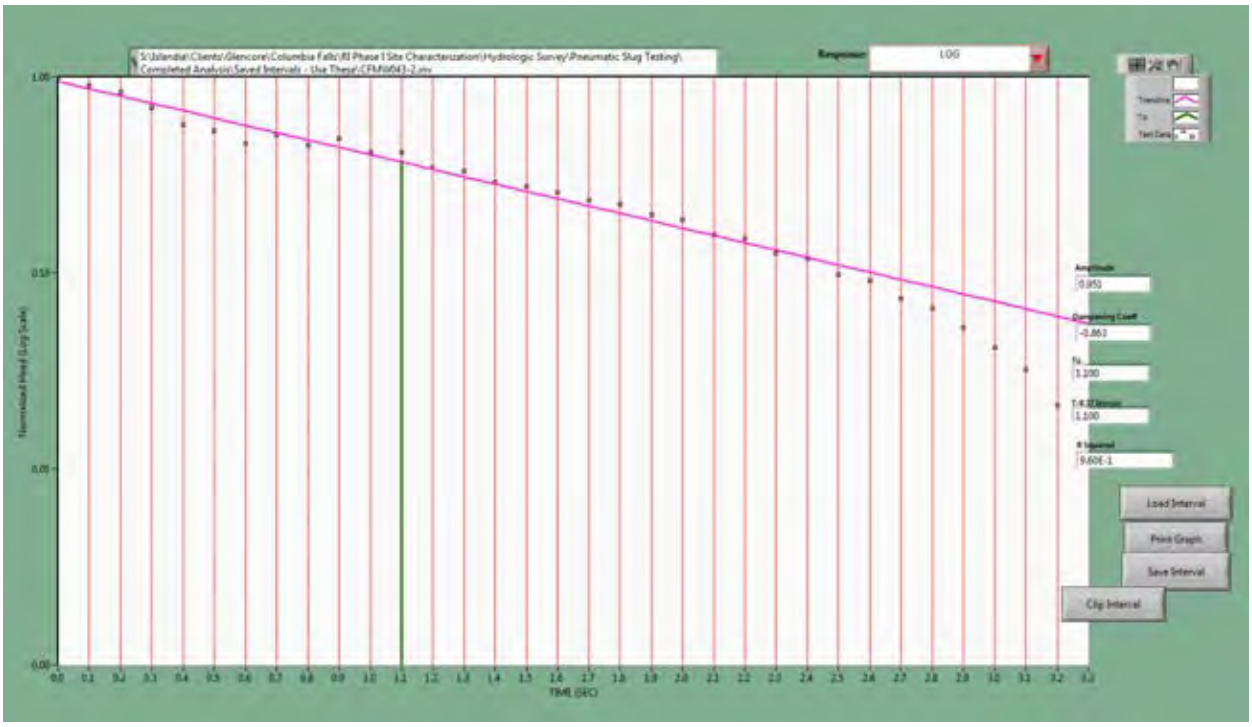
CFMW-043
1 Foot Displacement
Test #2

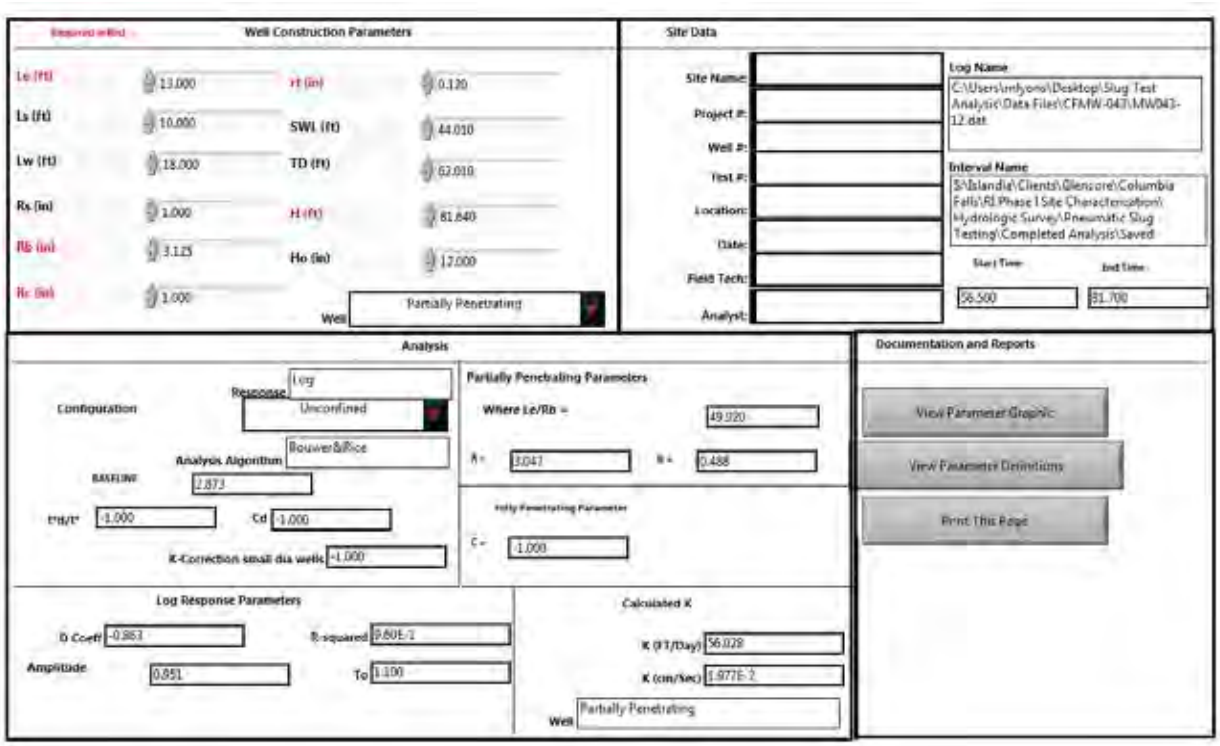


SITE INFORMATION -- SLUG TEST REV. 3.0

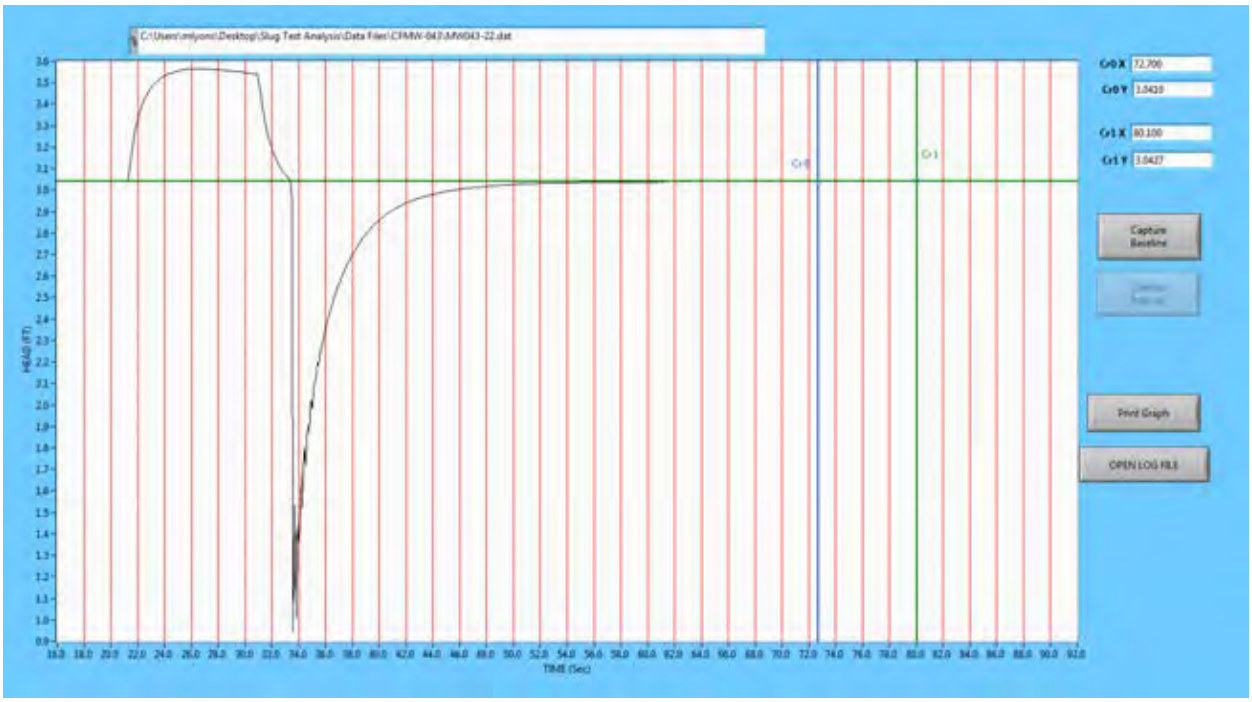
START DATE: 7/10/2017
START TIME: 9:48 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW043-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-043
1 Foot Displacement
Test #2





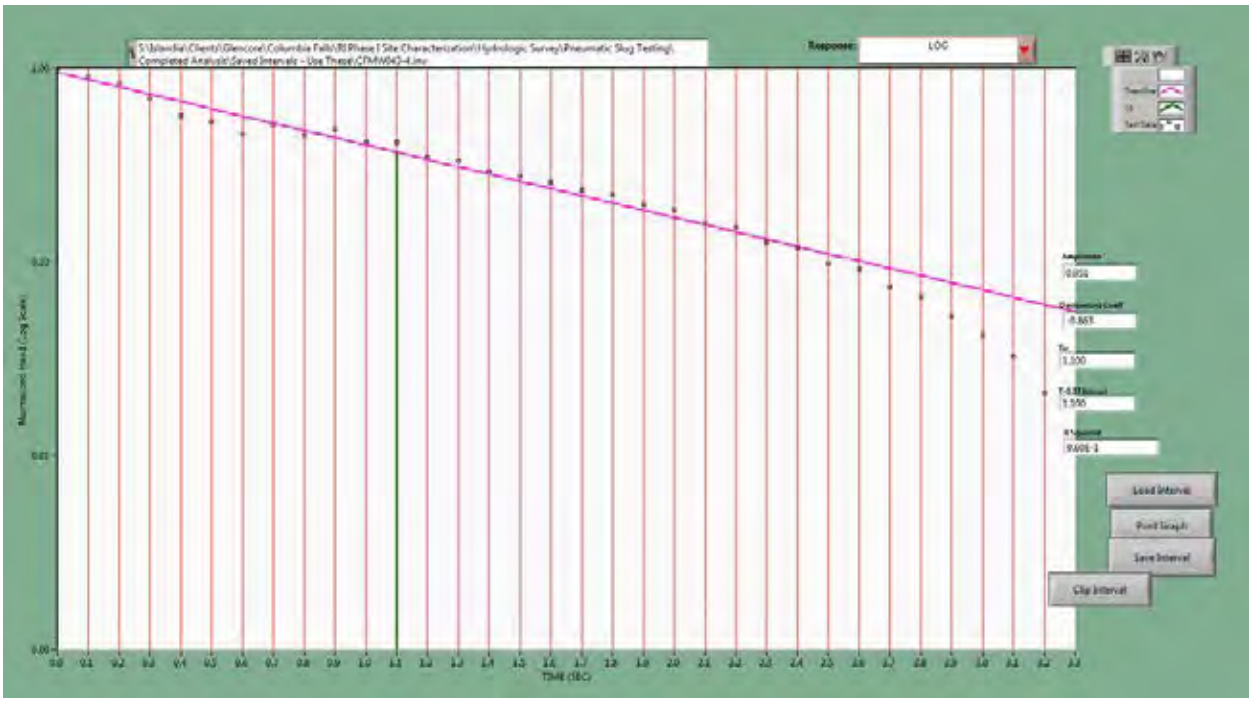
CFMW-043
2 Foot Displacement
Test #1

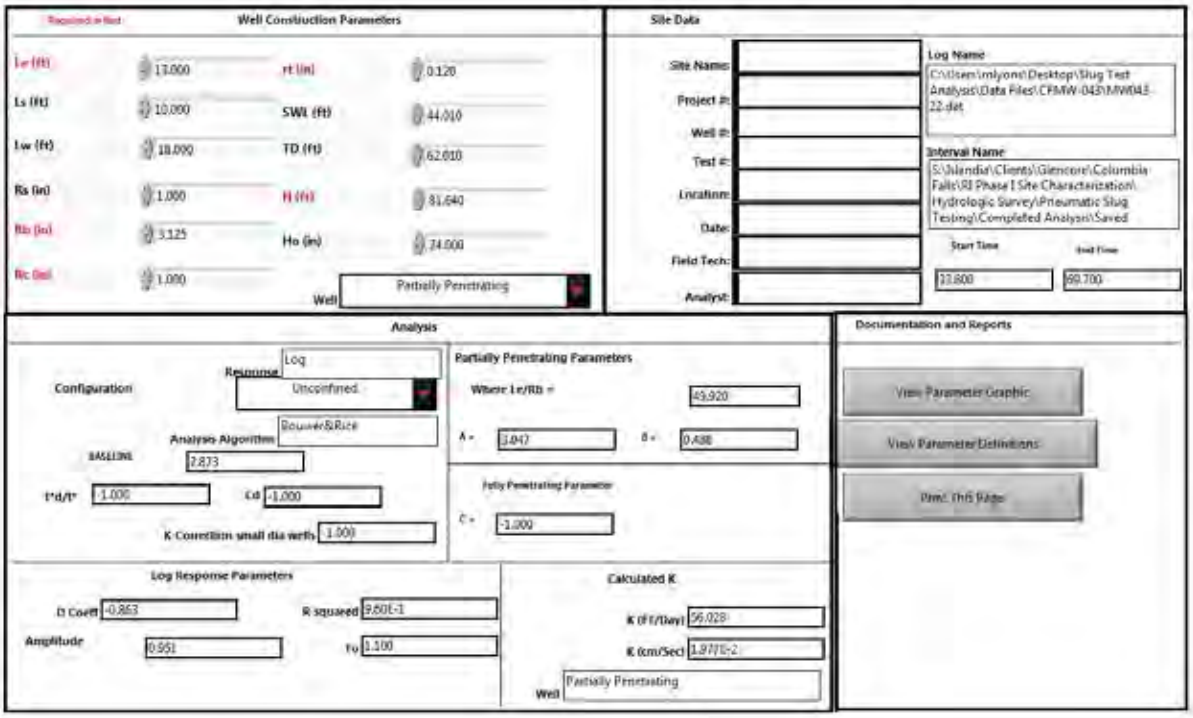


SITE INFORMATION -- SLUG TEST REV. 3.0

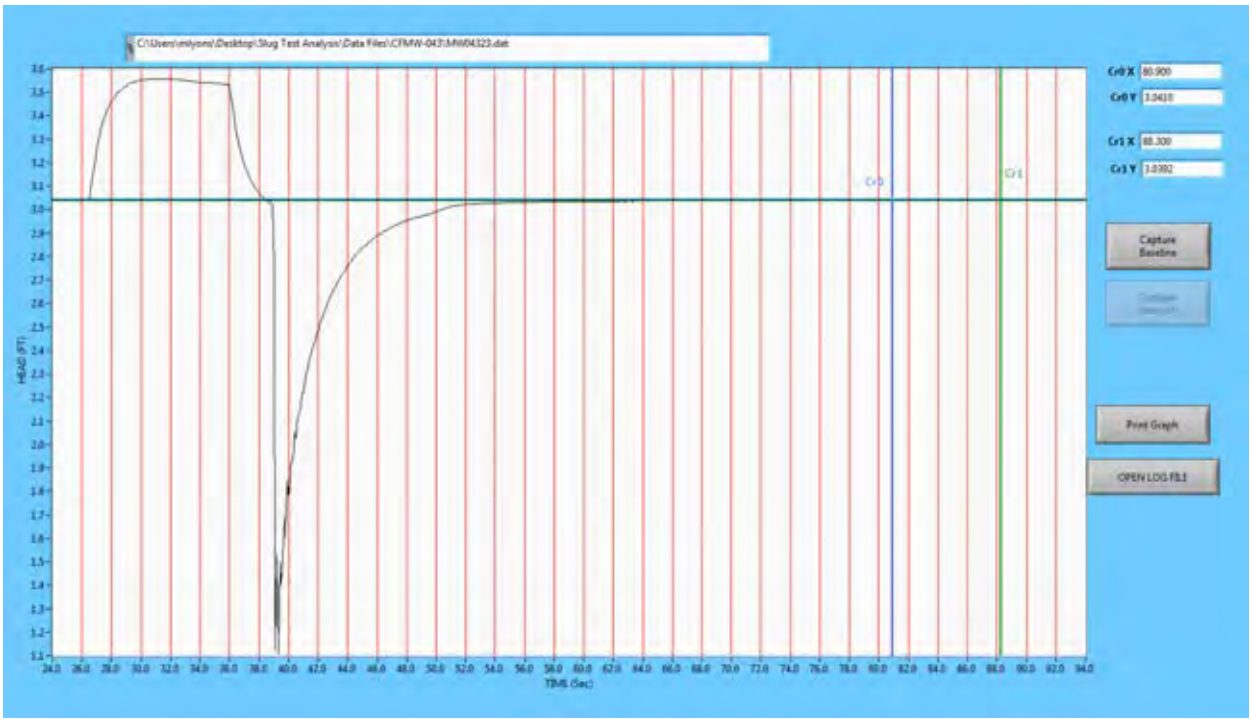
START DATE: 7/10/2017
START TIME: 9:54 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW043-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-043
2 Foot Displacement
Test #1





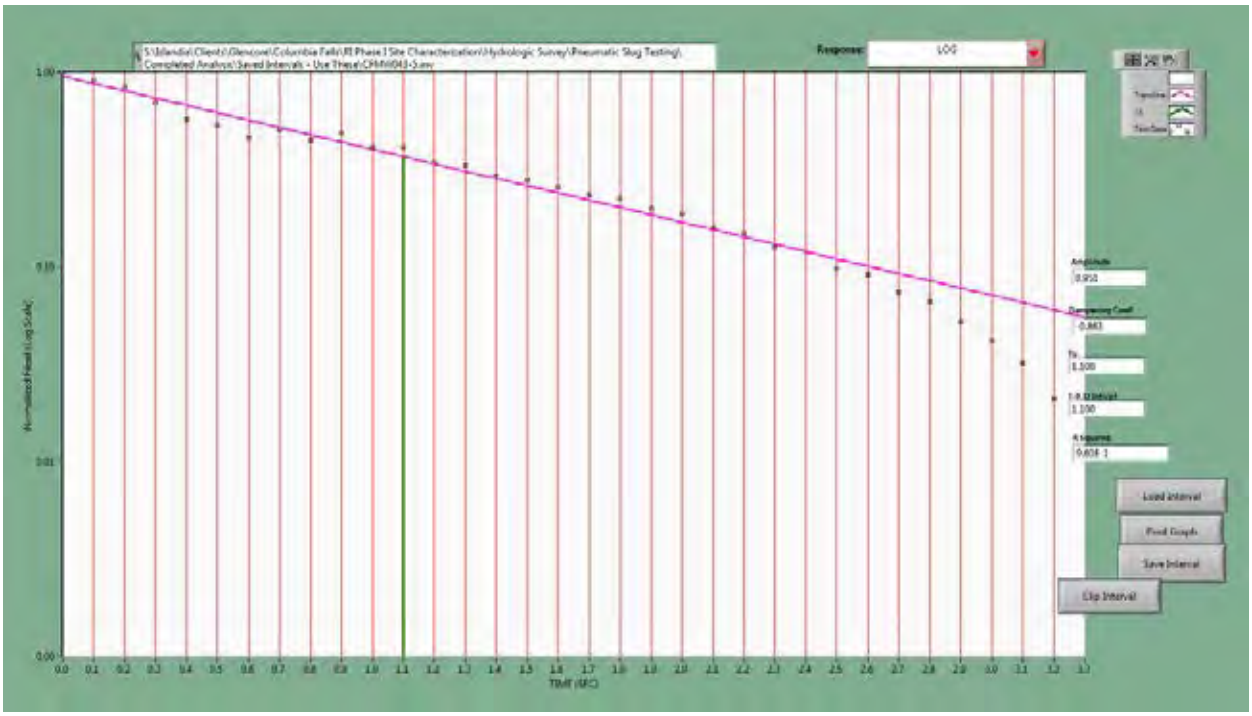
CFMW-043
2 Foot Displacement
Test #2

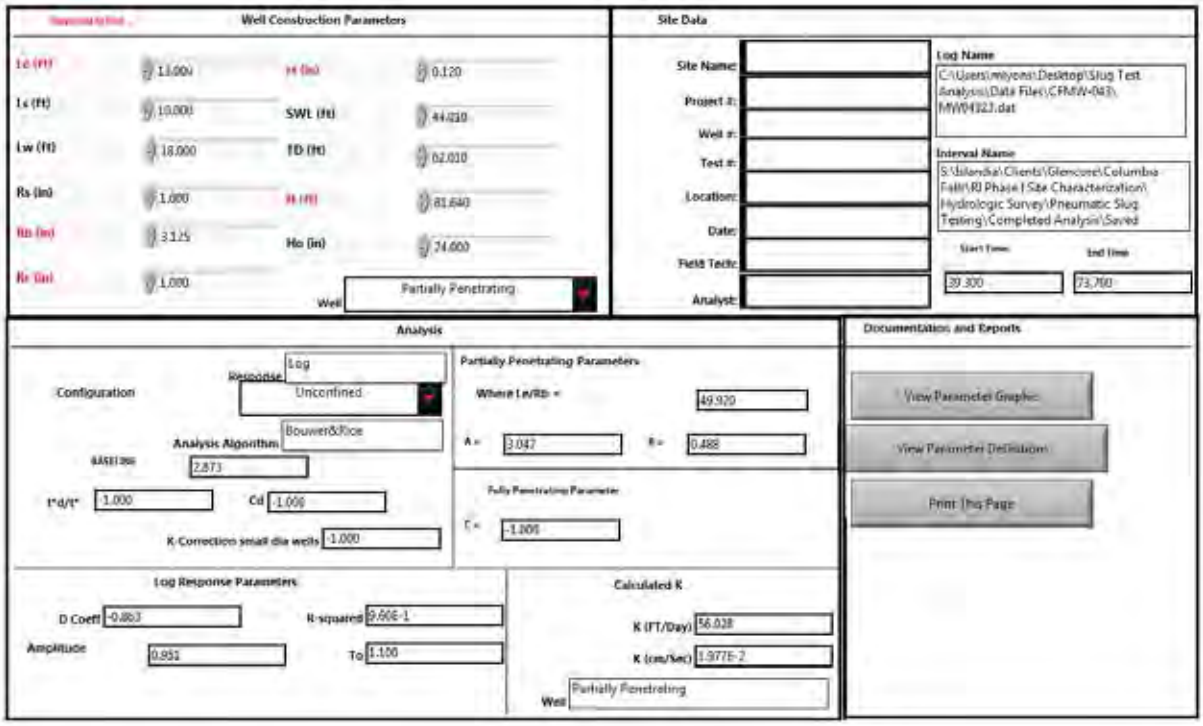


SITE INFORMATION -- SLUG TEST REV. 3.0

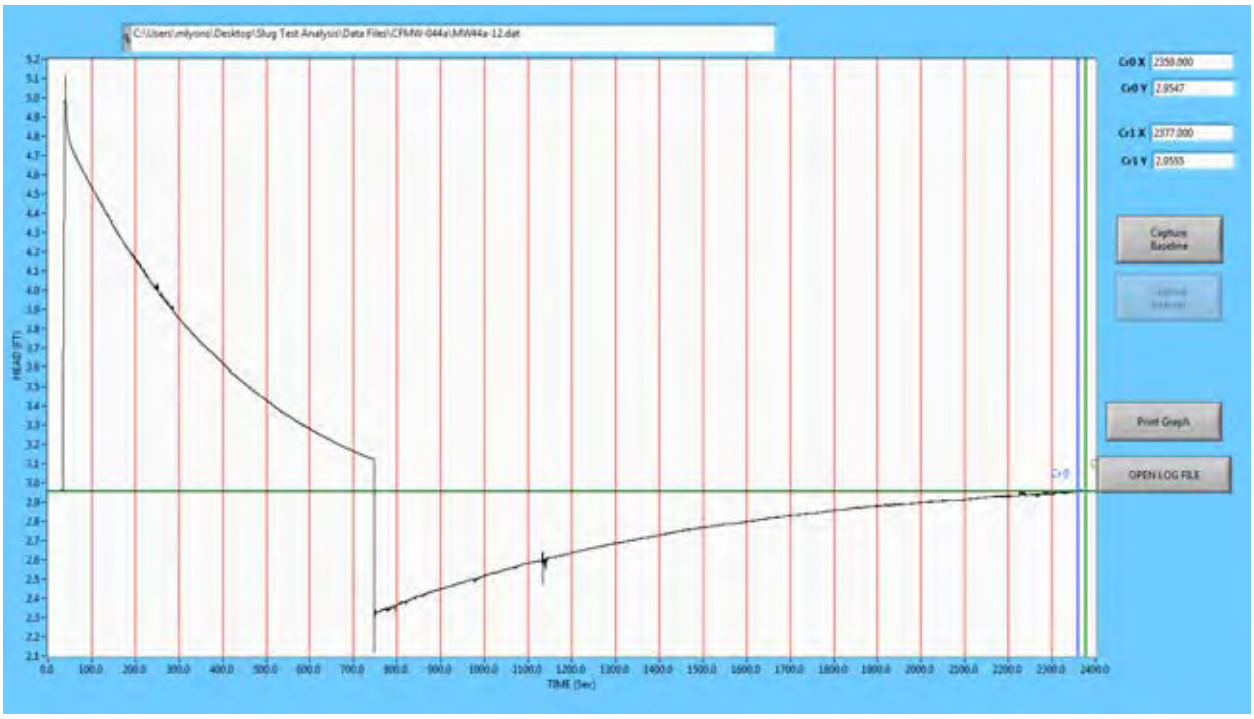
START DATE: 7/10/2017
START TIME: 10:00 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW04323.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-043
2 Foot Displacement
Test #2





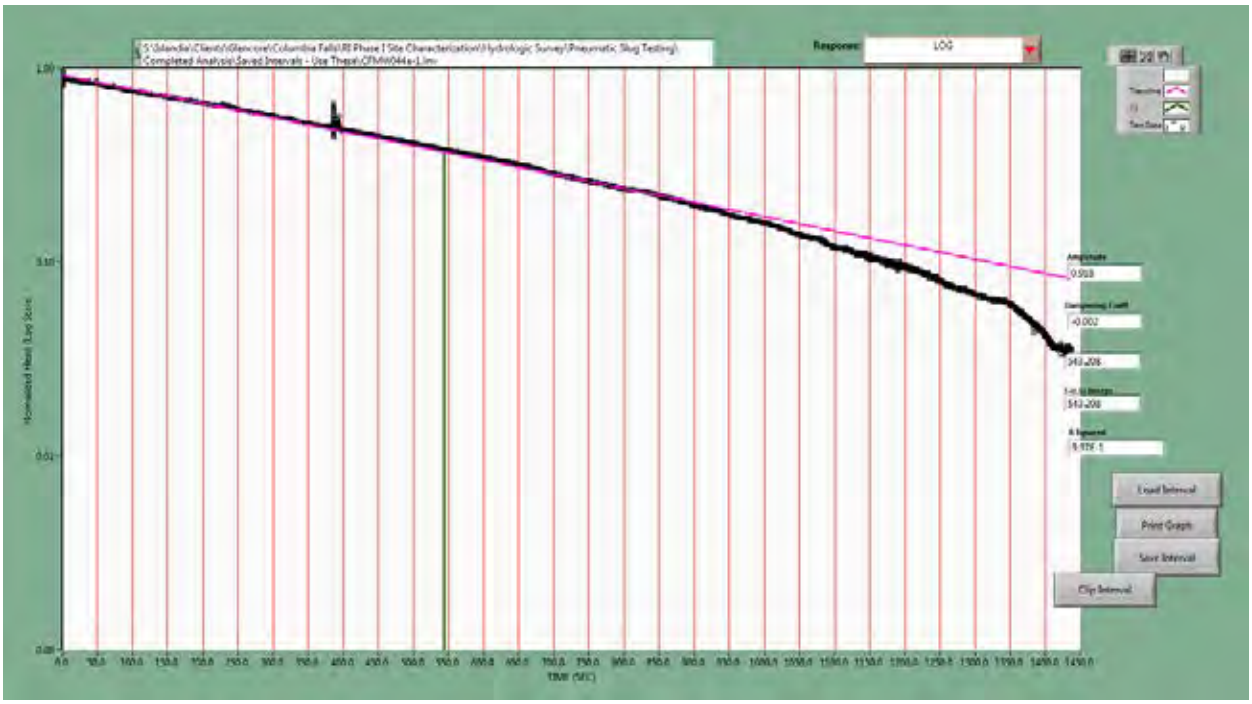
CFMW-044a
1 Foot Displacement
Test #1

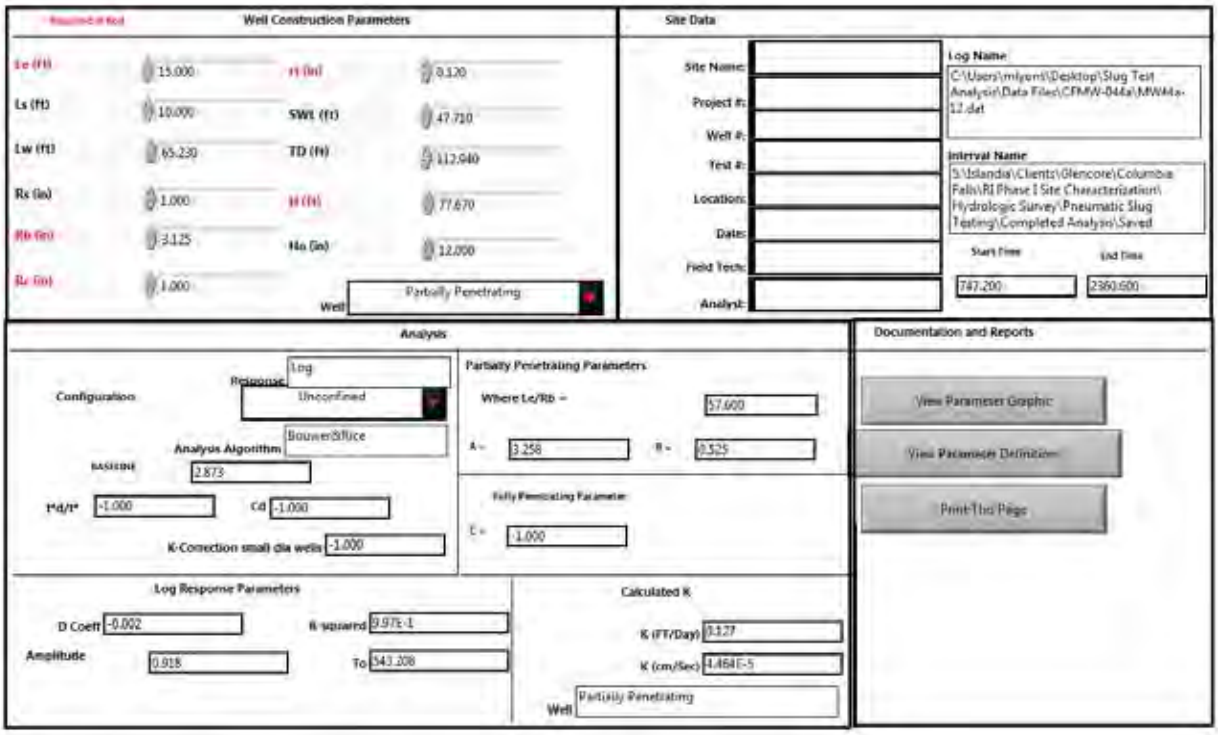


SITE INFORMATION -- SLUG TEST REV. 3.0

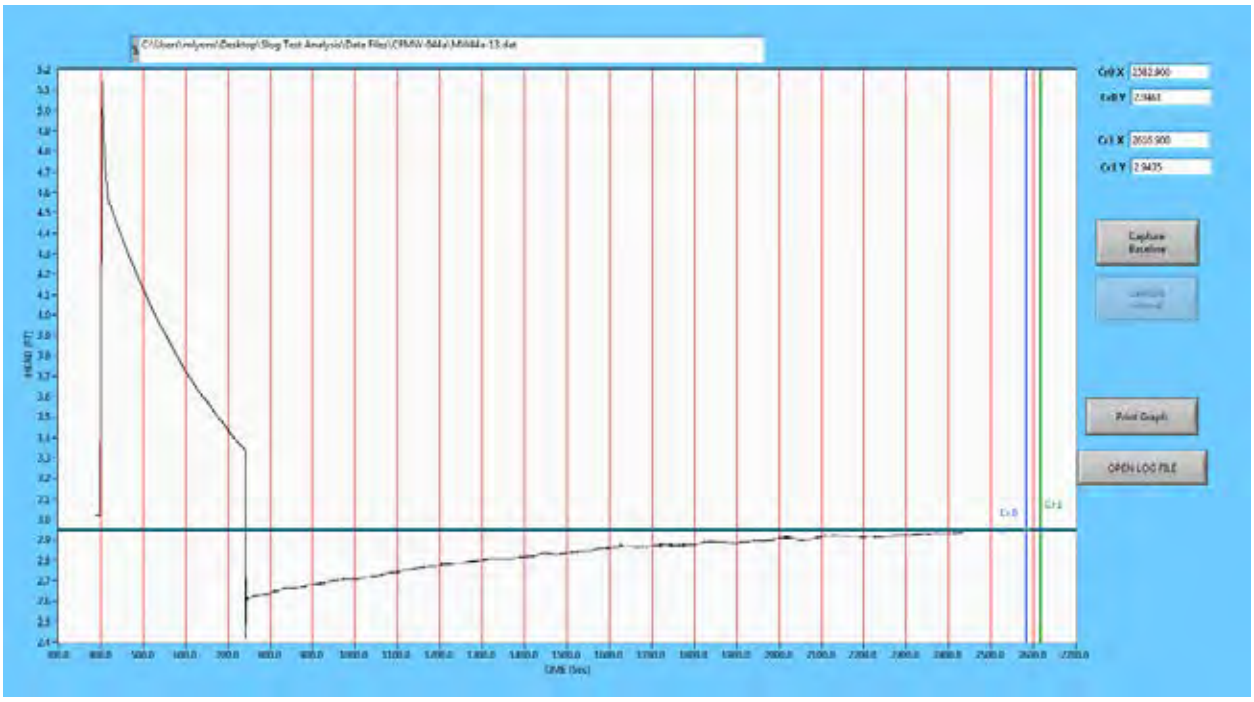
START DATE: 7/12/2017
START TIME: 4:45 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW44A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-044a
1 Foot Displacement
Test #1





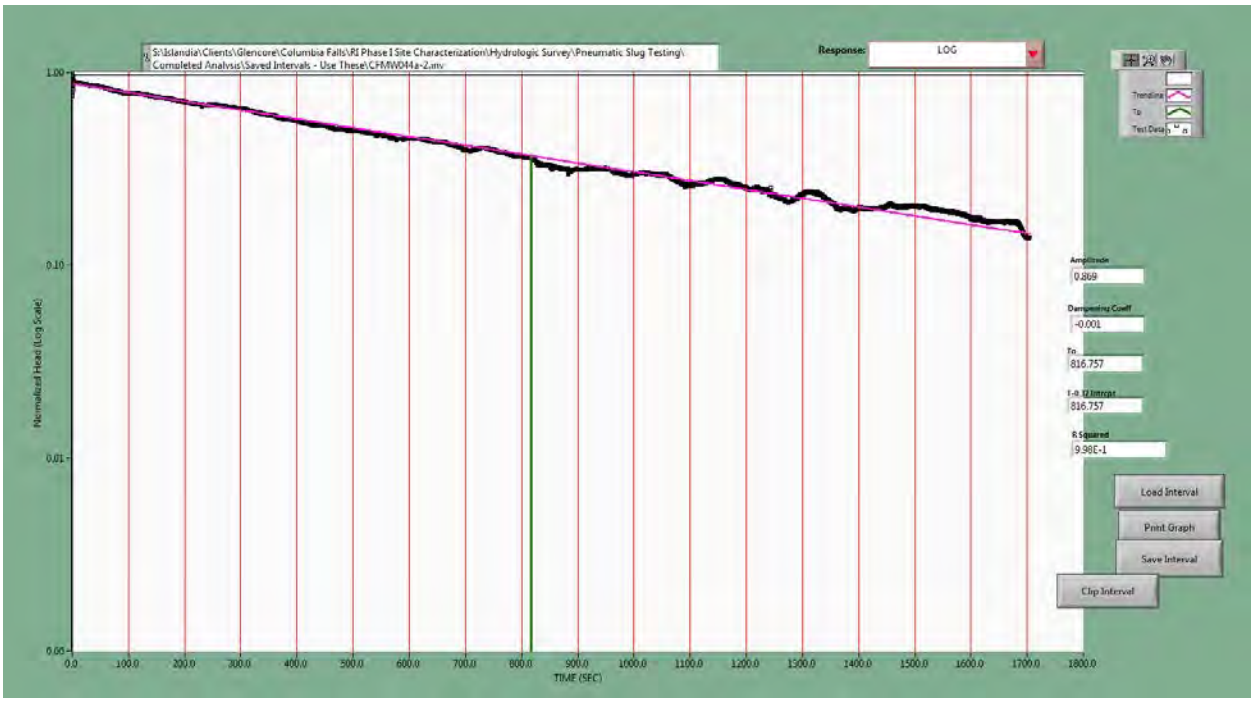
CFMW-044a
1 Foot Displacement
Test #2

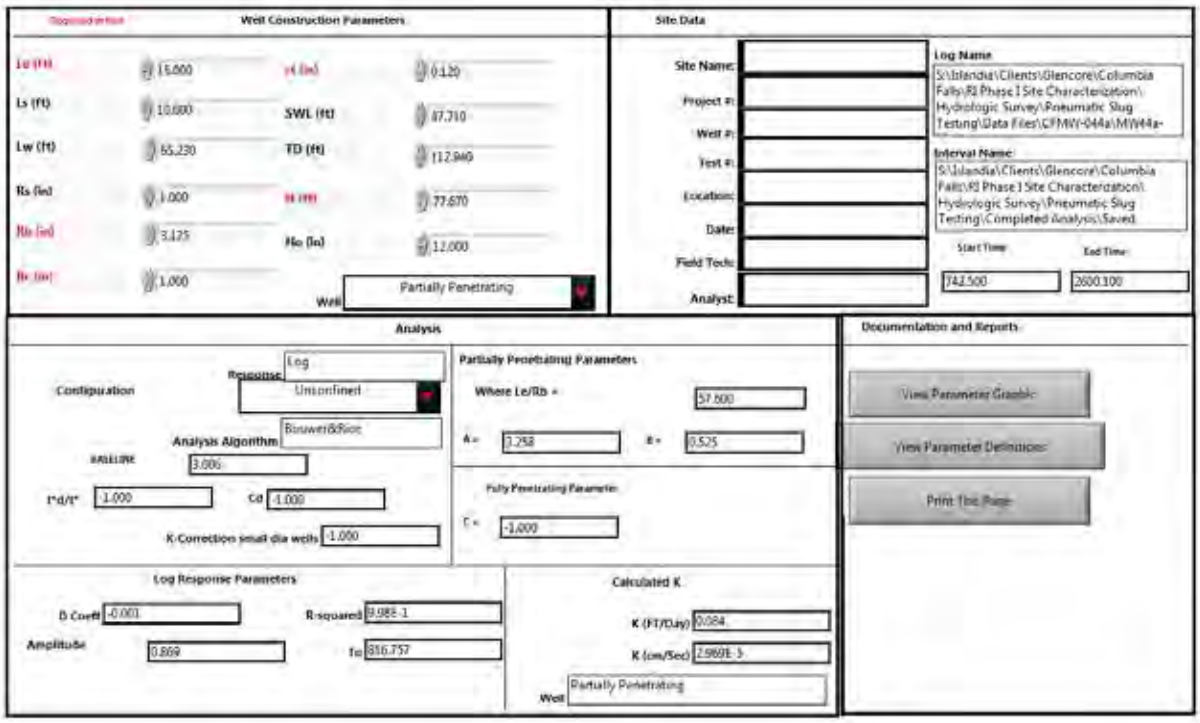


SITE INFORMATION -- SLUG TEST REV. 3.0

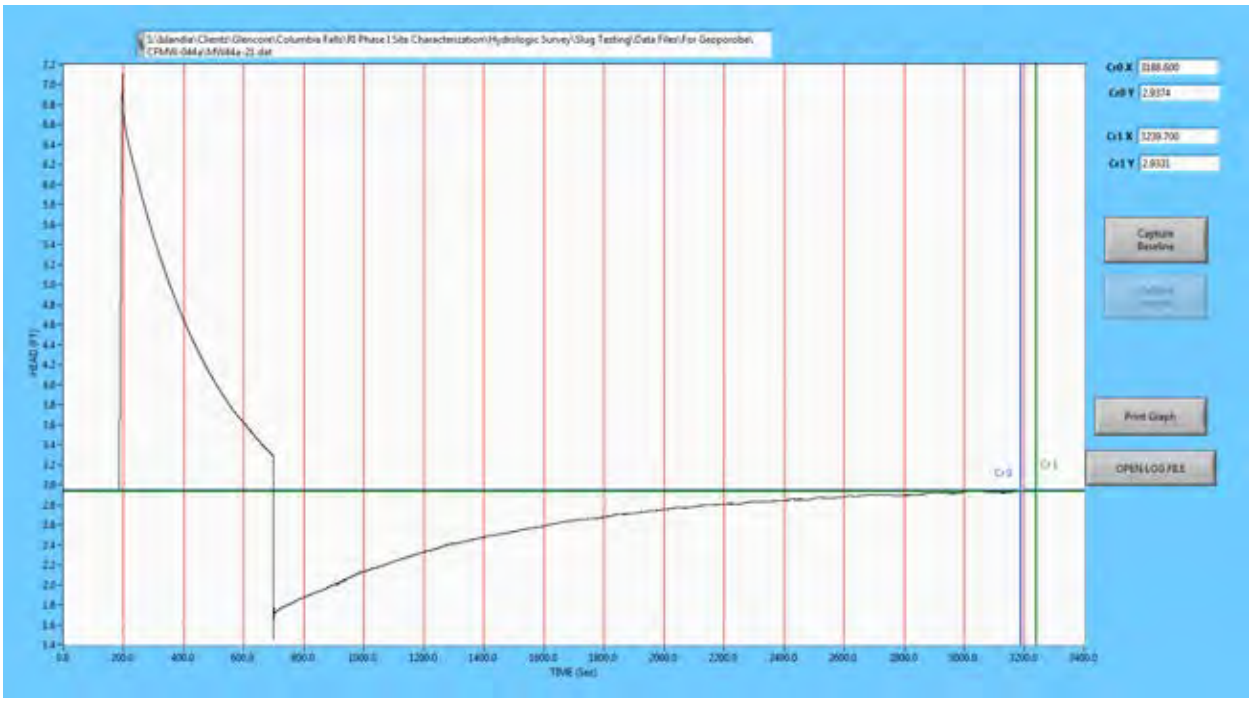
START DATE: 7/13/2017
START TIME: 10:16 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW44A-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-044a
1 Foot Displacement
Test #2





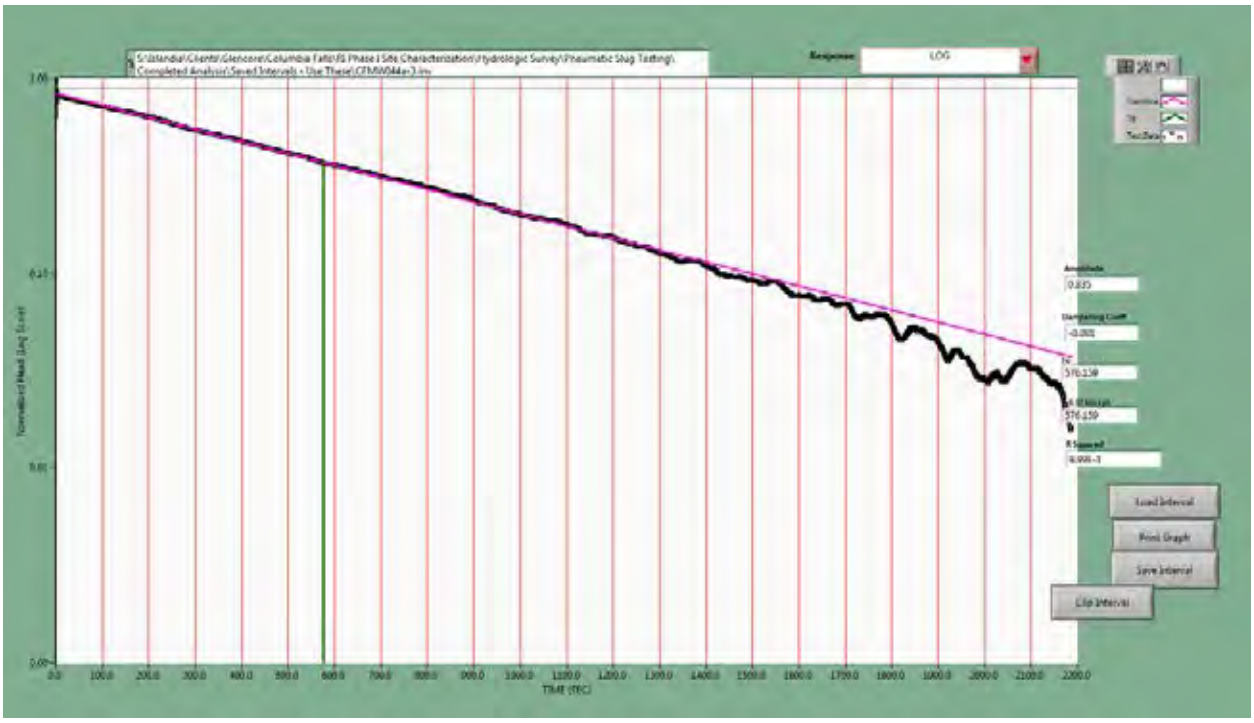
CFMW-044a
2 Foot Displacement
Test #1



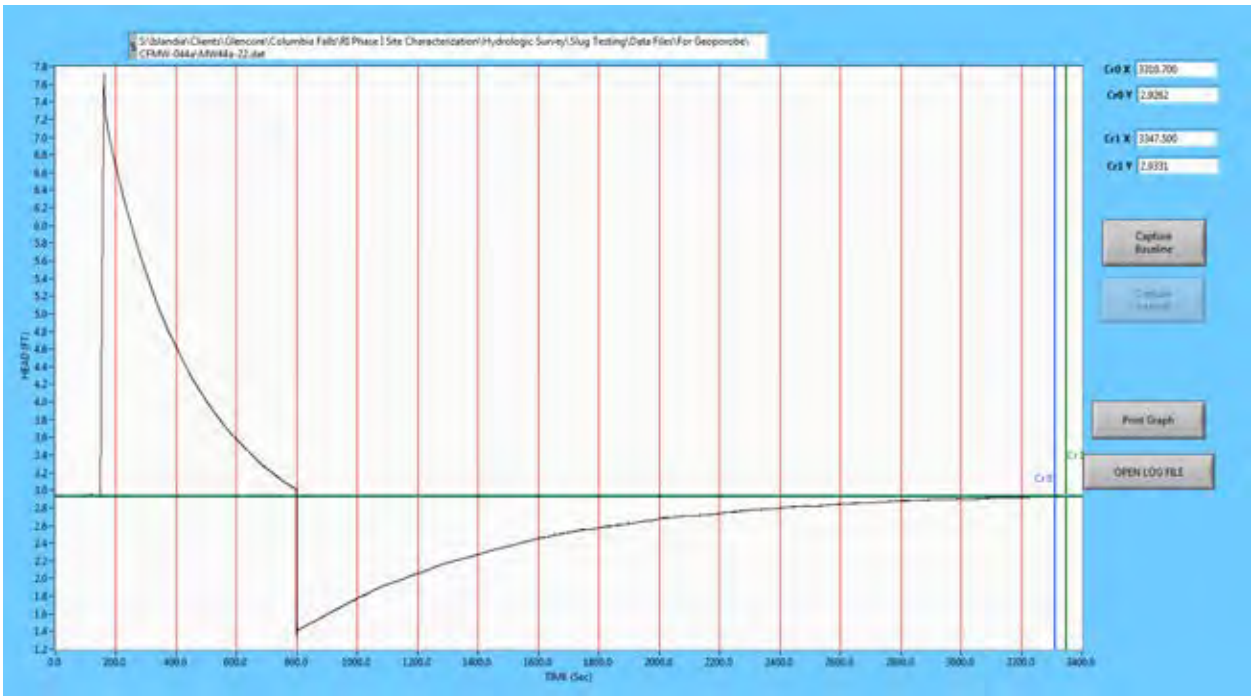
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/13/2017
START TIME: 11:00 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW44A-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-044a
2 Foot Displacement
Test #1



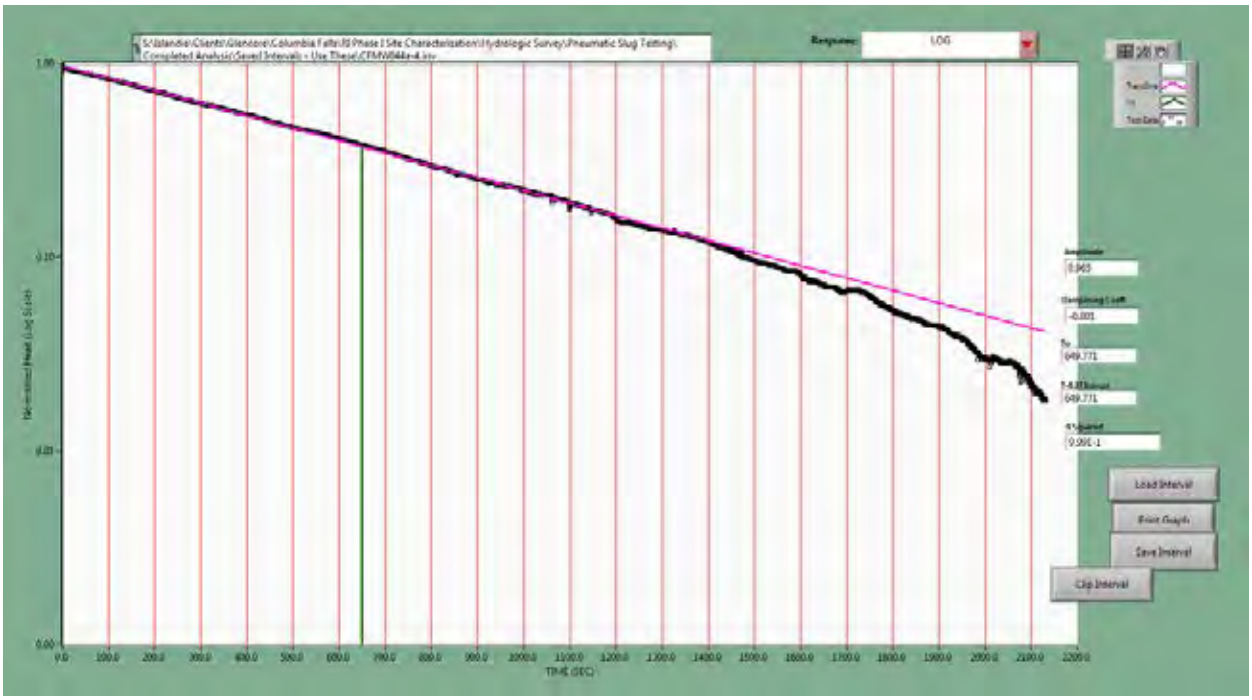
CFMW-044a
2 Foot Displacement
Test #2

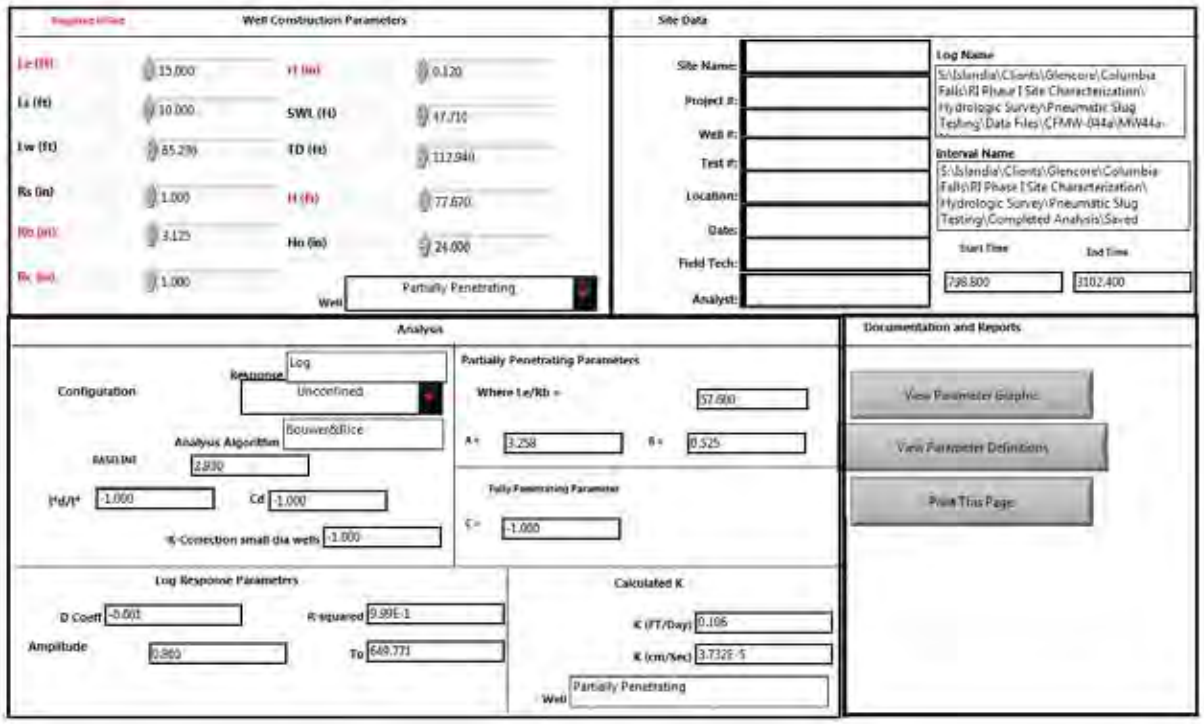


SITE INFORMATION -- SLUG TEST REV. 3.0

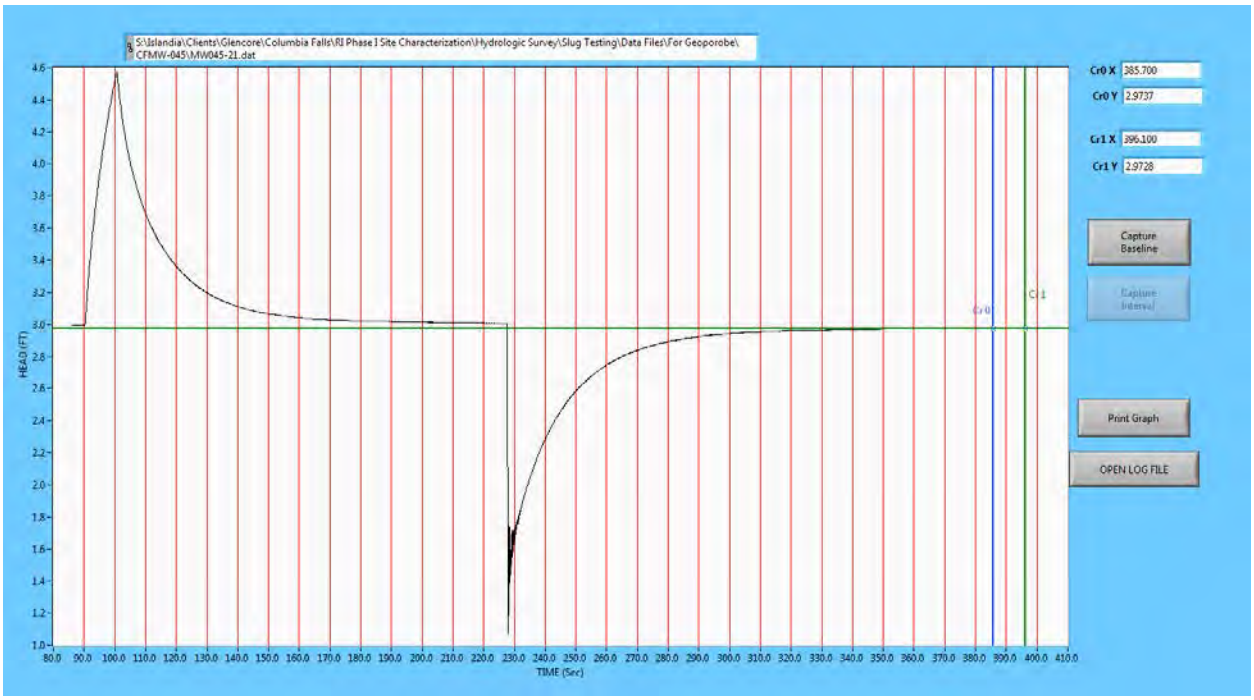
START DATE: 7/13/2017
START TIME: 11:56 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW44A-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-044a
2 Foot Displacement
Test #2





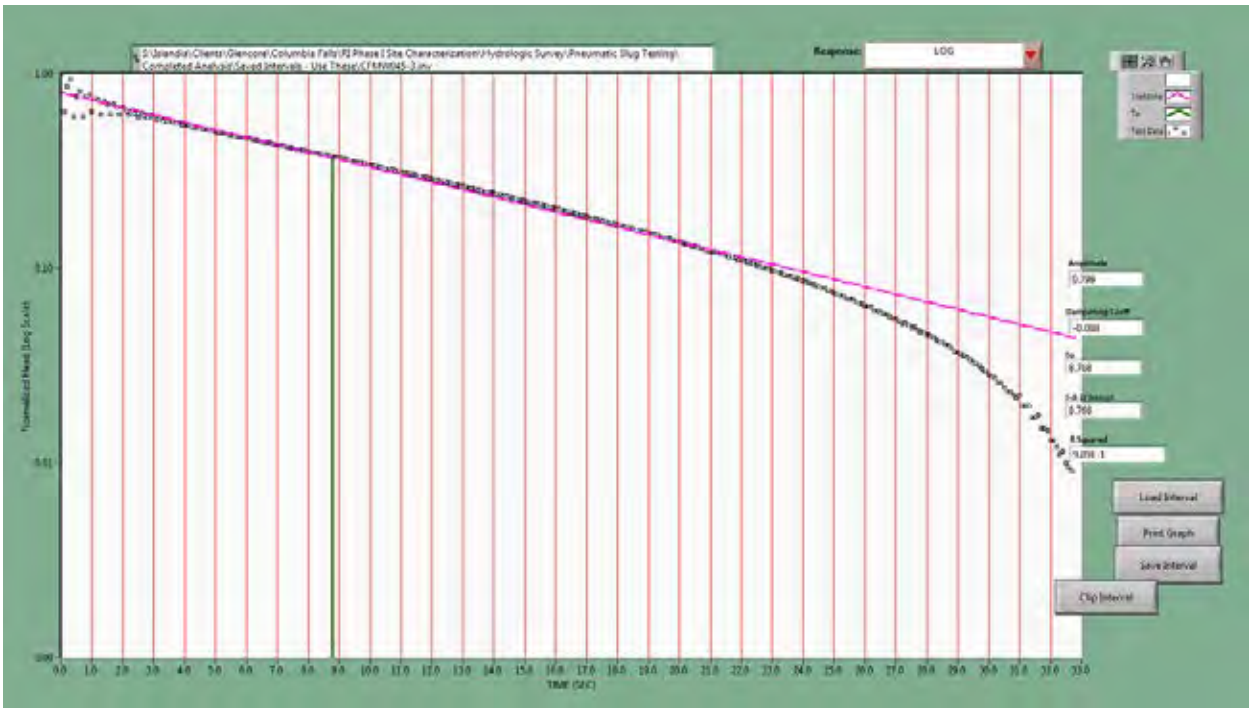
CFMW-045
2 Foot Displacement
Test #1

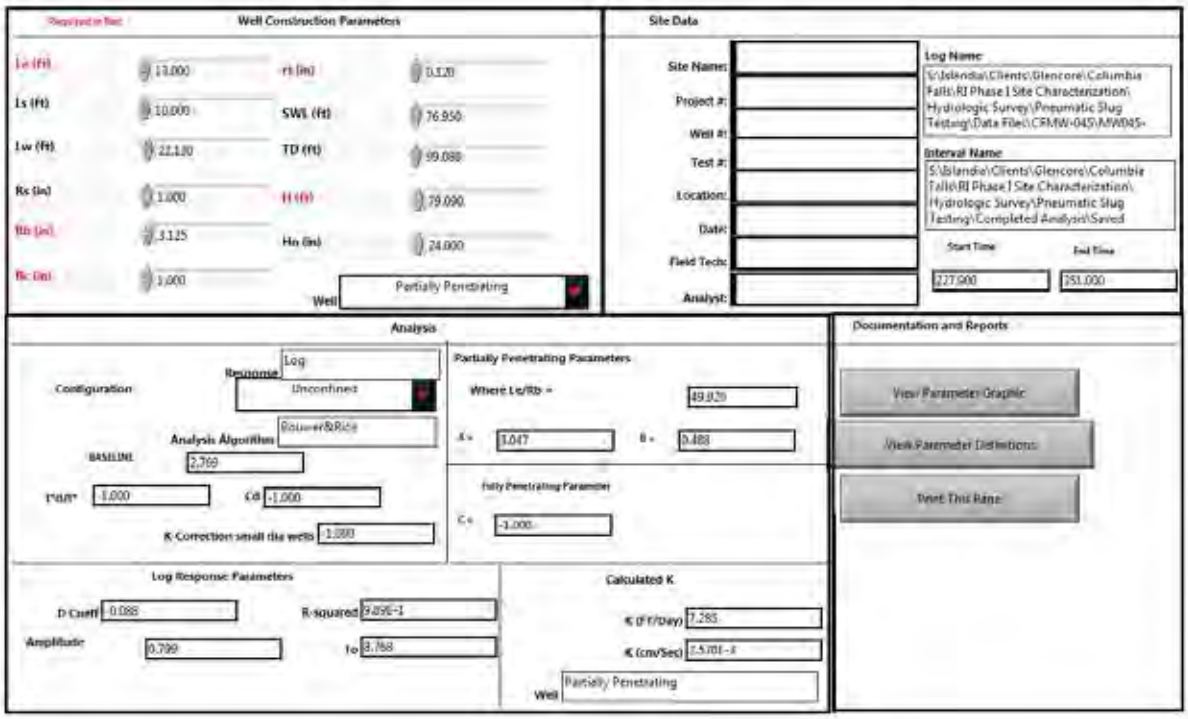


SITE INFORMATION -- SLUG TEST REV. 3.0

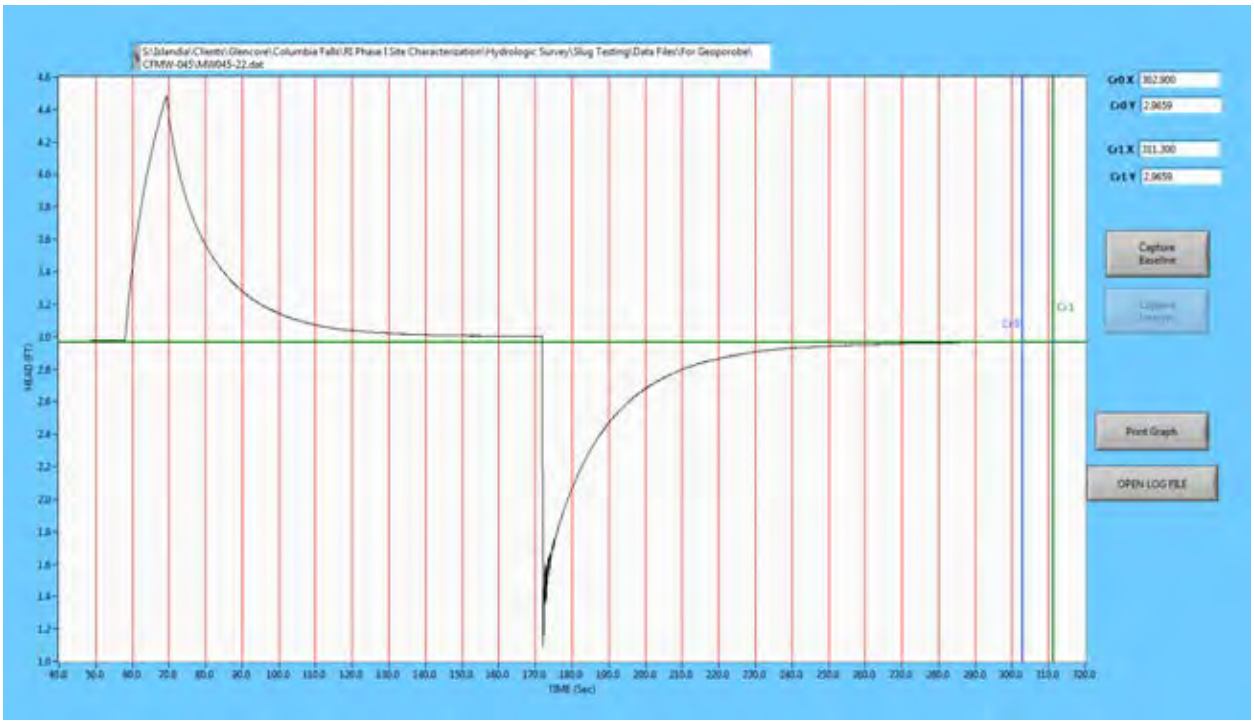
START DATE: 7/11/2017
START TIME: 11:45 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW045-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-045
2 Foot Displacement
Test #1





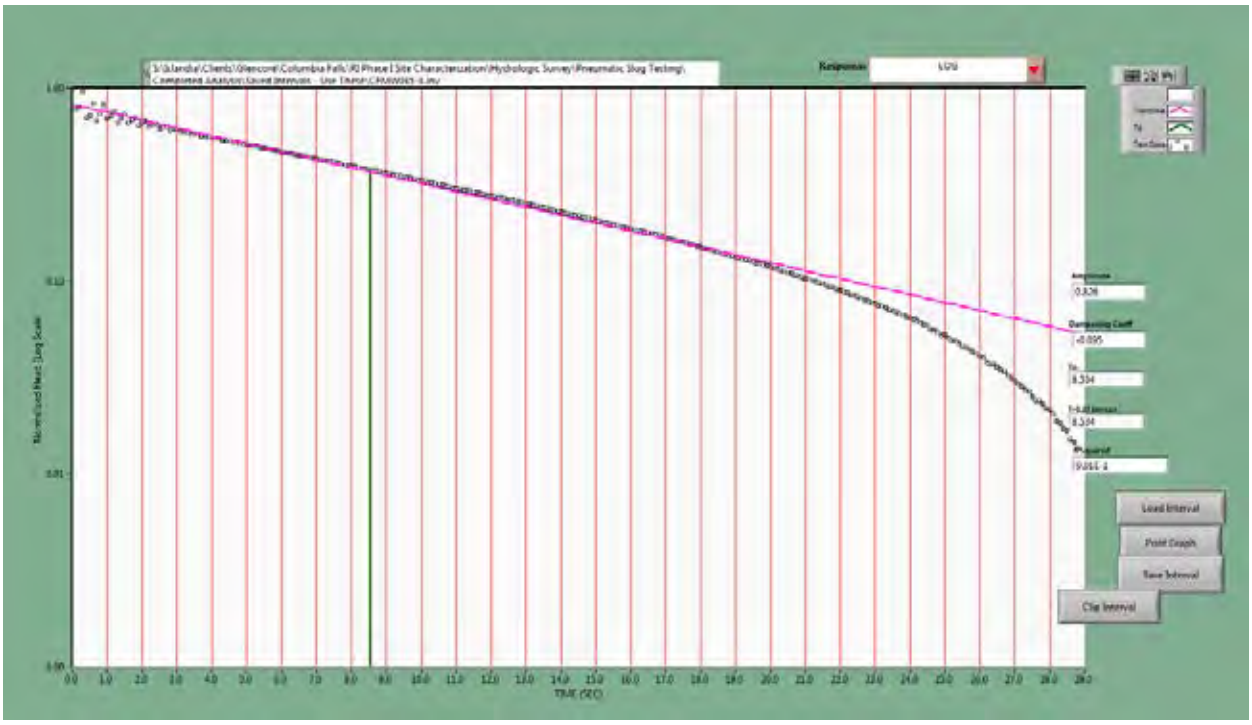
CFMW-045
2 Foot Displacement
Test #2

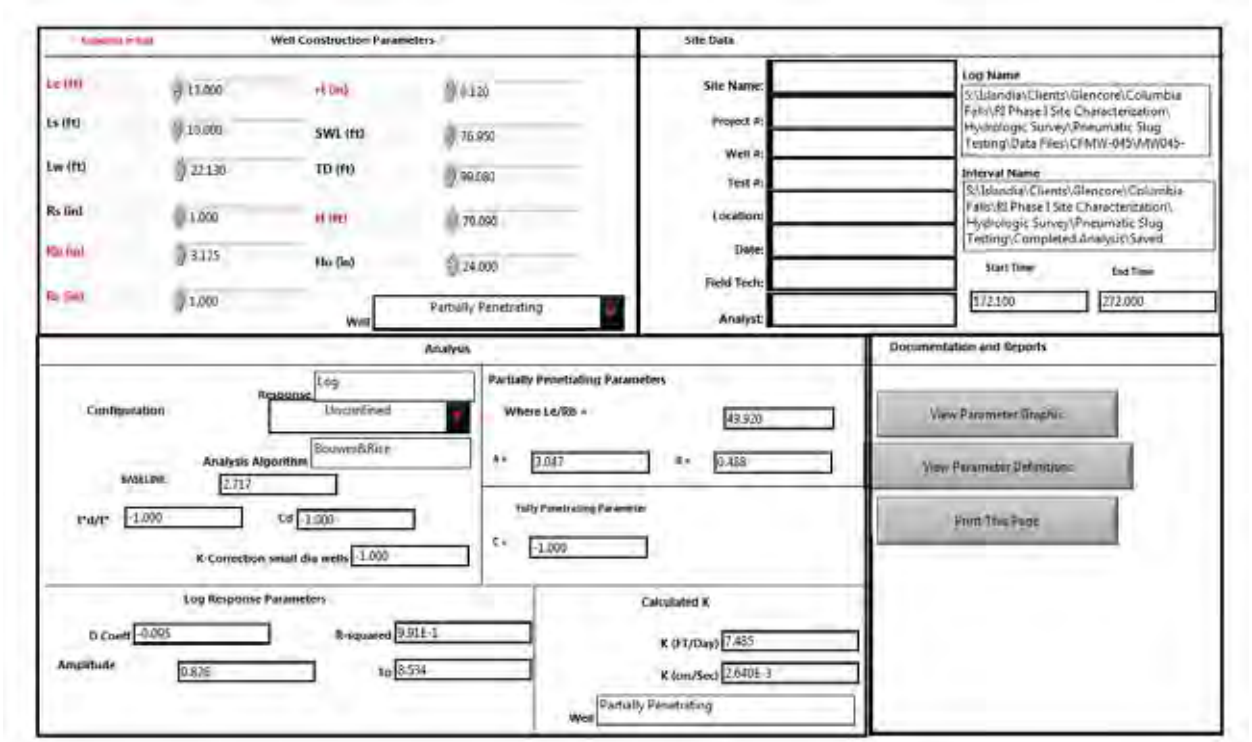


SITE INFORMATION -- SLUG TEST REV. 3.0

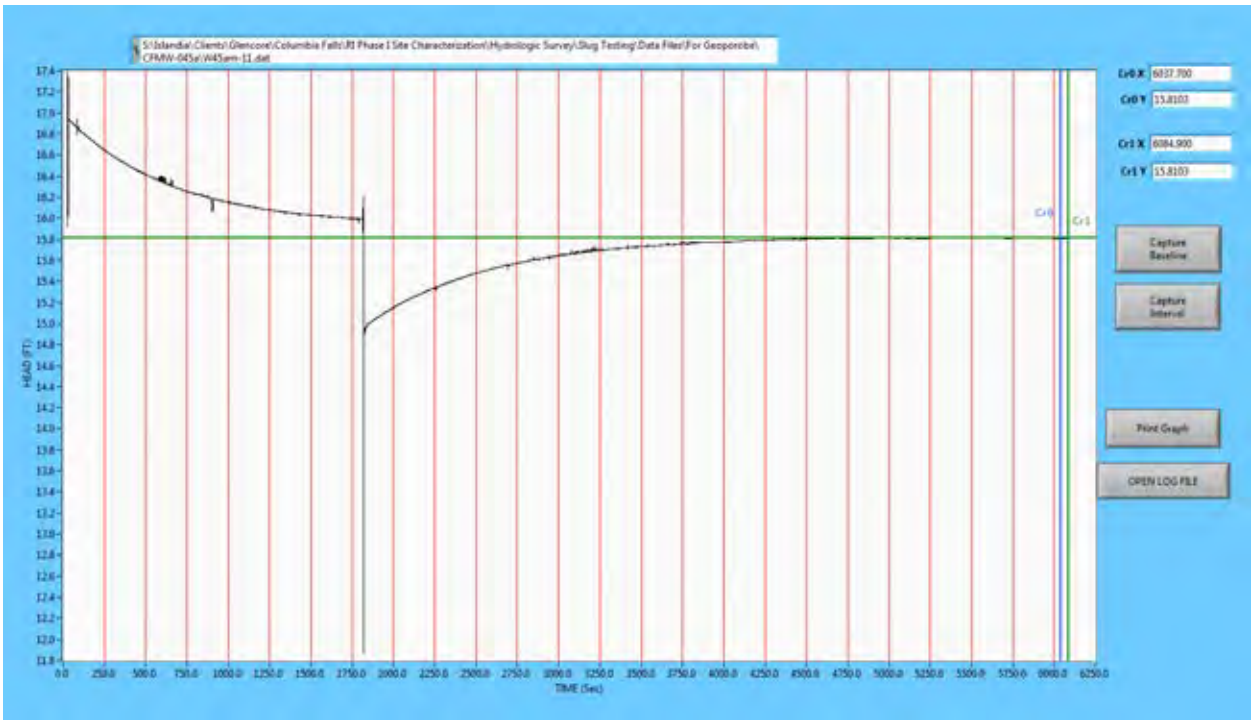
START DATE: 7/11/2017
START TIME: 11:52 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW045-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-045
2 Foot Displacement
Test #2





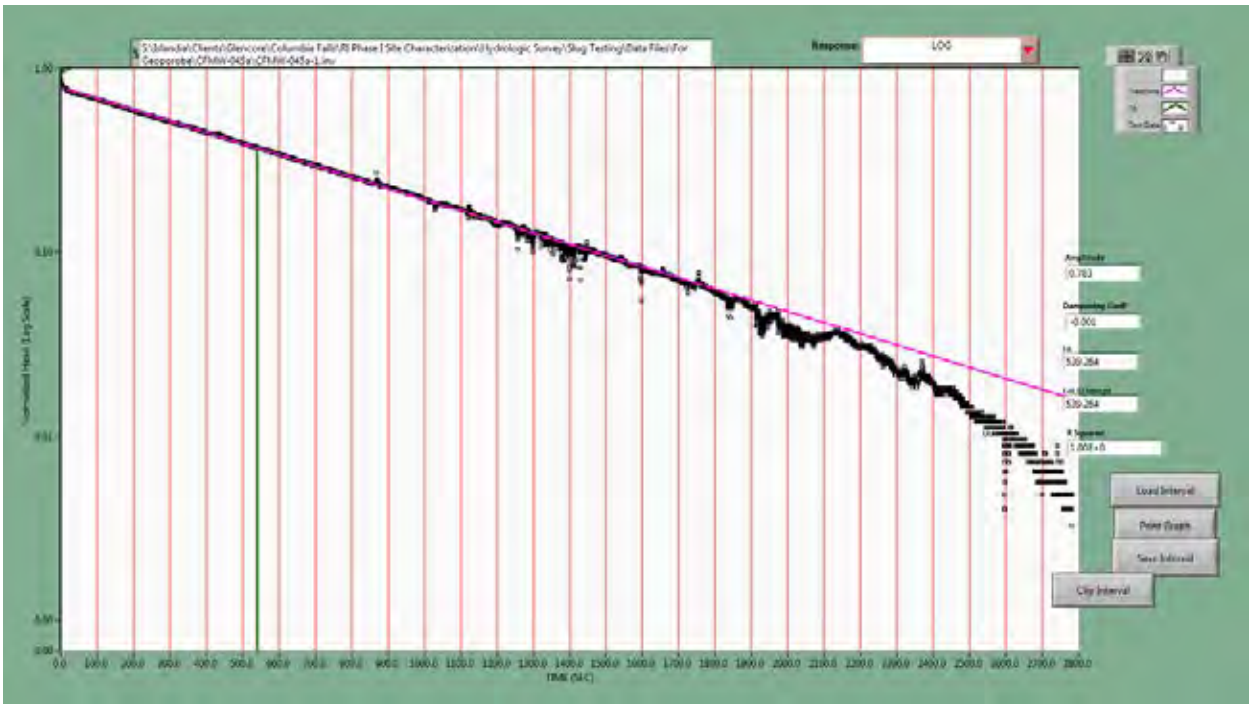
CFMW-045a
1 Foot Displacement
Test #1

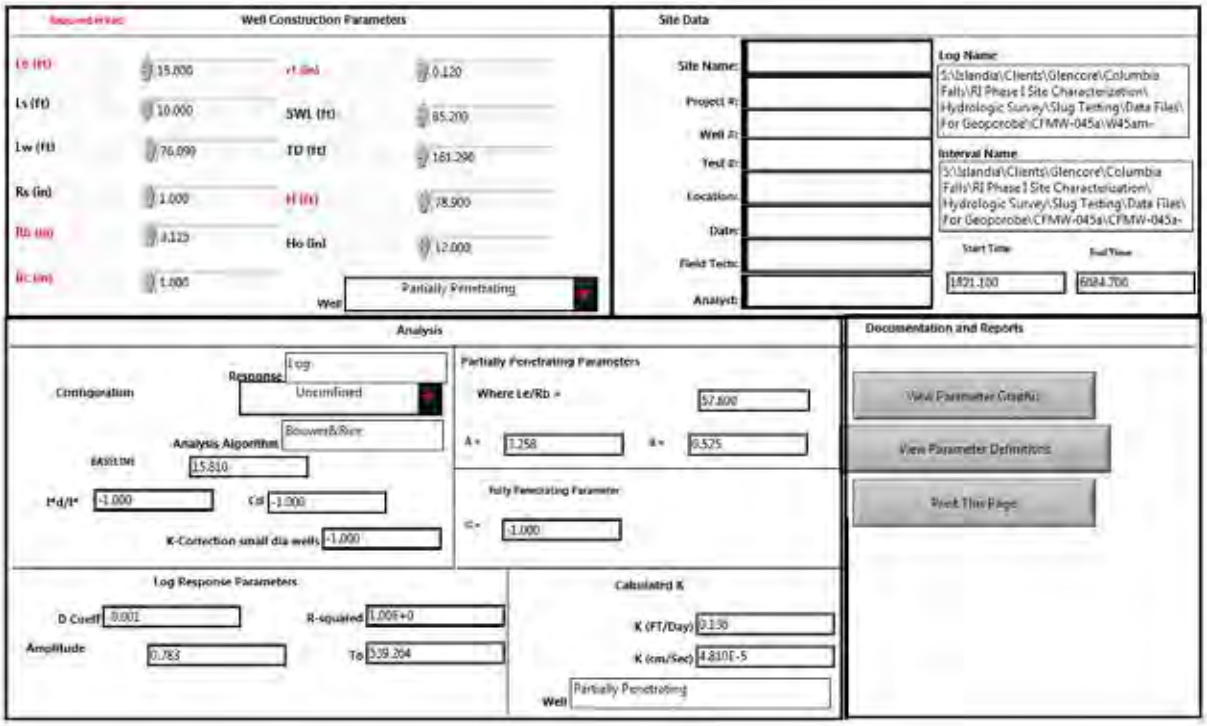


SITE INFORMATION -- SLUG TEST REV. 3.0

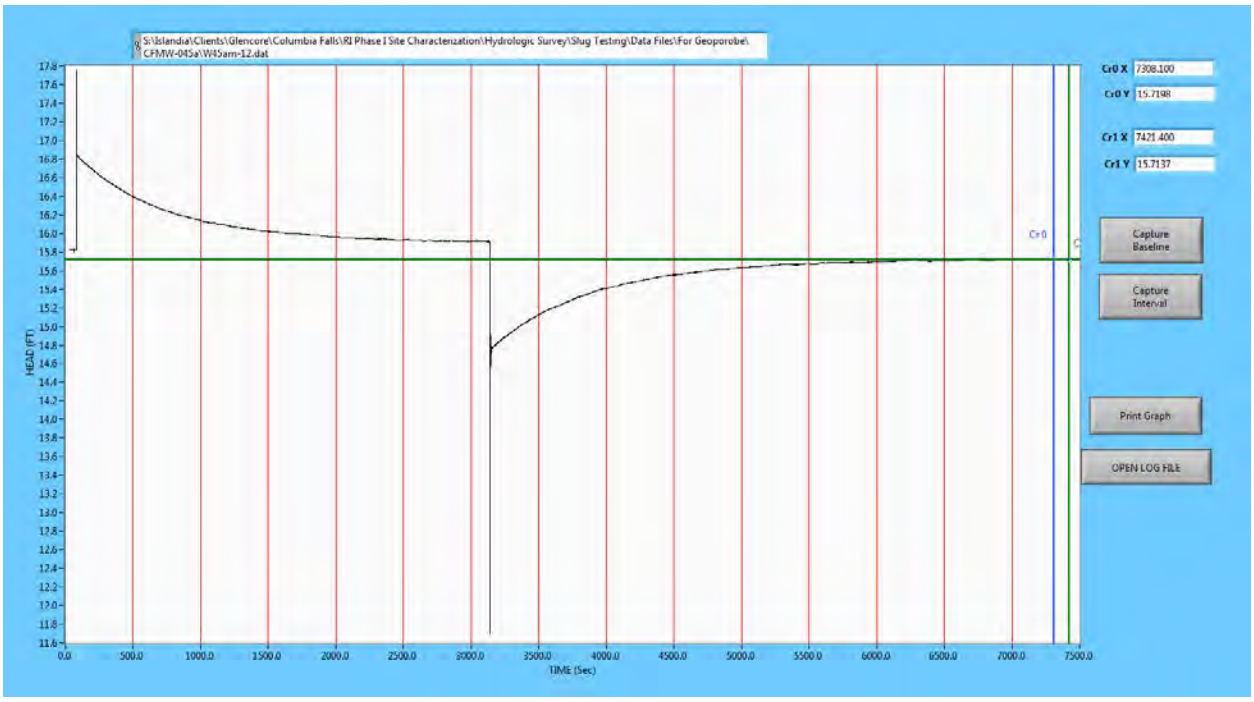
START DATE: 7/19/2017
START TIME: 12:38 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\W45AM-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-045a
1 Foot Displacement
Test #1





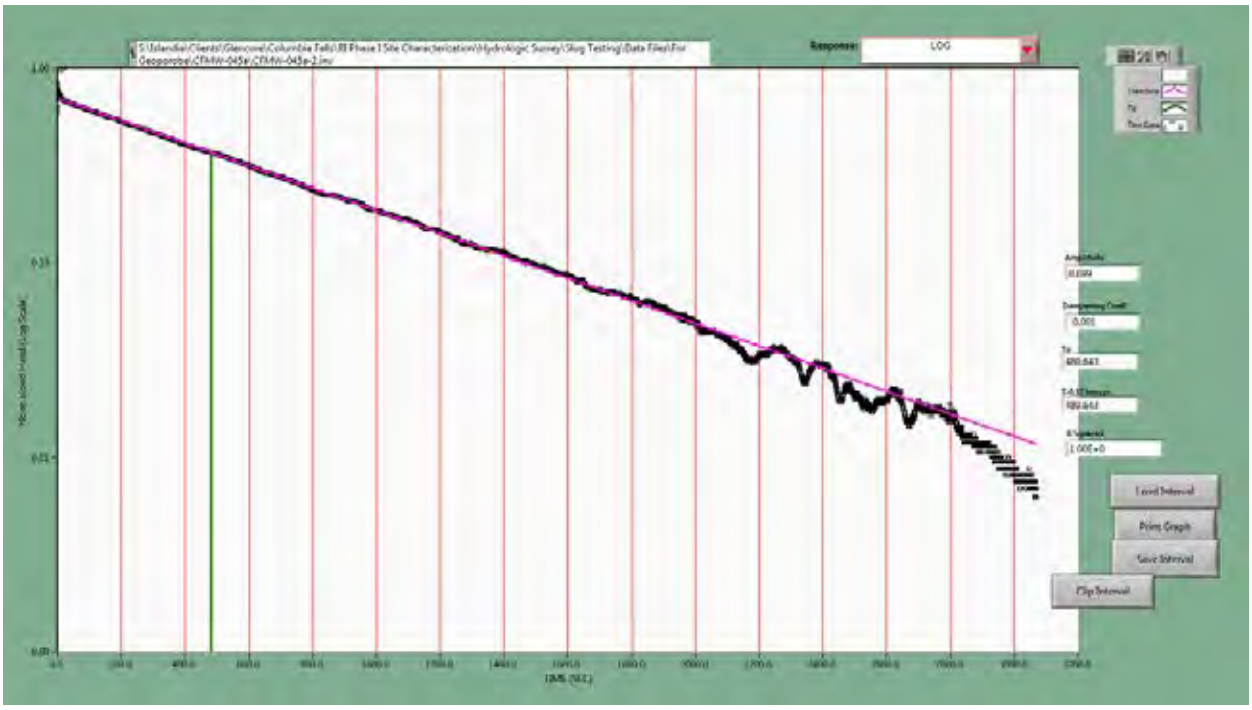
CFMW-045a
1 Foot Displacement
Test #2

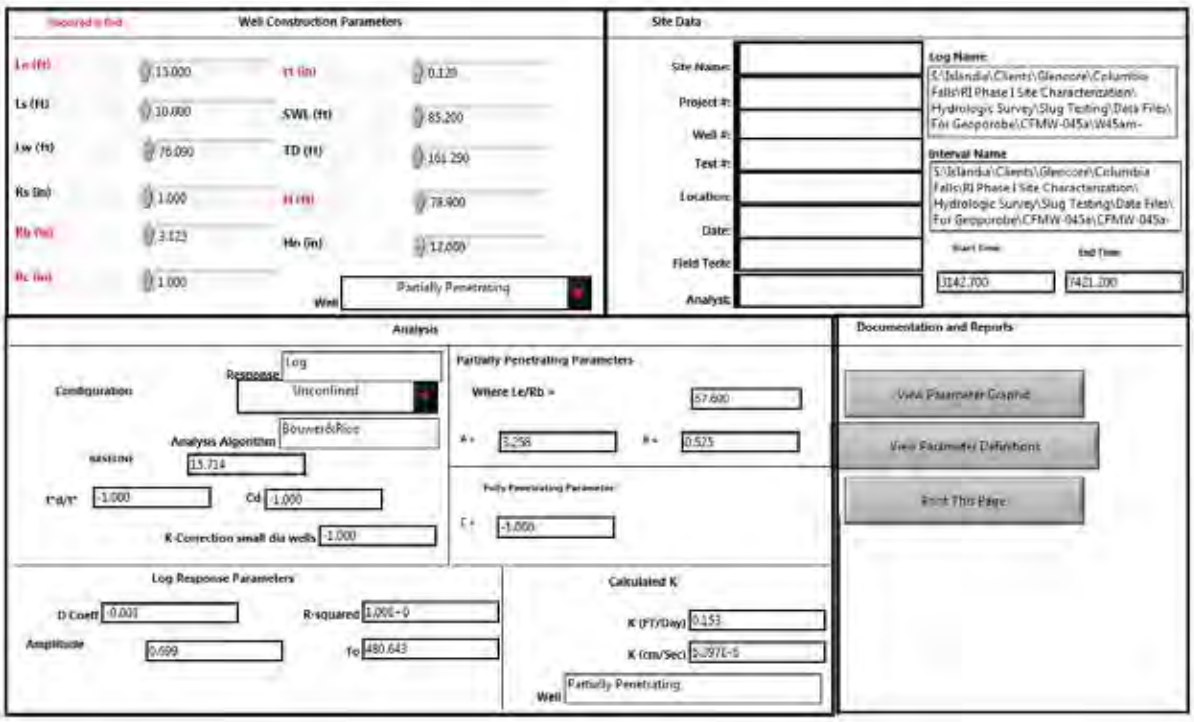


SITE INFORMATION -- SLUG TEST REV. 3.0

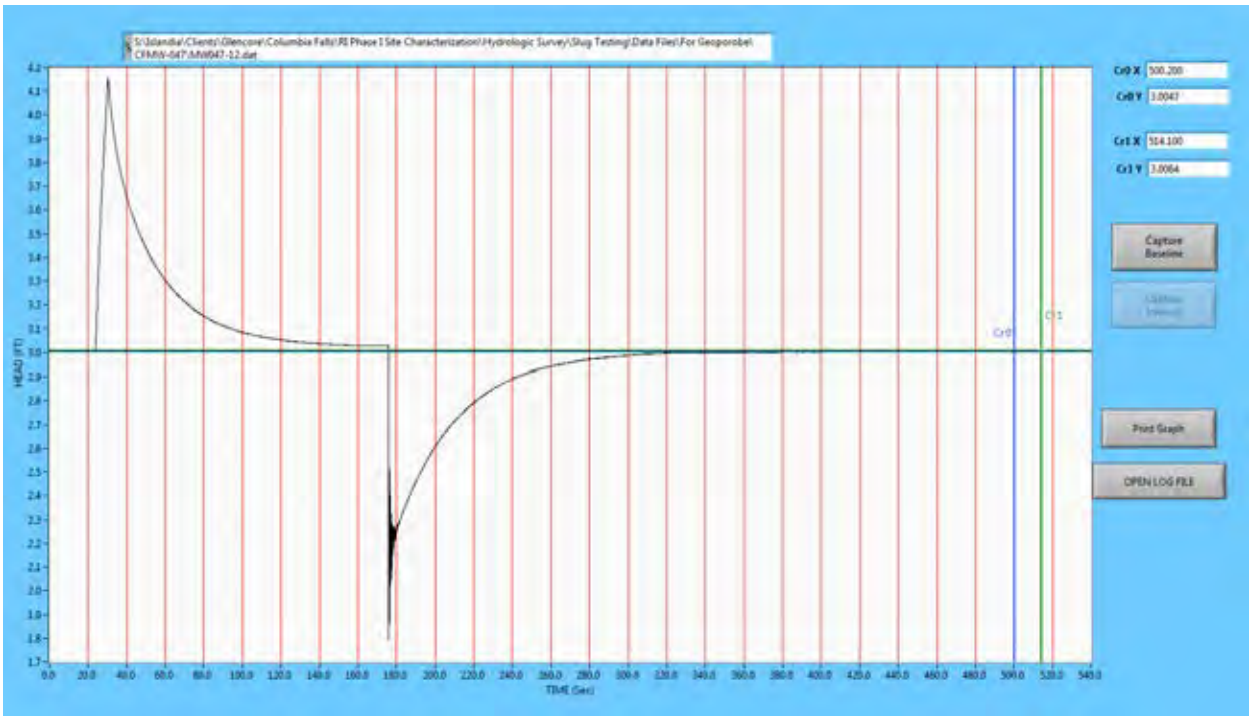
START DATE: 7/19/2017
START TIME: 2:23 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\W45AM-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-045a
1 Foot Displacement
Test #2





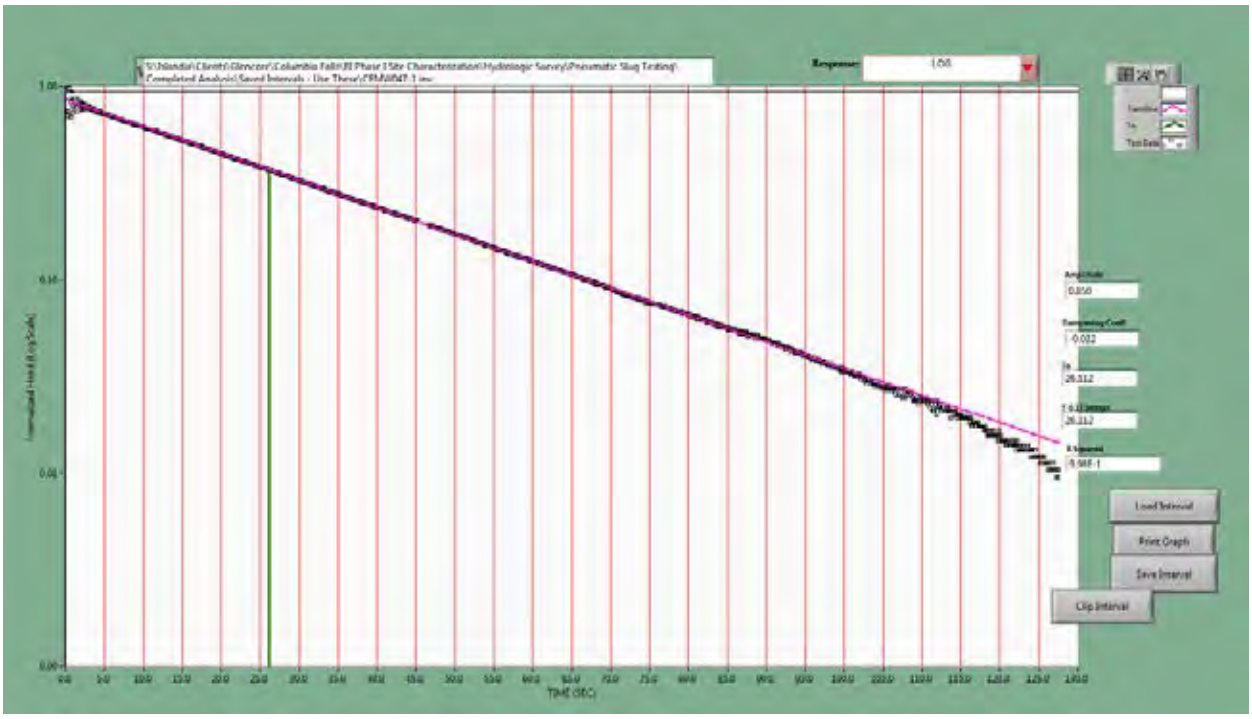
CFMW-047
1 Foot Displacement
Test #1

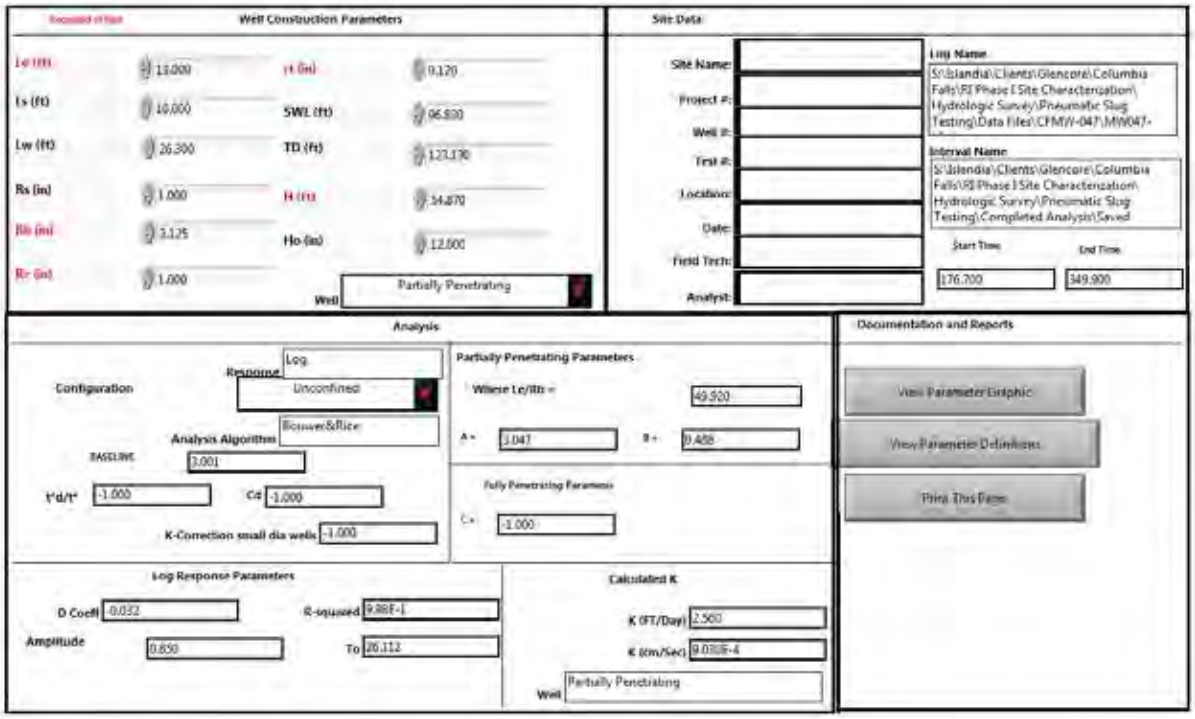


SITE INFORMATION -- SLUG TEST REV. 3.0

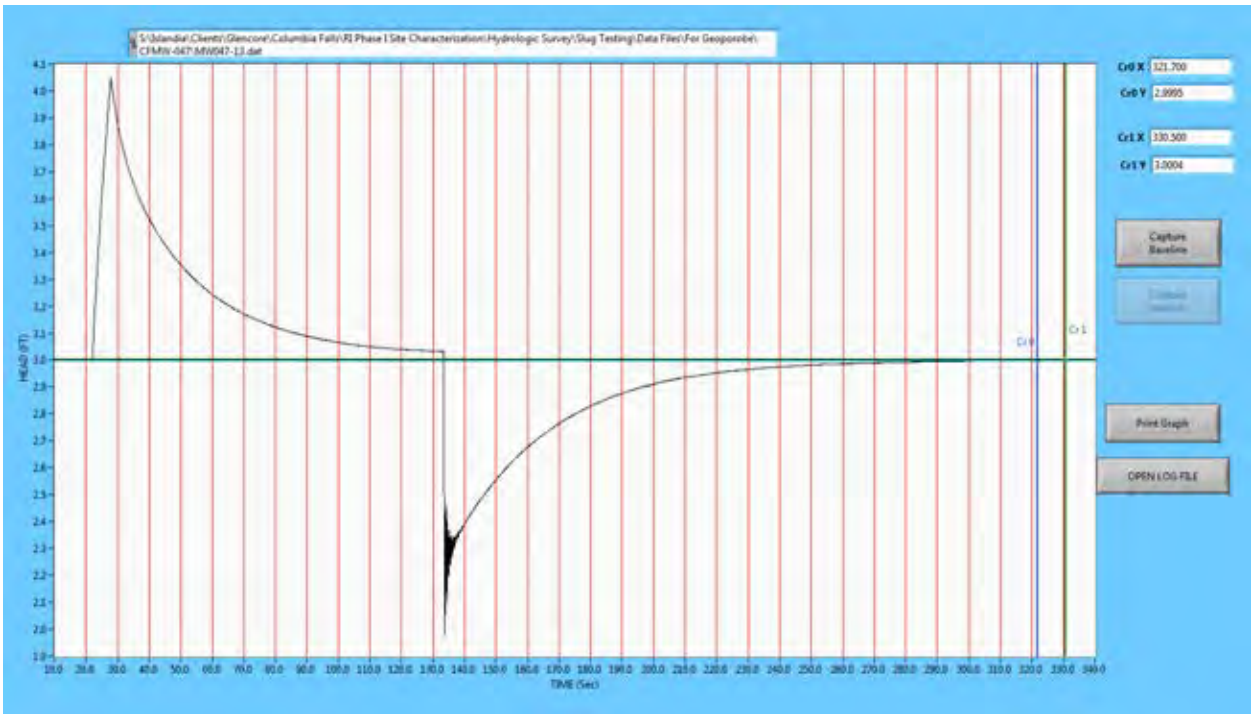
START DATE: 7/10/2017
START TIME: 3:57 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW047-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-047
1 Foot Displacement
Test #1





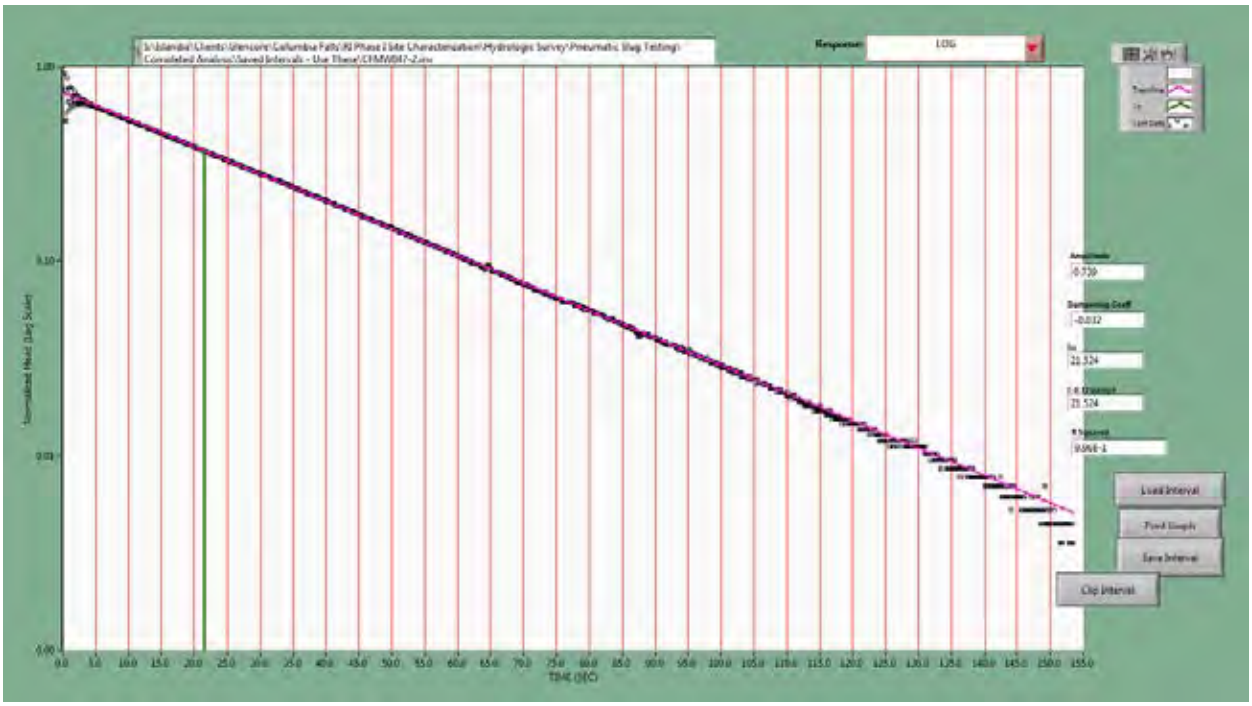
CFMW-047
1 Foot Displacement
Test #2

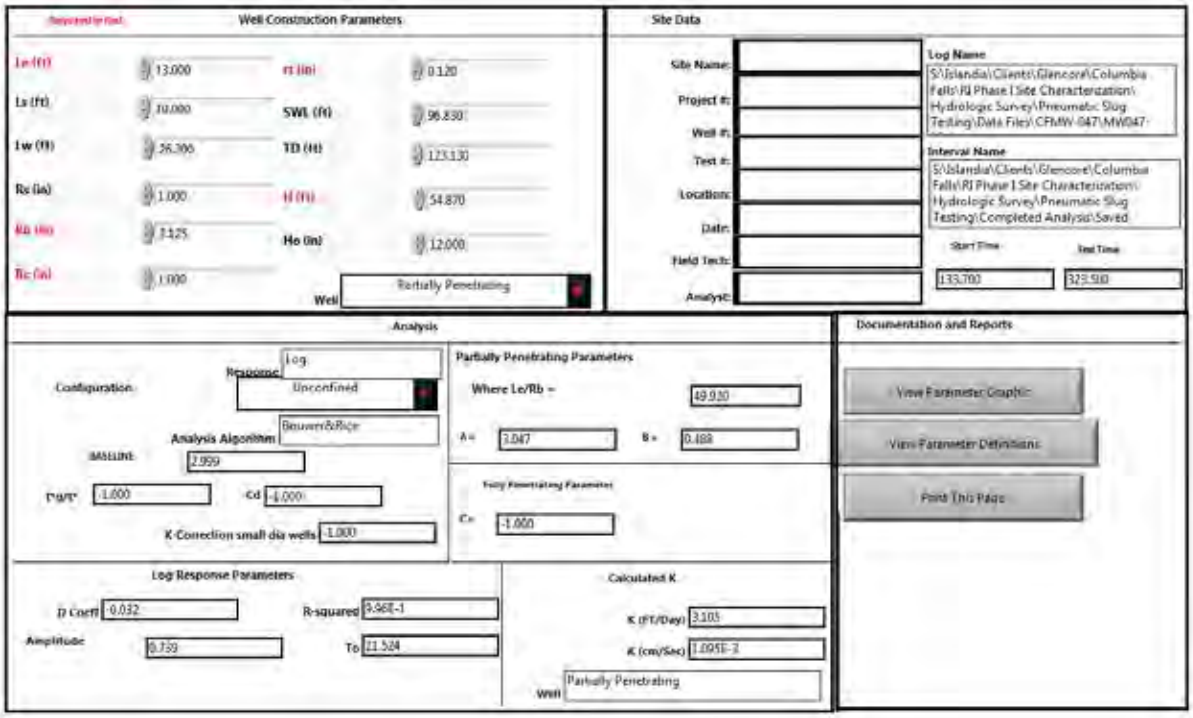


SITE INFORMATION -- SLUG TEST REV. 3.0

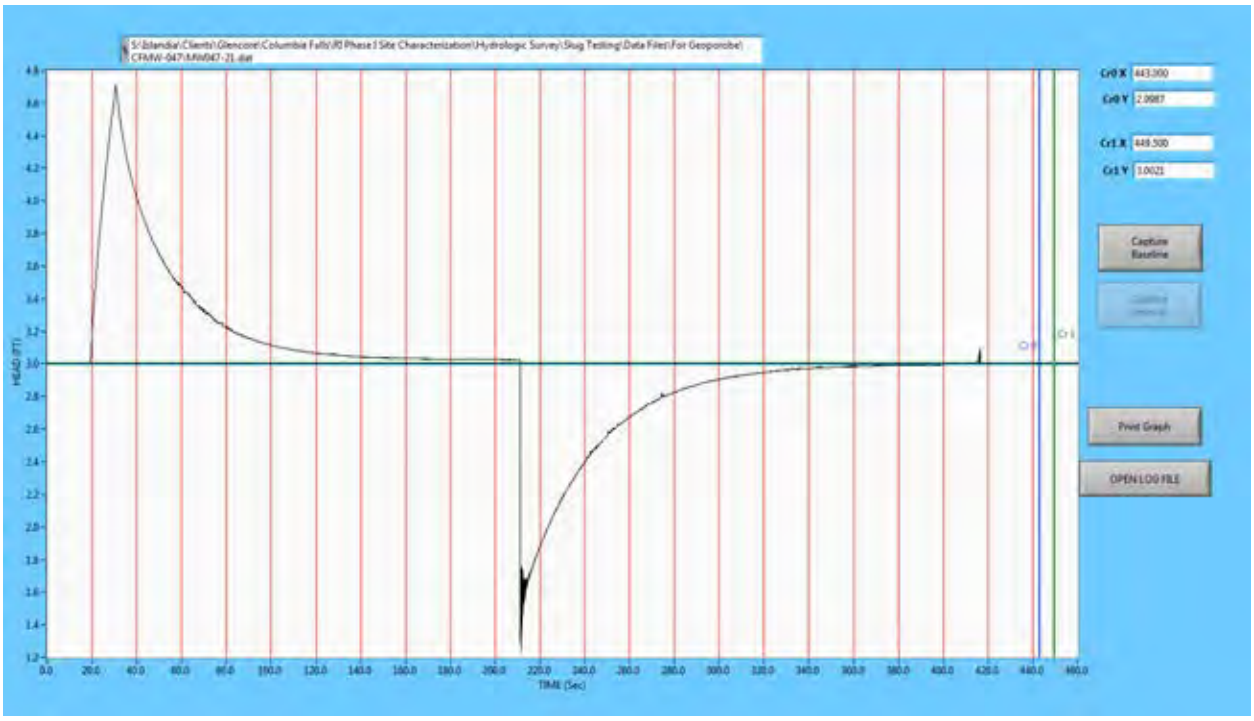
START DATE: 7/10/2017
START TIME: 4:10 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW047-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-047
1 Foot Displacement
Test #2





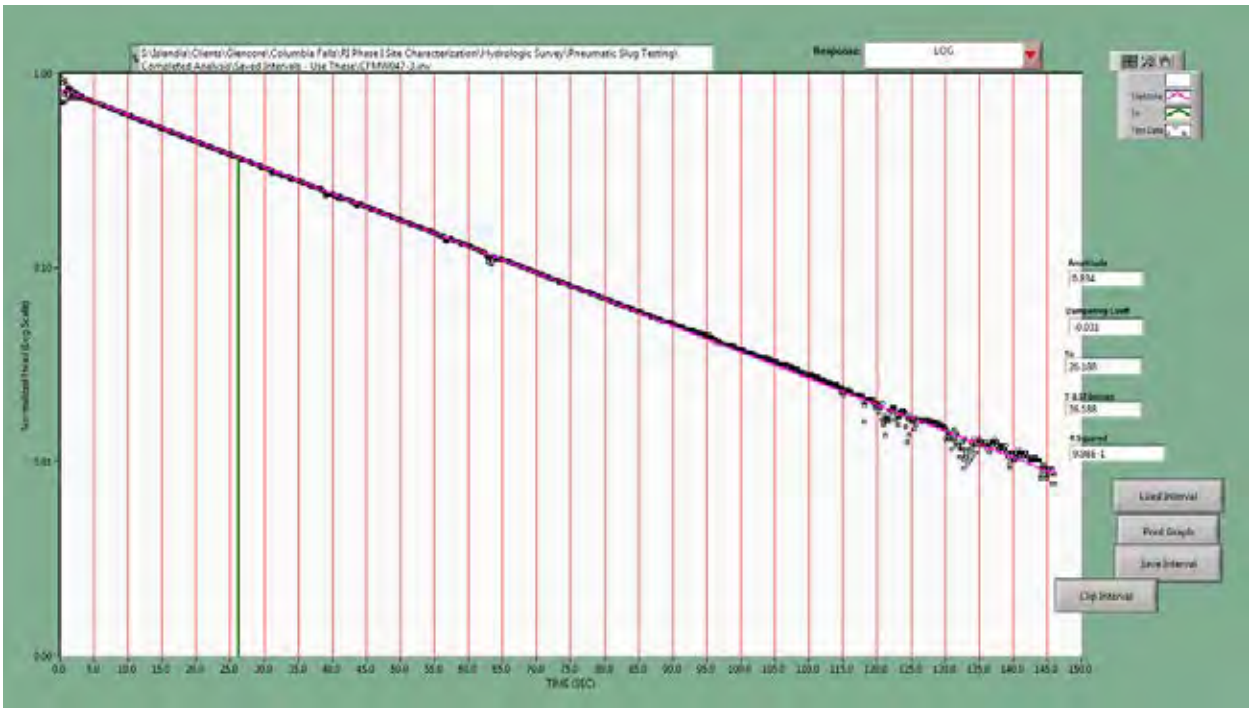
CFMW-047
2 Foot Displacement
Test #1

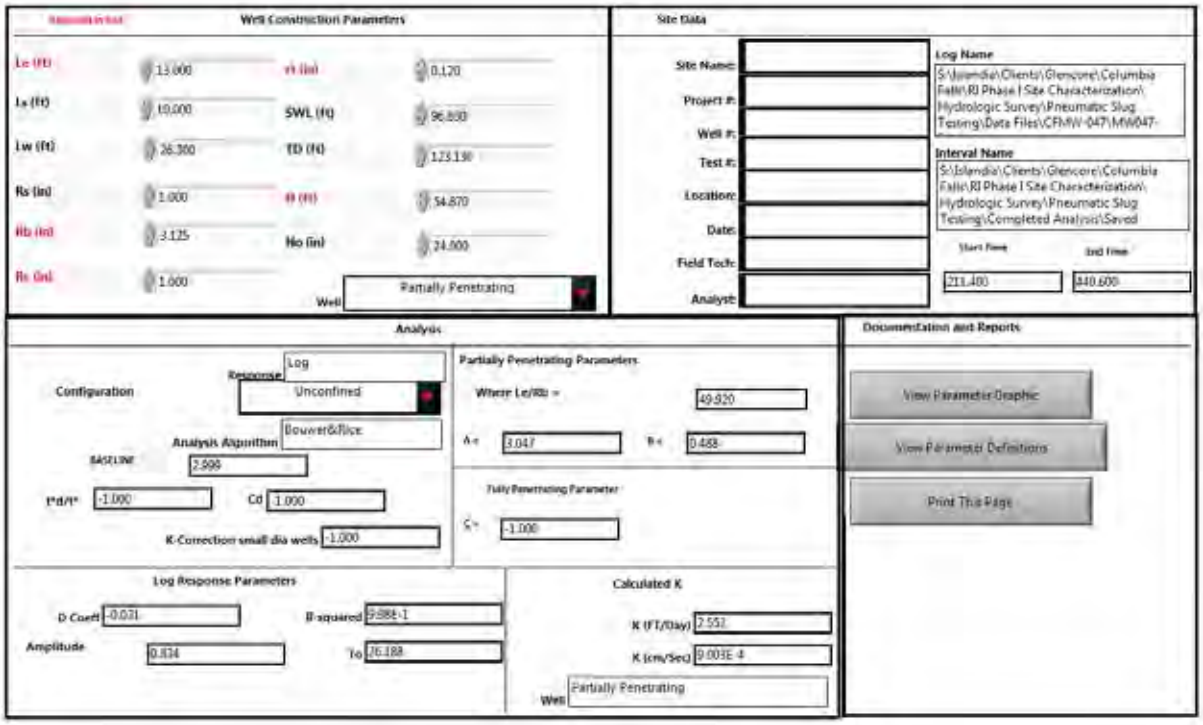


SITE INFORMATION -- SLUG TEST REV. 3.0

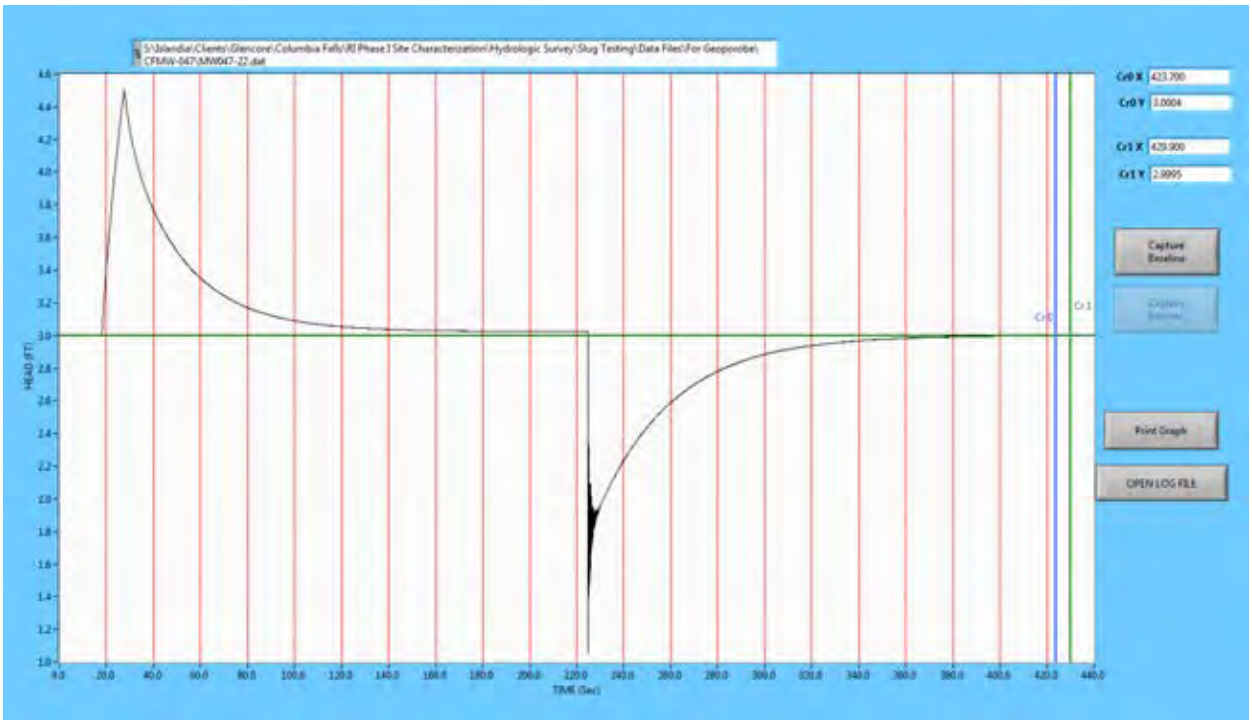
START DATE: 7/10/2017
START TIME: 4:15 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW047-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-047
2 Foot Displacement
Test #1





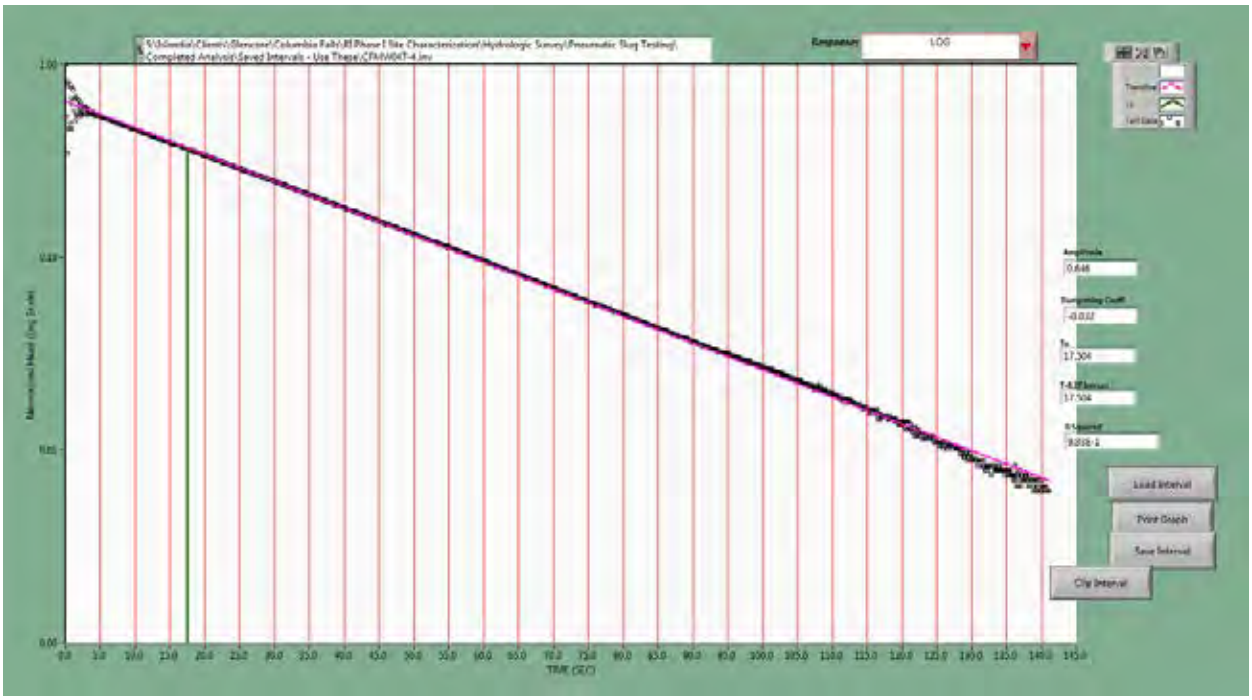
CFMW-047
2 Foot Displacement
Test #2

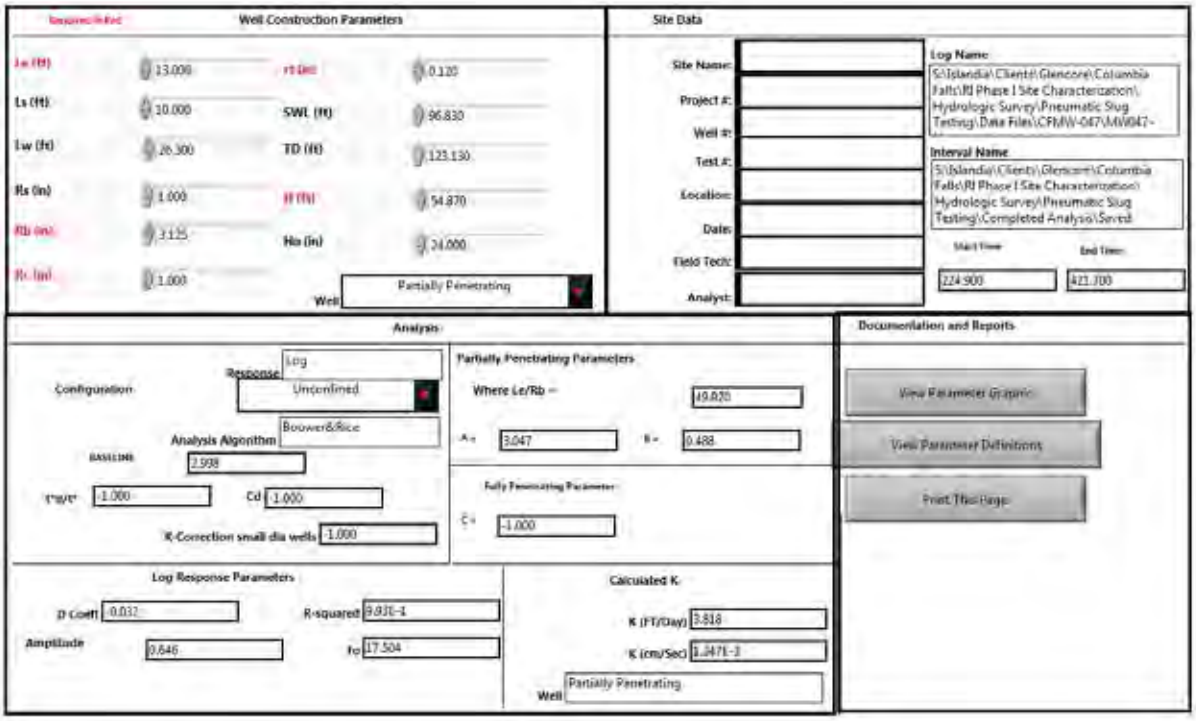


SITE INFORMATION -- SLUG TEST REV. 3.0

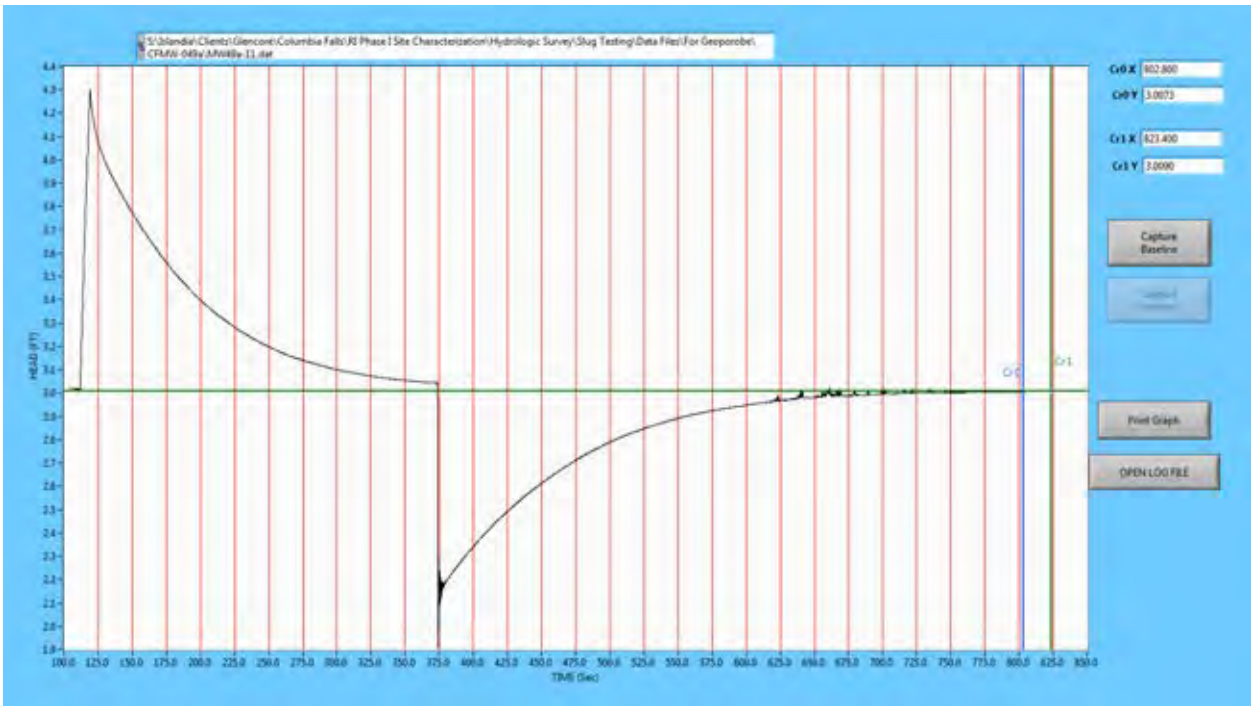
START DATE: 7/10/2017
START TIME: 4:23 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW047-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-047
2 Foot Displacement
Test #2





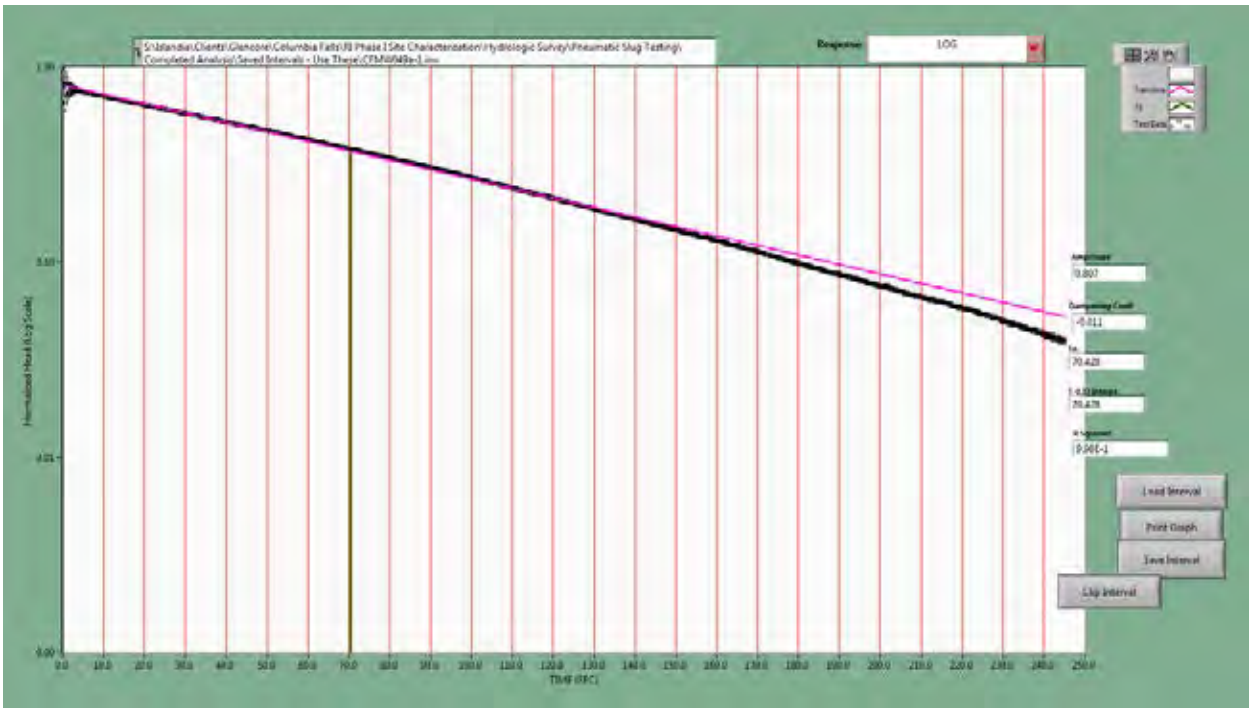
CFMW-049a
1 Foot Displacement
Test #1

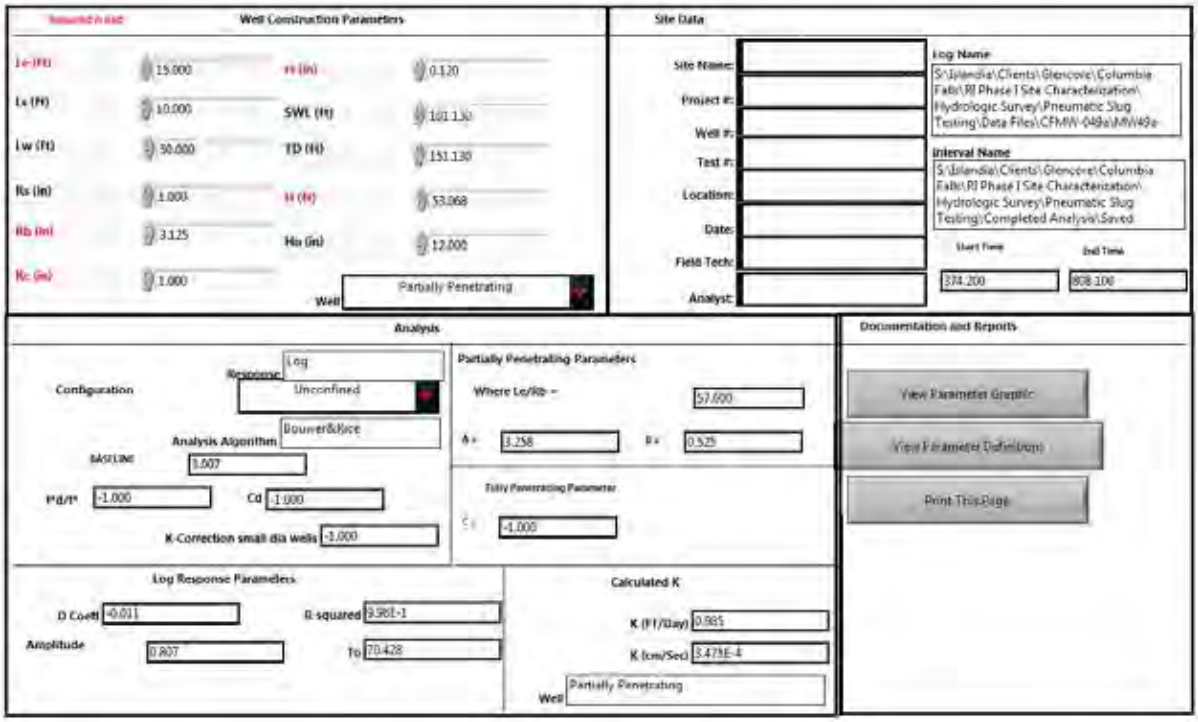


SITE INFORMATION -- SLUG TEST REV. 3.0

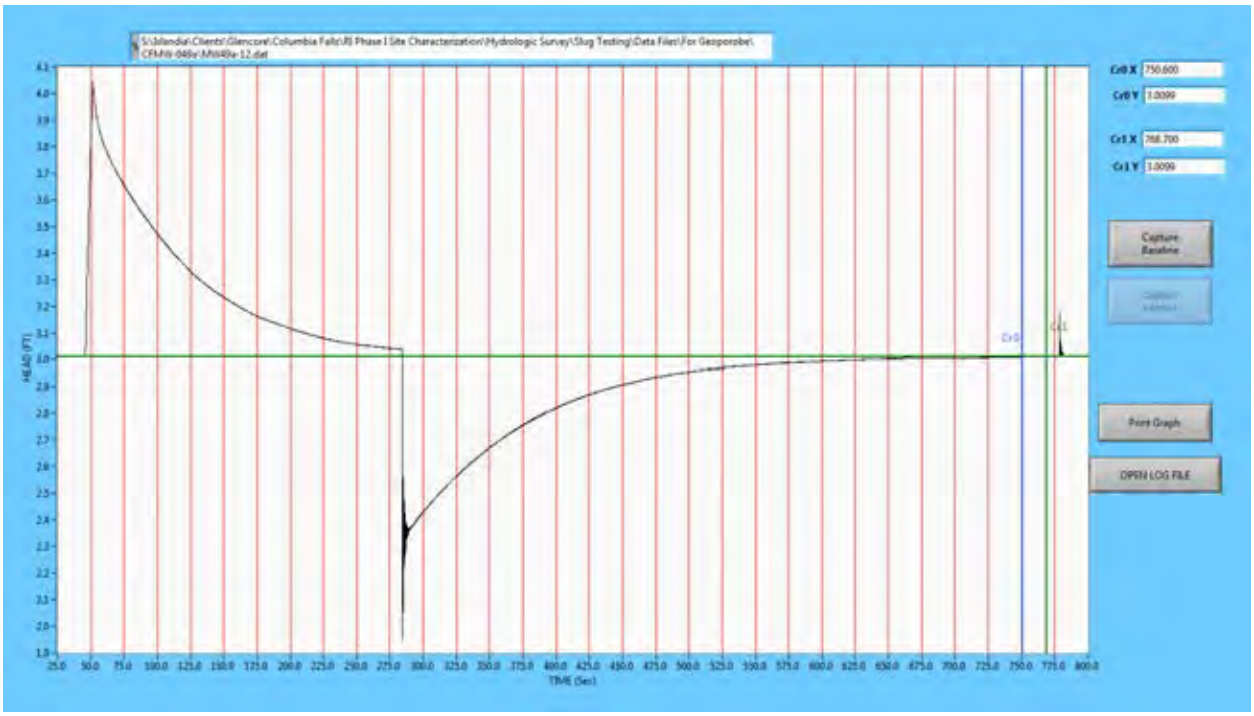
START DATE: 7/18/2017
START TIME: 11:51 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW49A-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-049a
1 Foot Displacement
Test #1





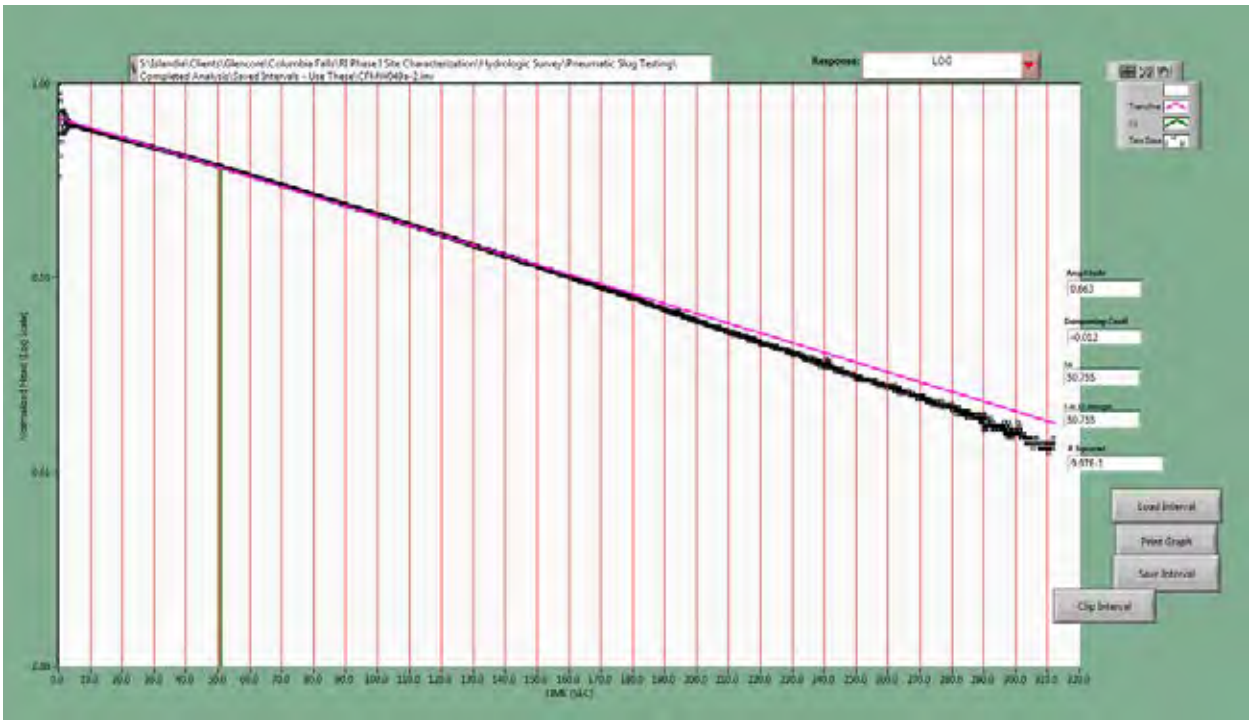
CFMW-049a
1 Foot Displacement
Test #2

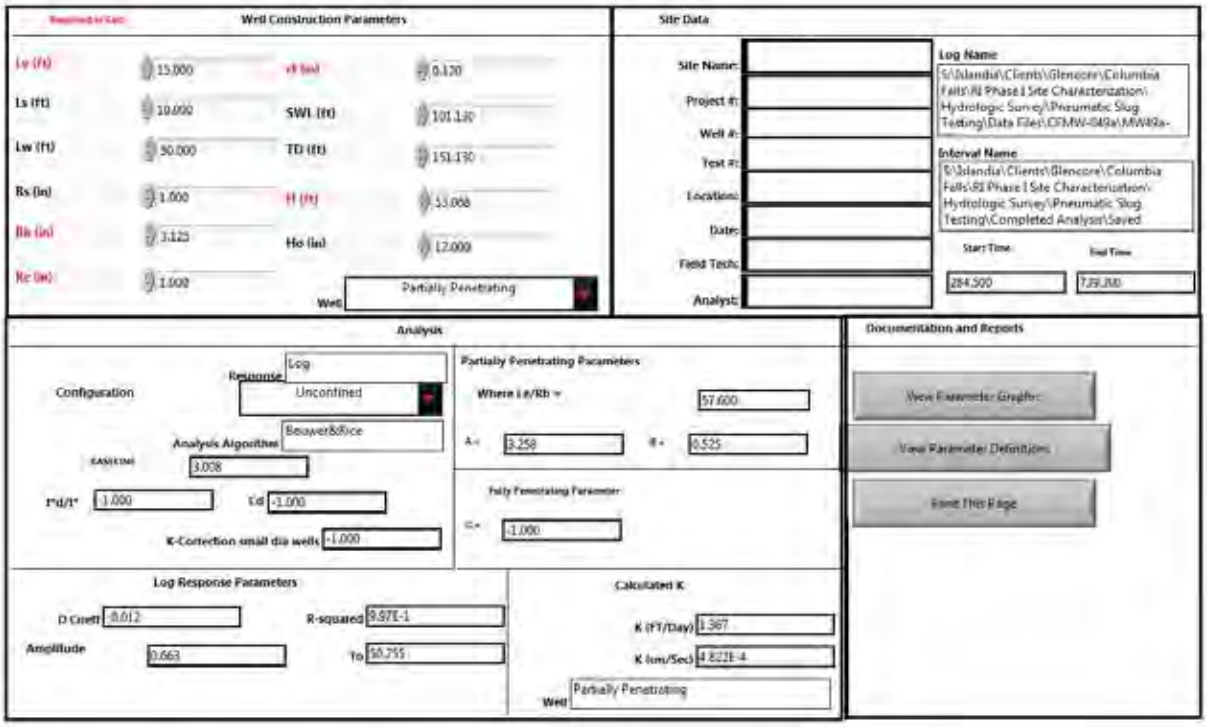


SITE INFORMATION -- SLUG TEST REV. 3.0

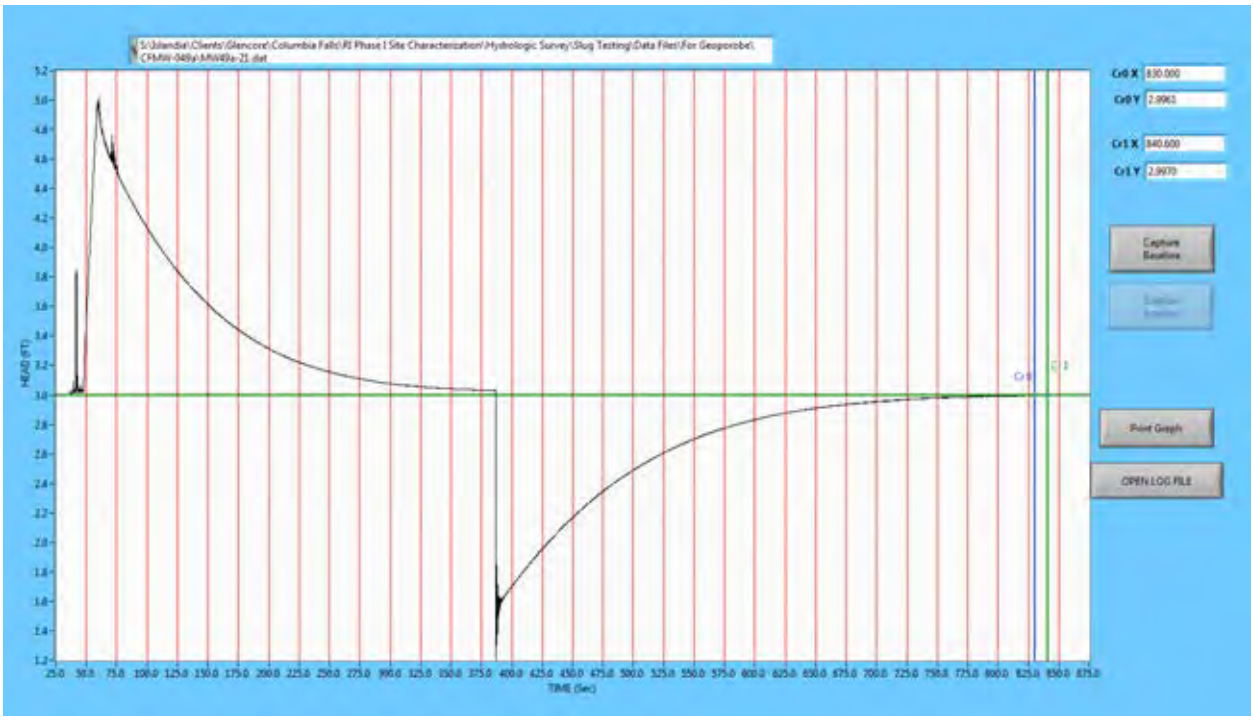
START DATE: 7/18/2017
START TIME: 12:05 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW49A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-049a
1 Foot Displacement
Test #2





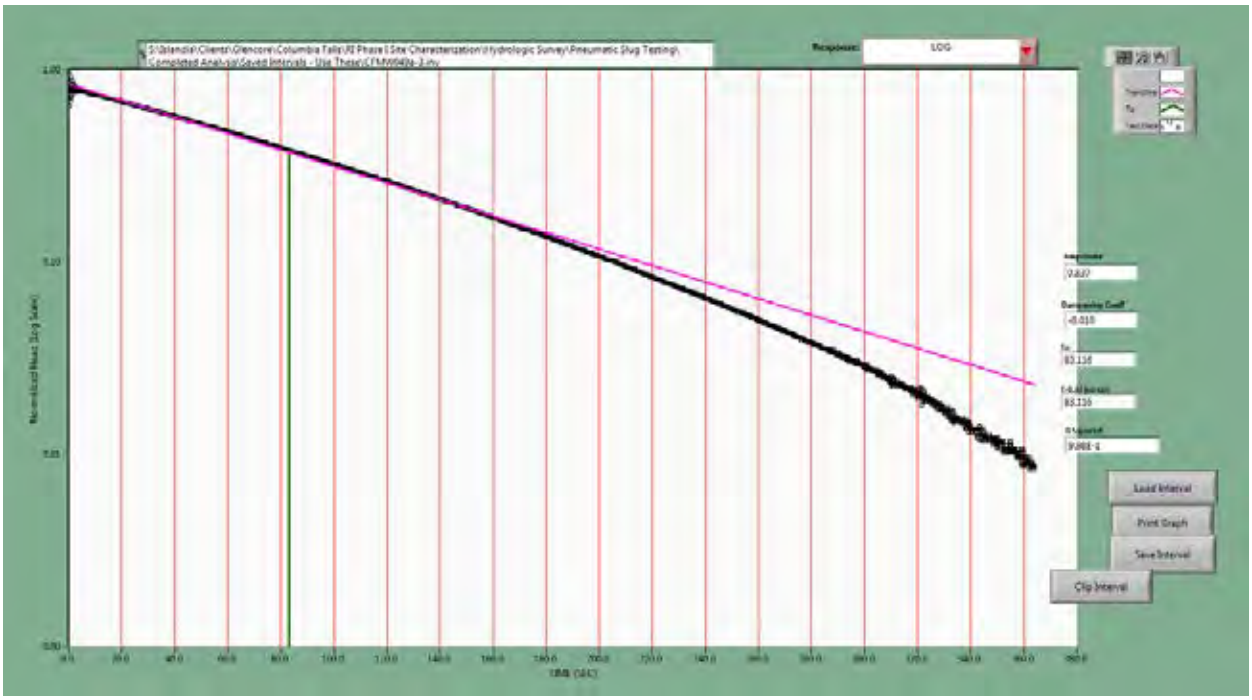
CFMW-049a
2 Foot Displacement
Test #1

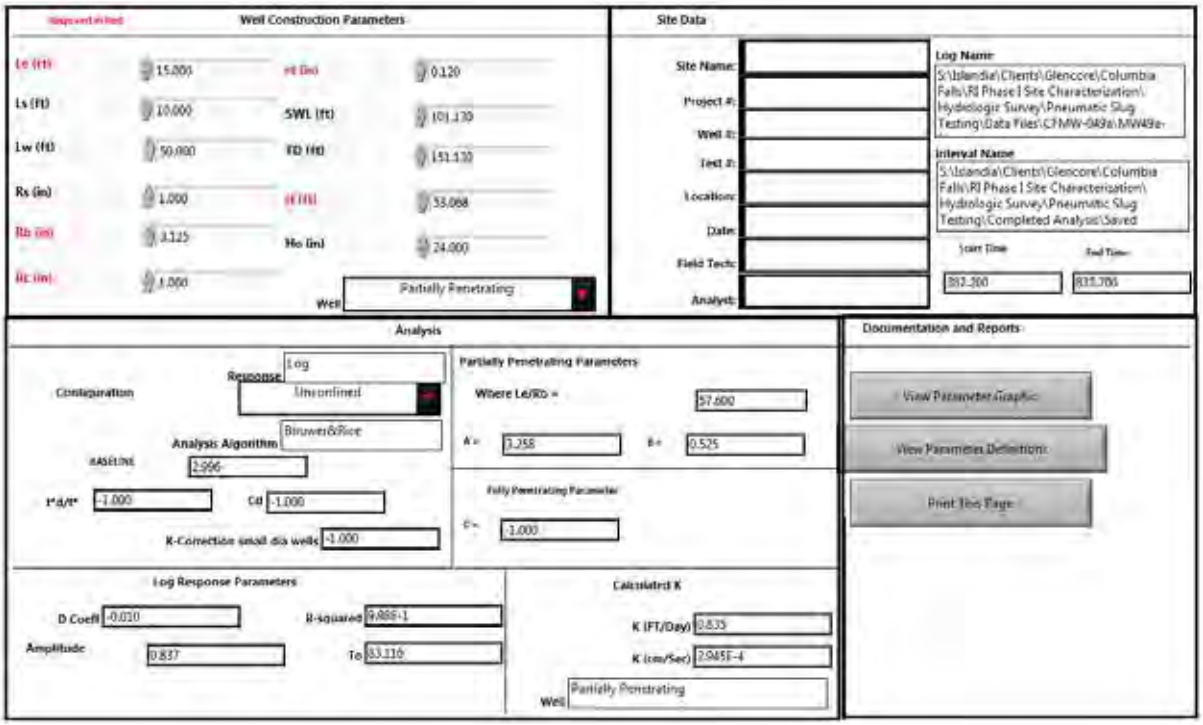


SITE INFORMATION -- SLUG TEST REV. 3.0

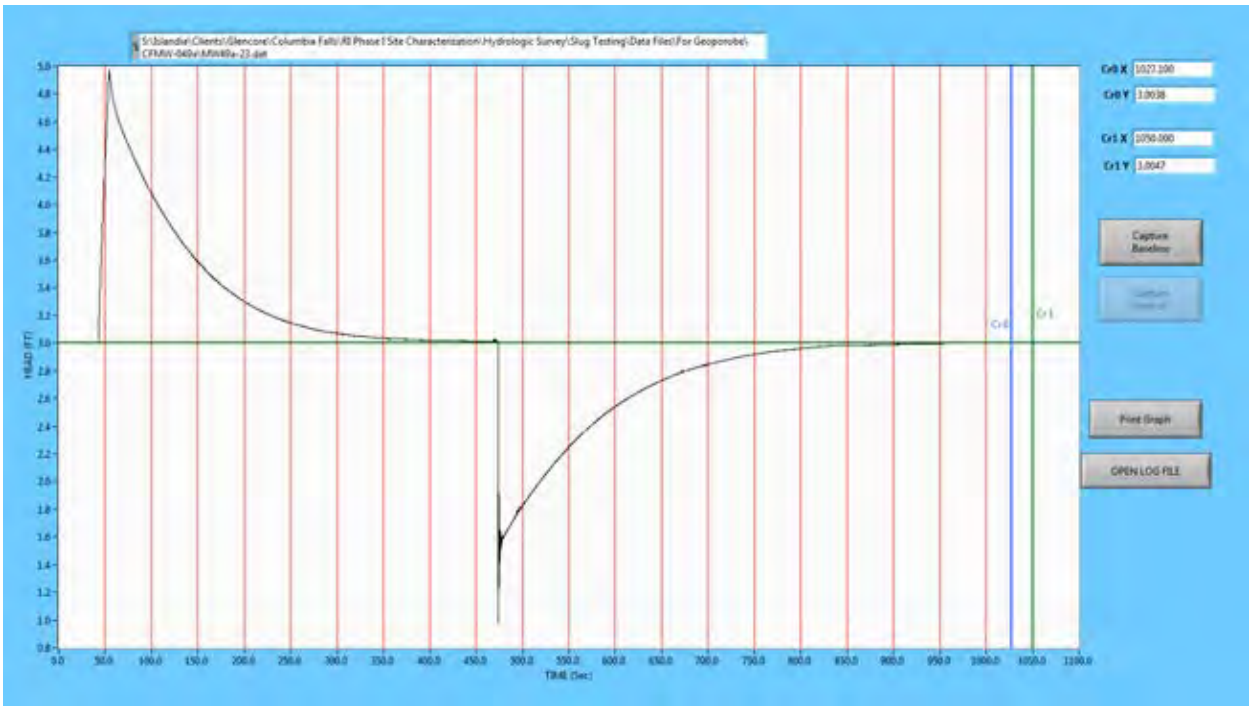
START DATE: 7/18/2017
START TIME: 12:19 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW49A-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-049a
2 Foot Displacement
Test #1





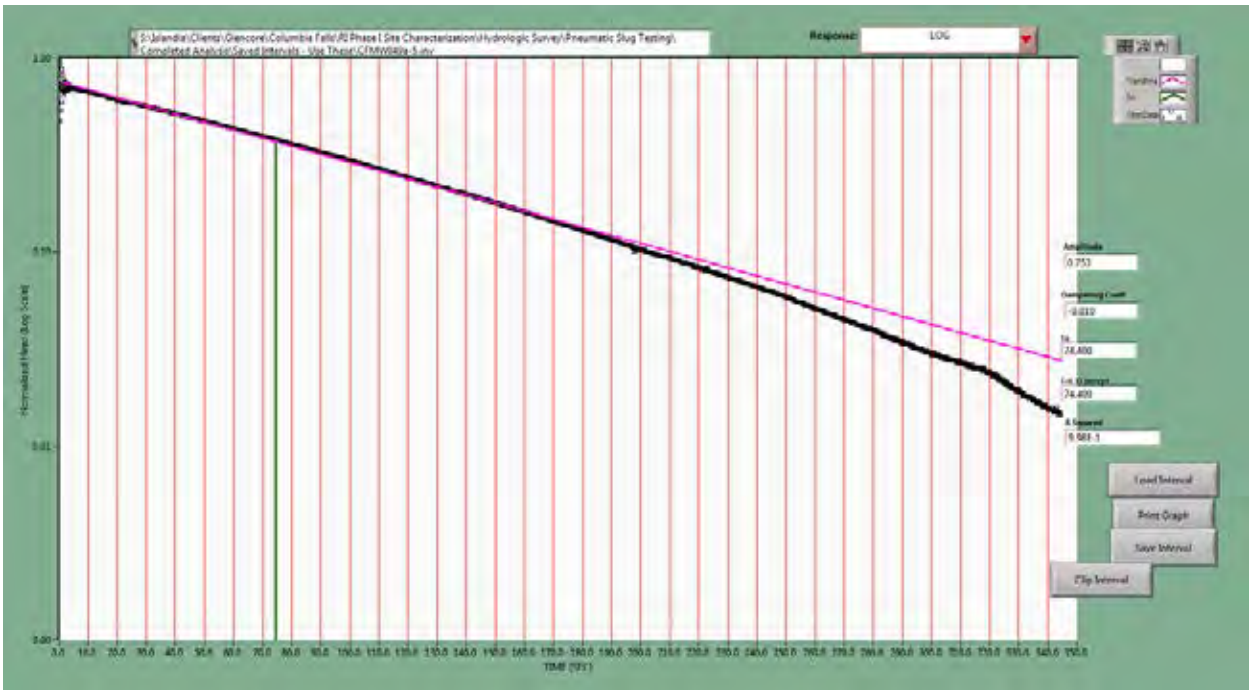
CFMW-049a
2 Foot Displacement
Test #2

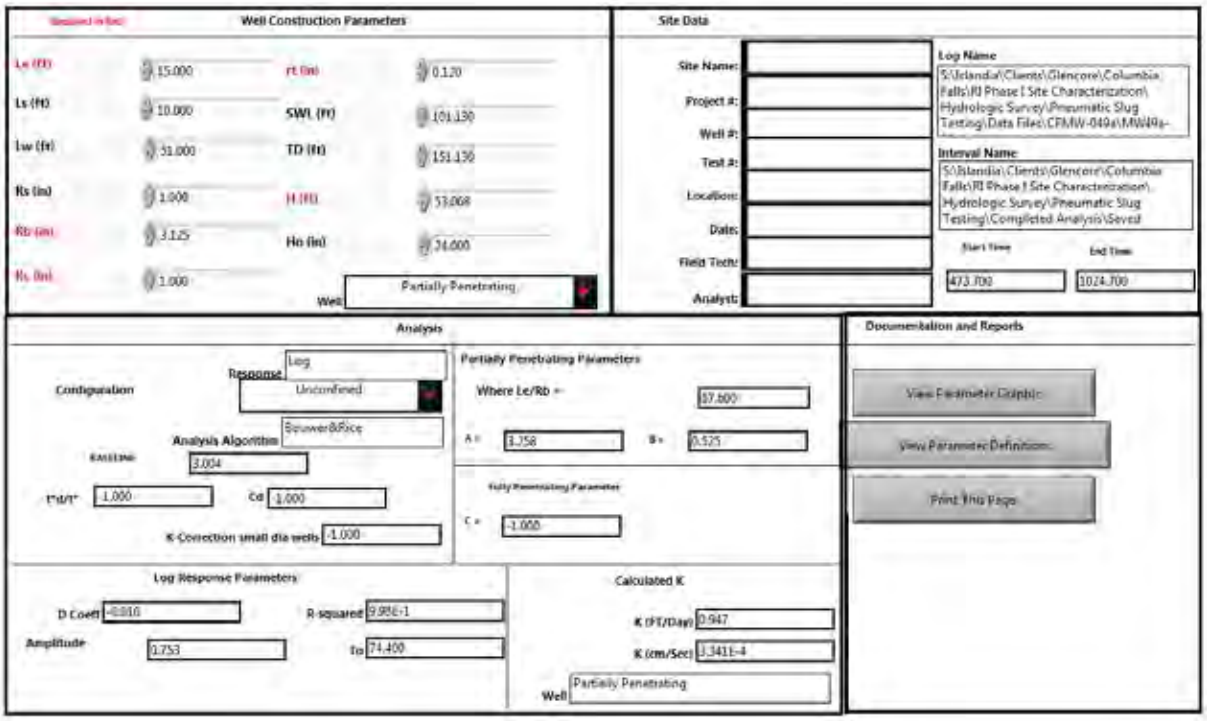


SITE INFORMATION -- SLUG TEST REV. 3.0

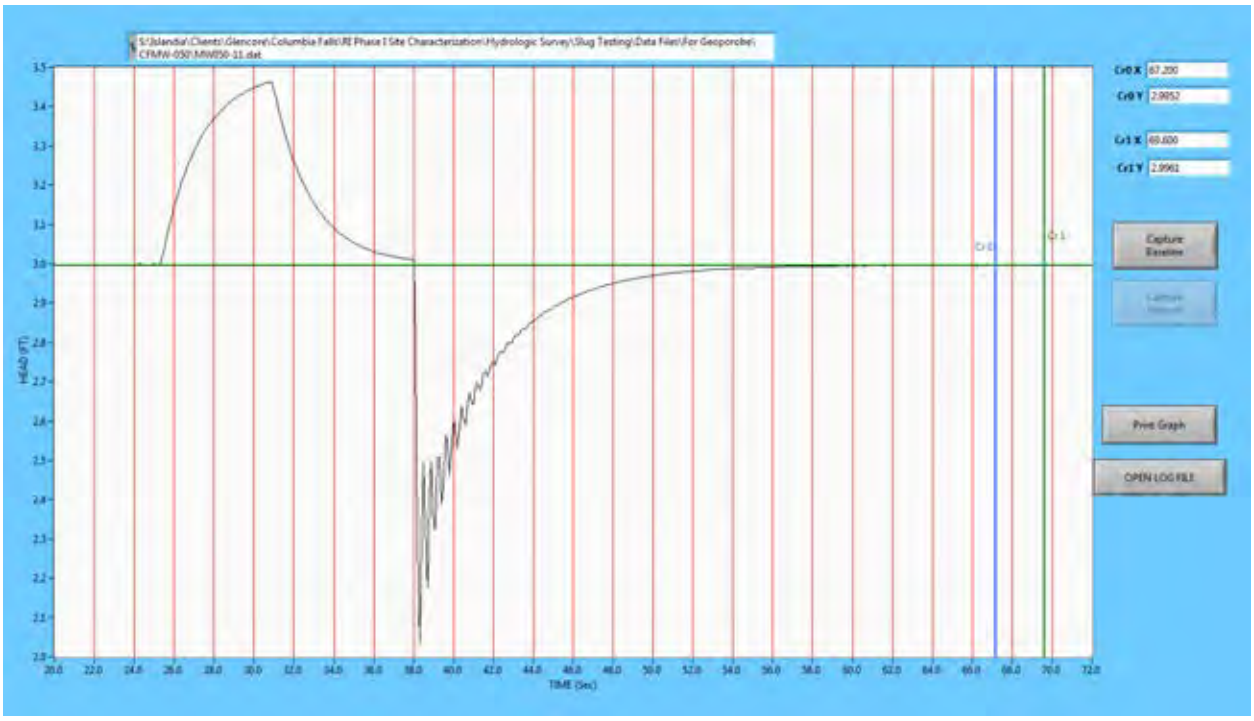
START DATE: 7/18/2017
START TIME: 1:01 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW49A-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-049a
2 Foot Displacement
Test #2





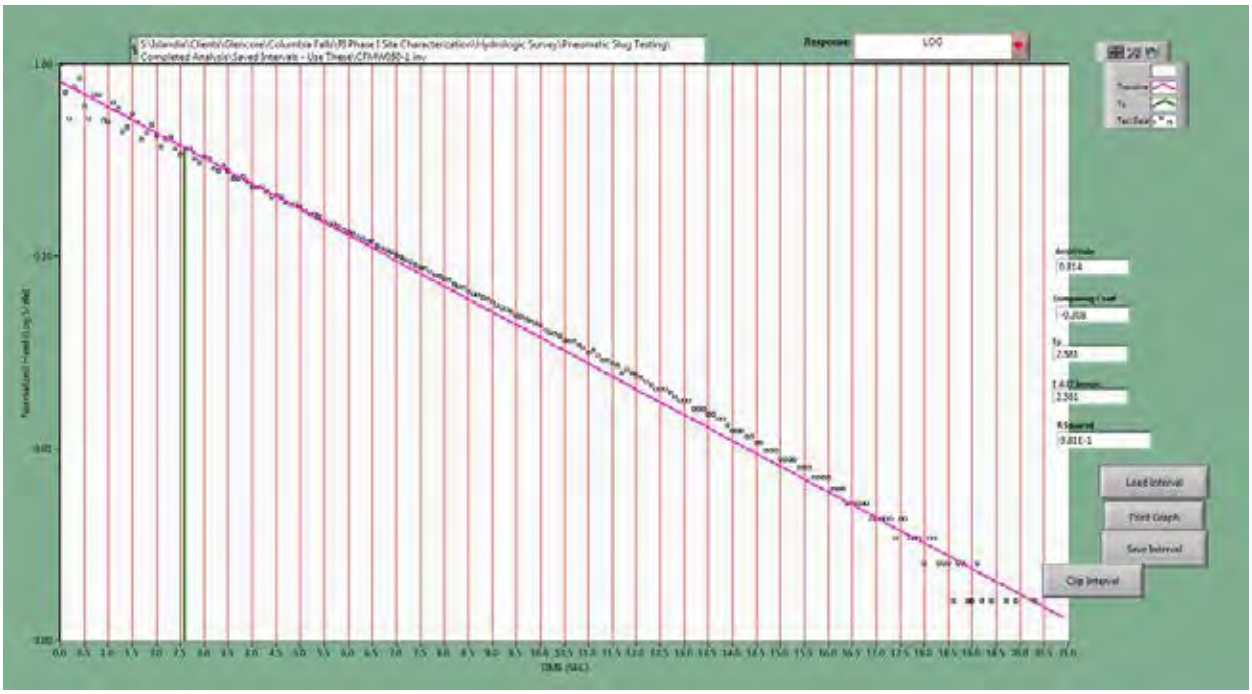
CFMW-050
1 Foot Displacement
Test #1

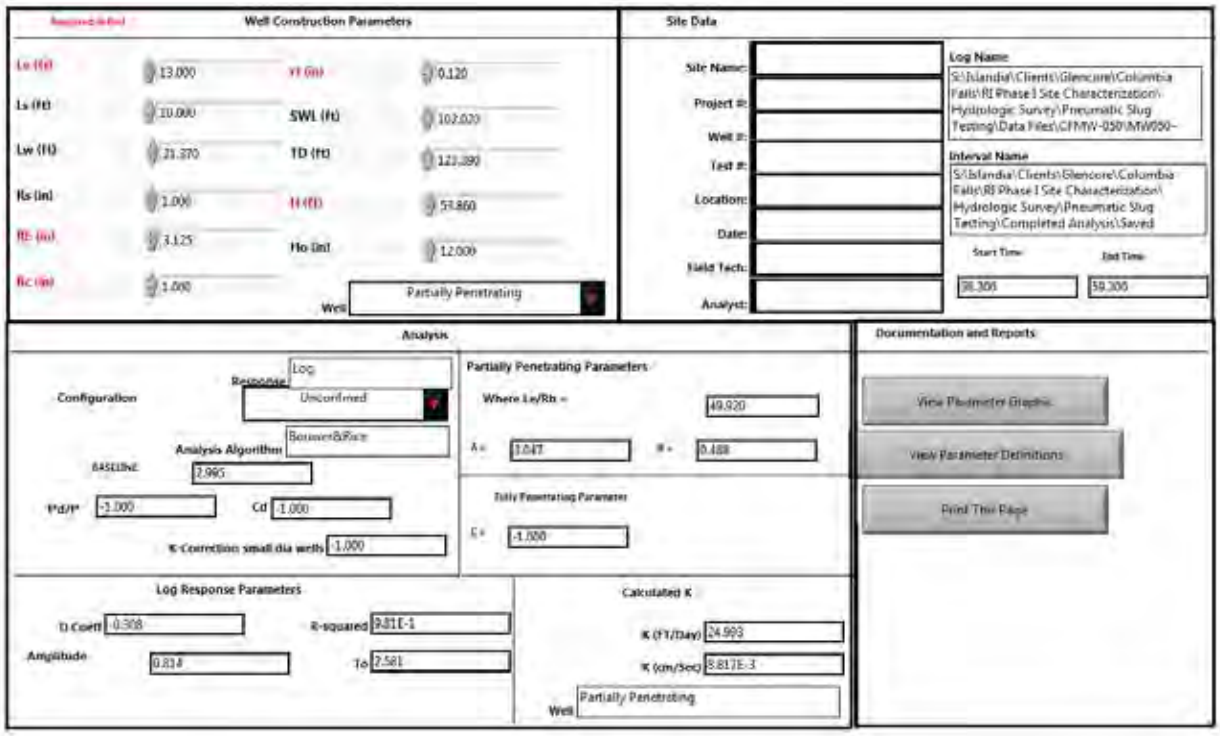


SITE INFORMATION -- SLUG TEST REV. 3.0

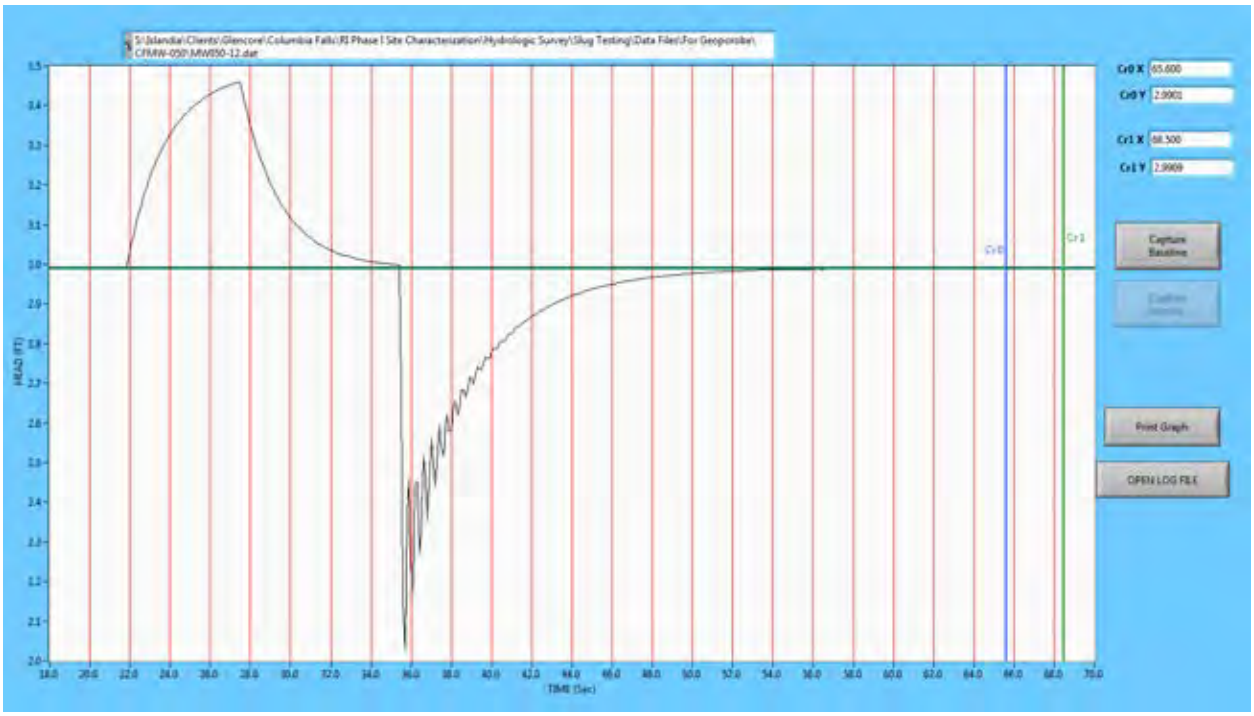
START DATE: 7/13/2017
START TIME: 1:25 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW050-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-050
1 Foot Displacement
Test #1





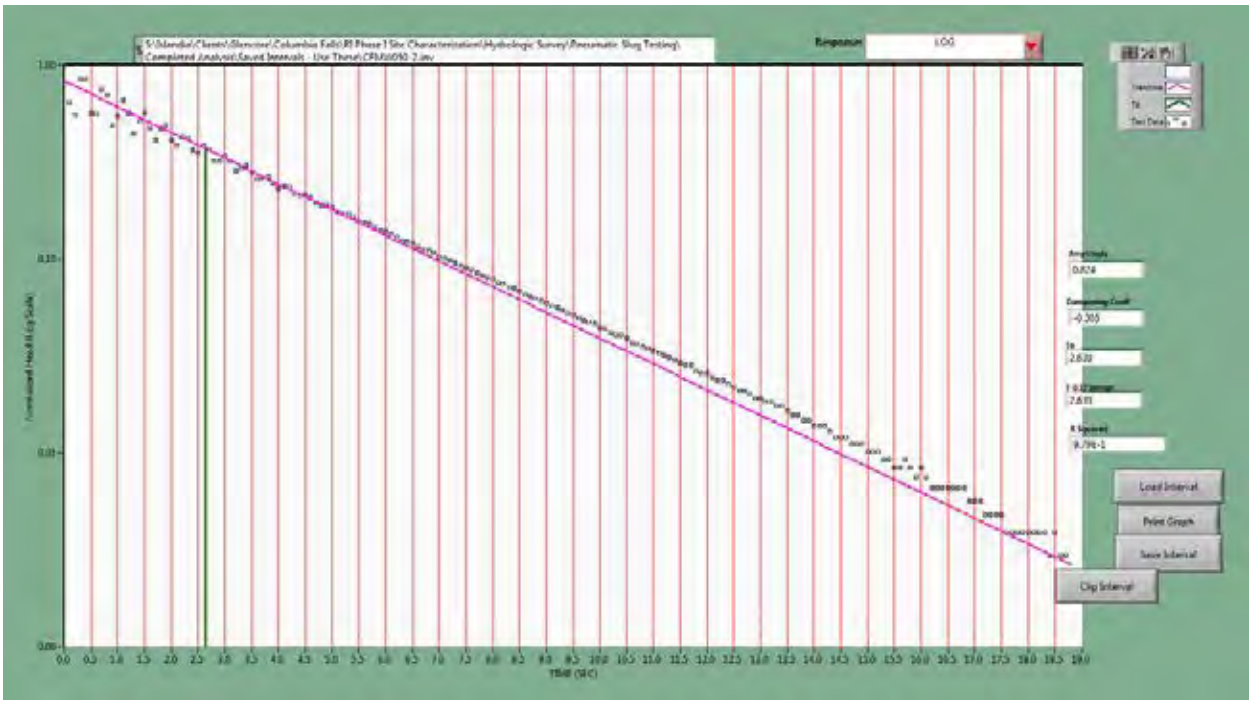
CFMW-050
1 Foot Displacement
Test #2

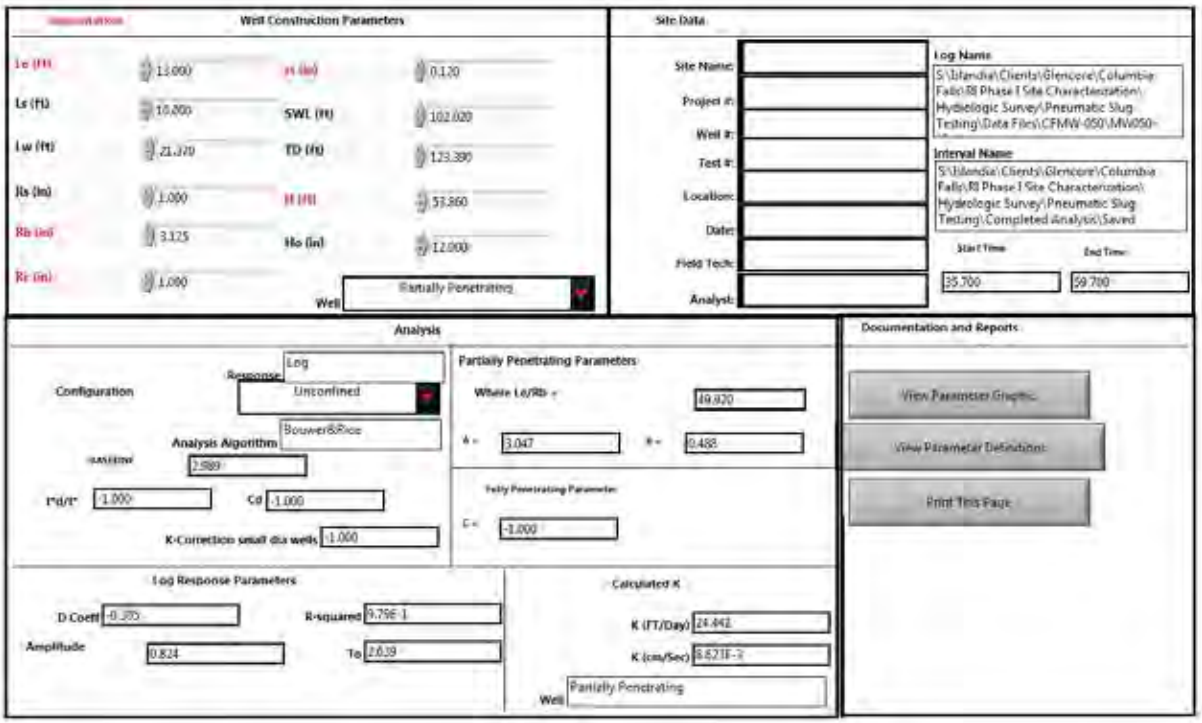


SITE INFORMATION -- SLUG TEST REV. 3.0

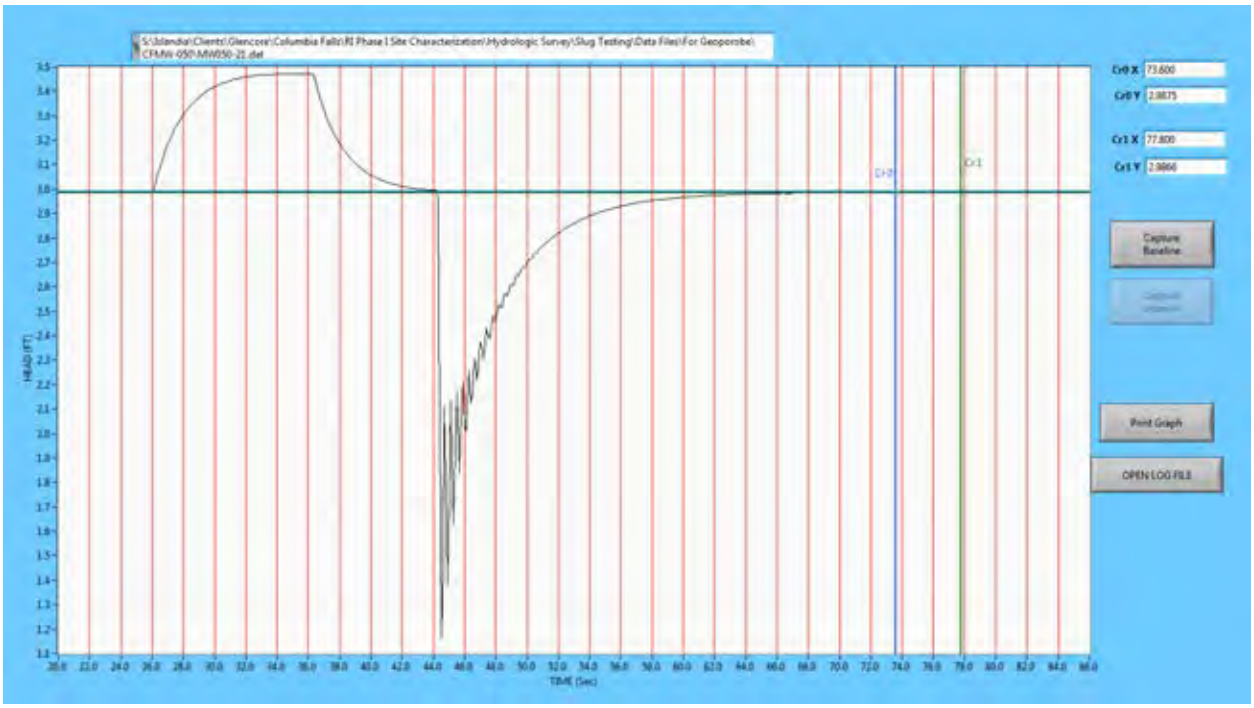
START DATE: 7/13/2017
START TIME: 1:26 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW050-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-050
1 Foot Displacement
Test #2





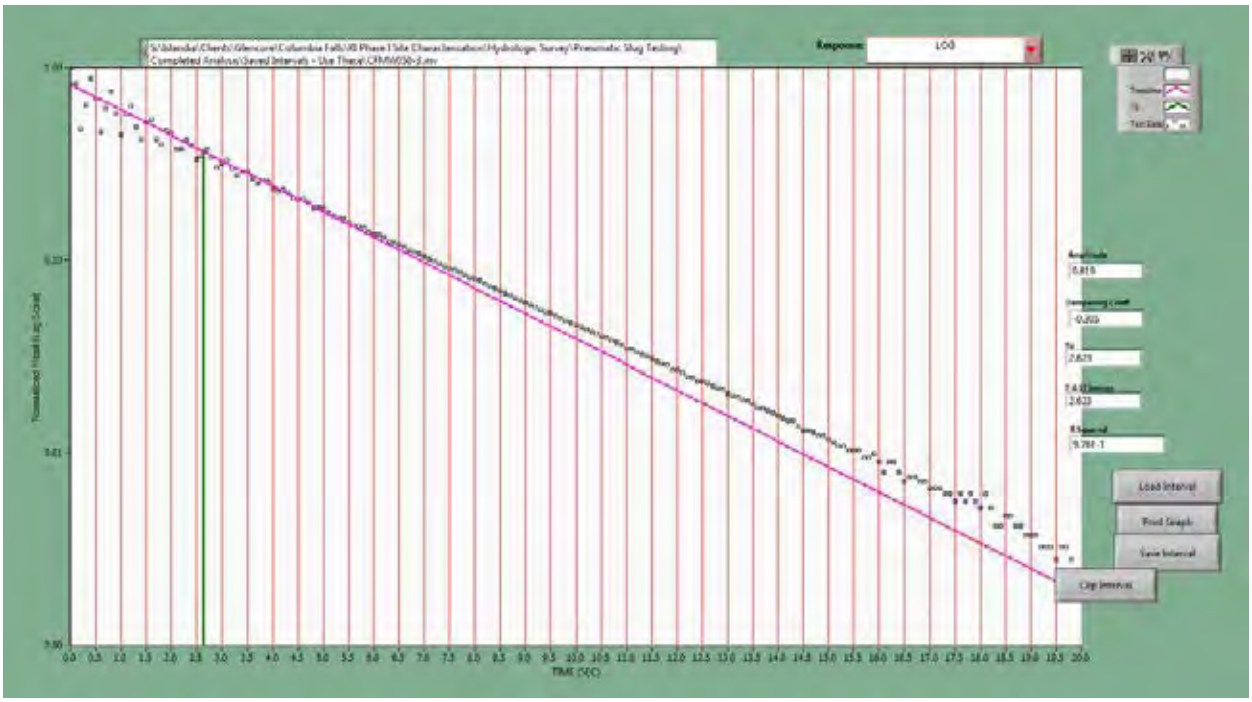
CFMW-050
2 Foot Displacement
Test #1

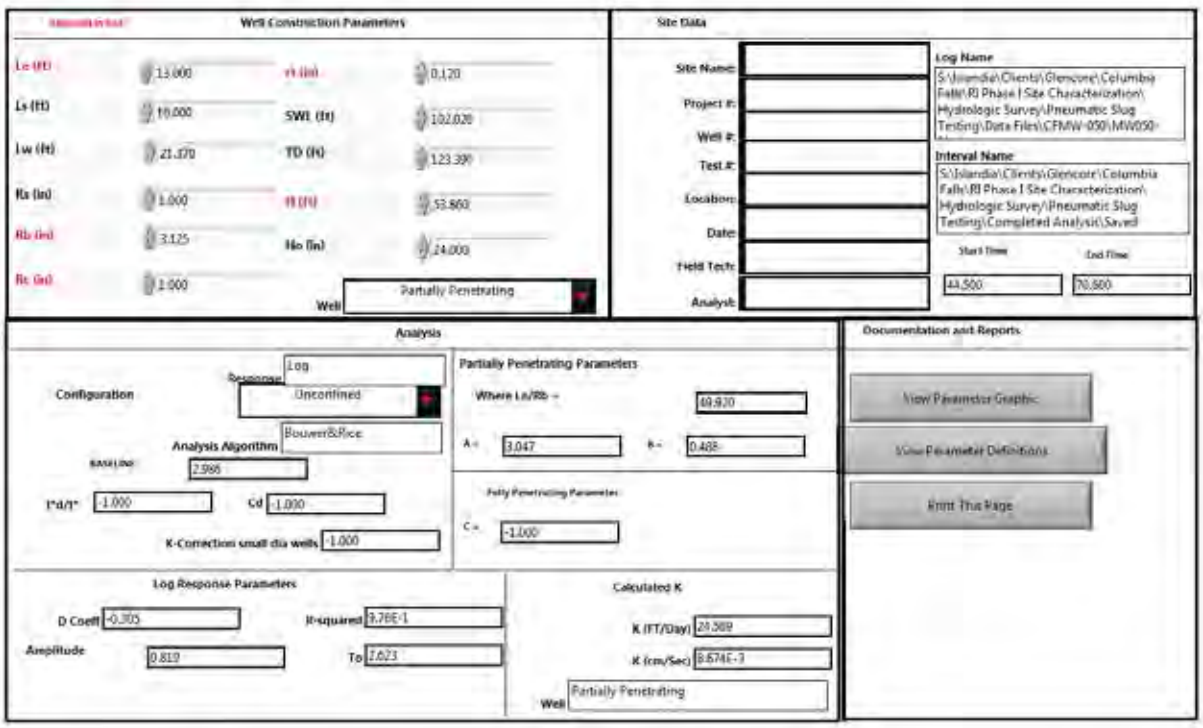


SITE INFORMATION -- SLUG TEST REV. 3.0

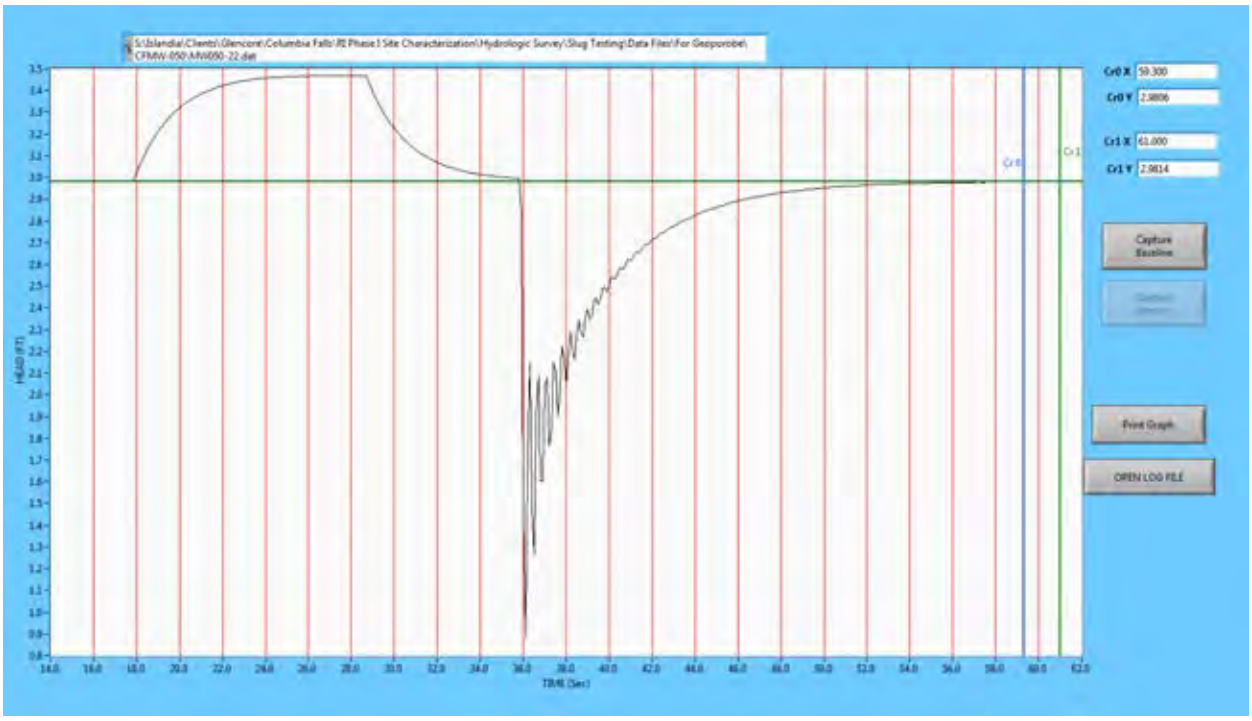
START DATE: 7/13/2017
START TIME: 1:27 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW050-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-050
2 Foot Displacement
Test #1





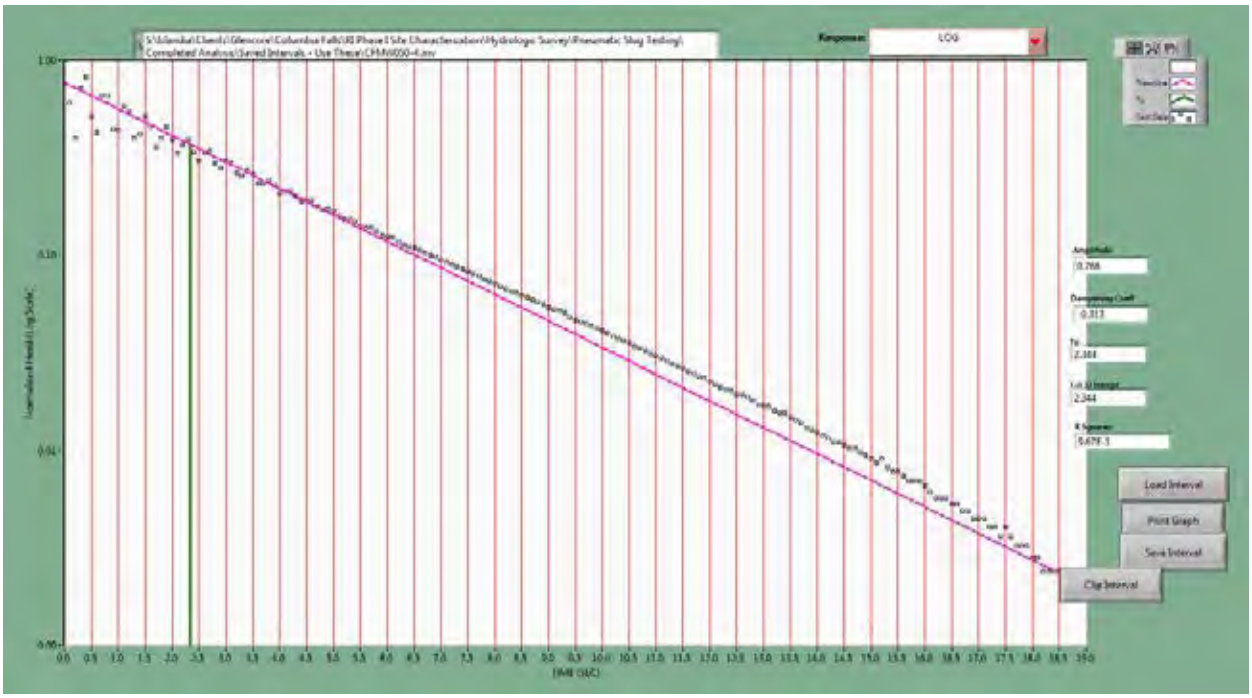
CFMW-050
2 Foot Displacement
Test #2

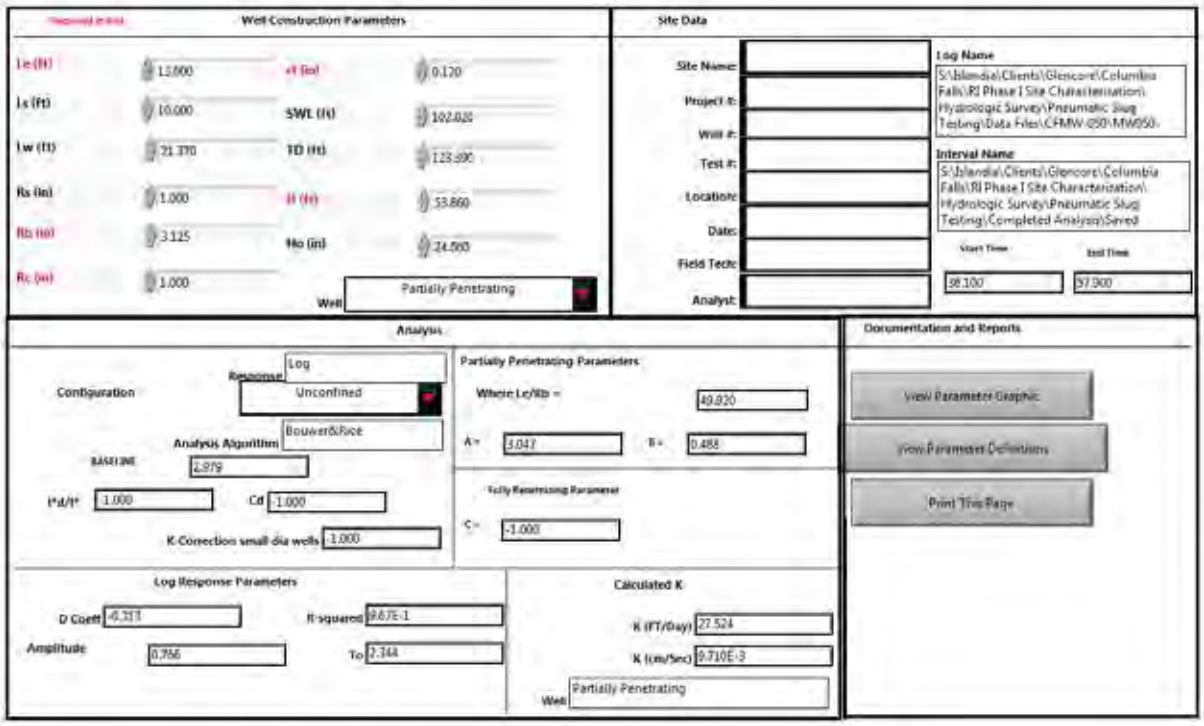


SITE INFORMATION -- SLUG TEST REV. 3.0

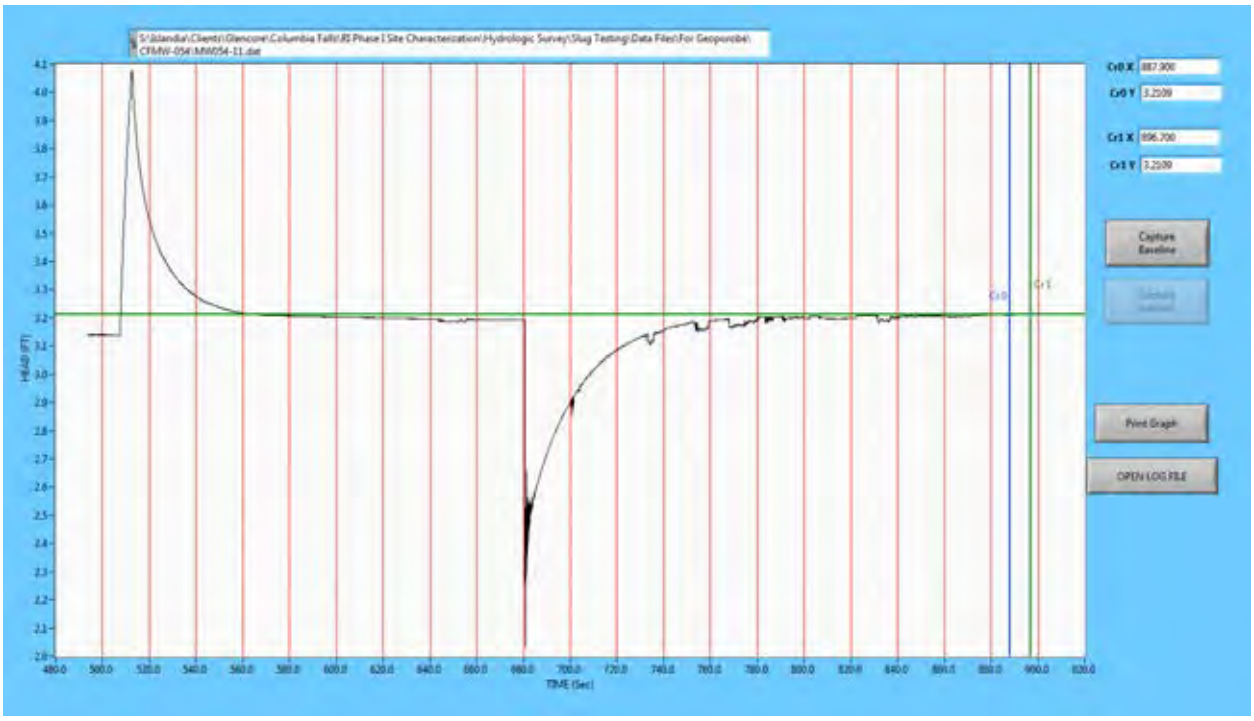
START DATE: 7/13/2017
START TIME: 1:29 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW050-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-050
2 Foot Displacement
Test #2





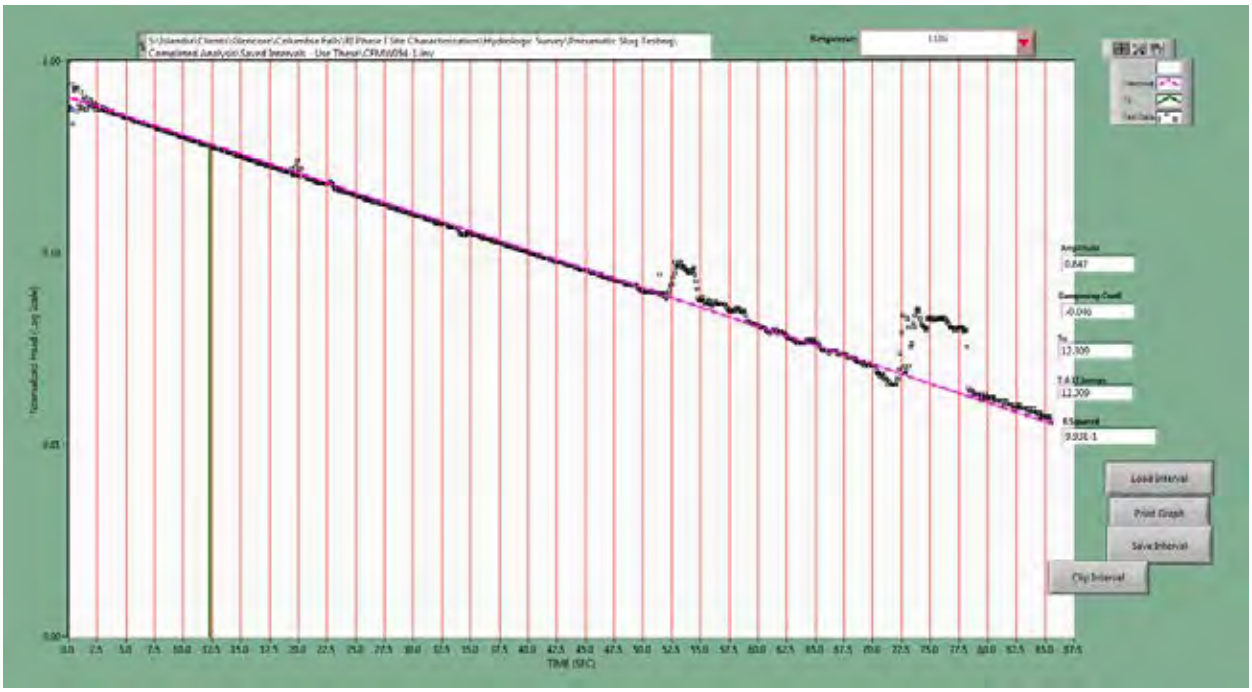
CFMW-054
1 Foot Displacement
Test #1

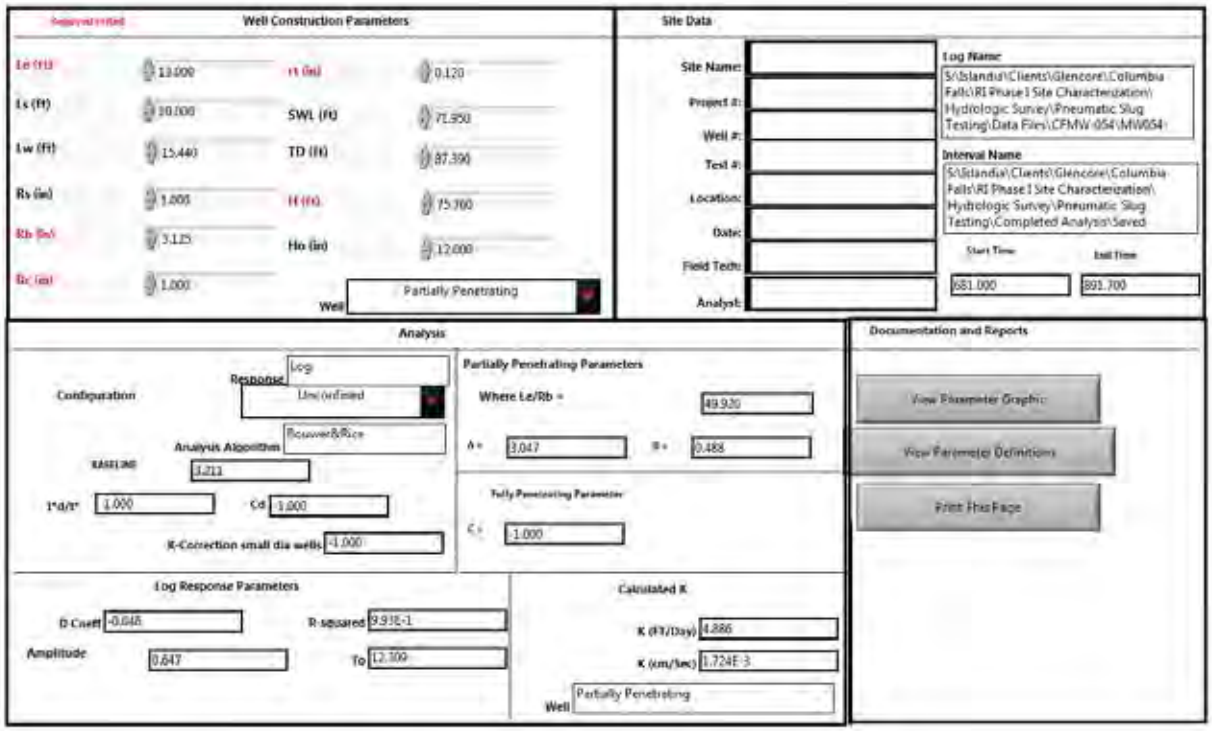


SITE INFORMATION -- SLUG TEST REV. 3.0

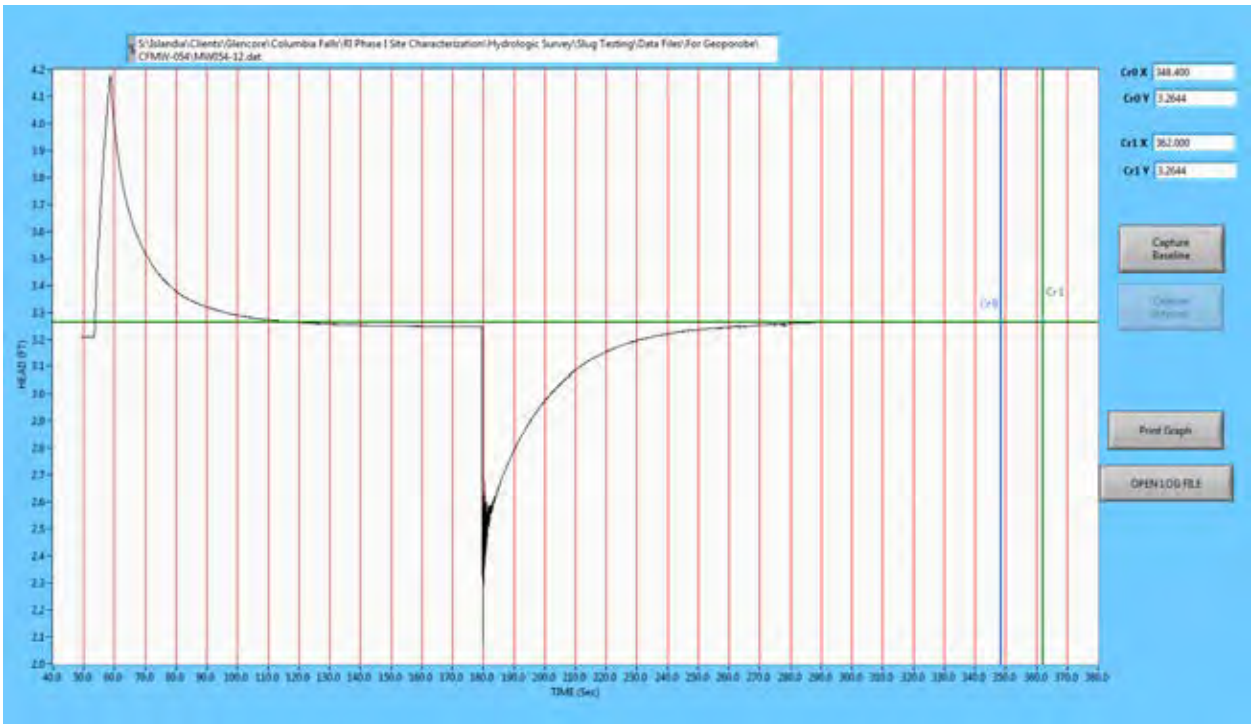
START DATE: 7/11/2017
START TIME: 9:14 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW054-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-054
1 Foot Displacement
Test #1





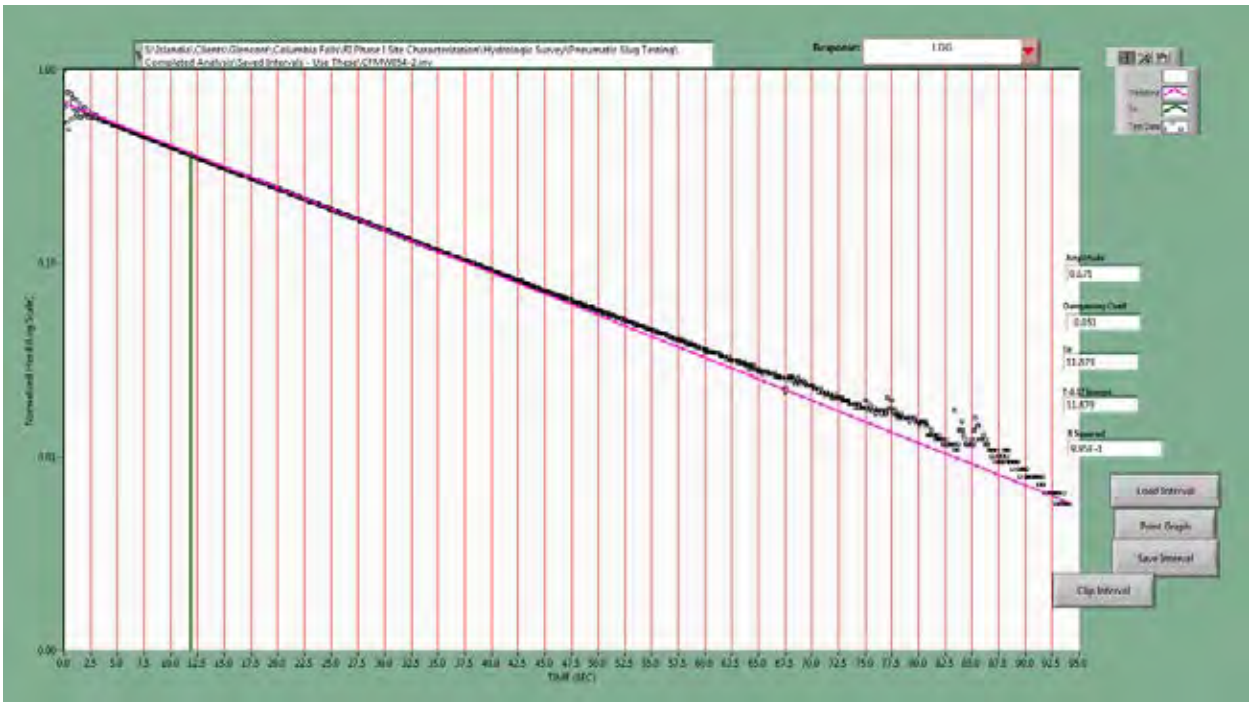
CFMW-054
1 Foot Displacement
Test #2

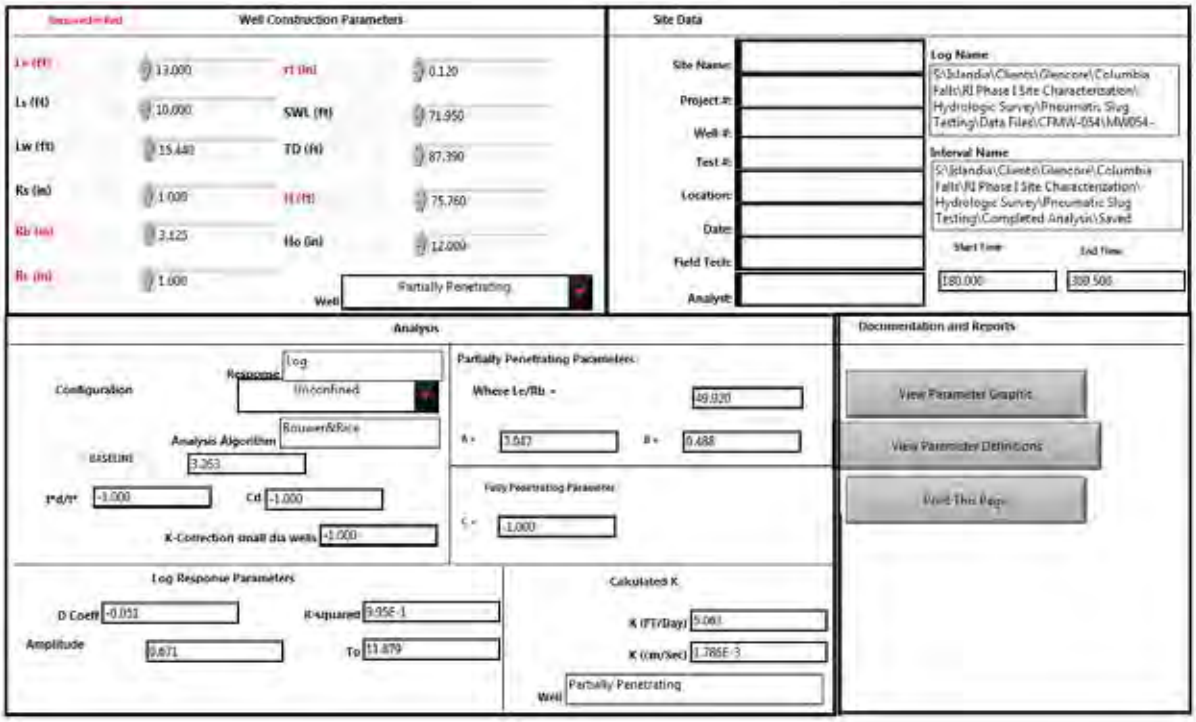


SITE INFORMATION -- SLUG TEST REV. 3.0

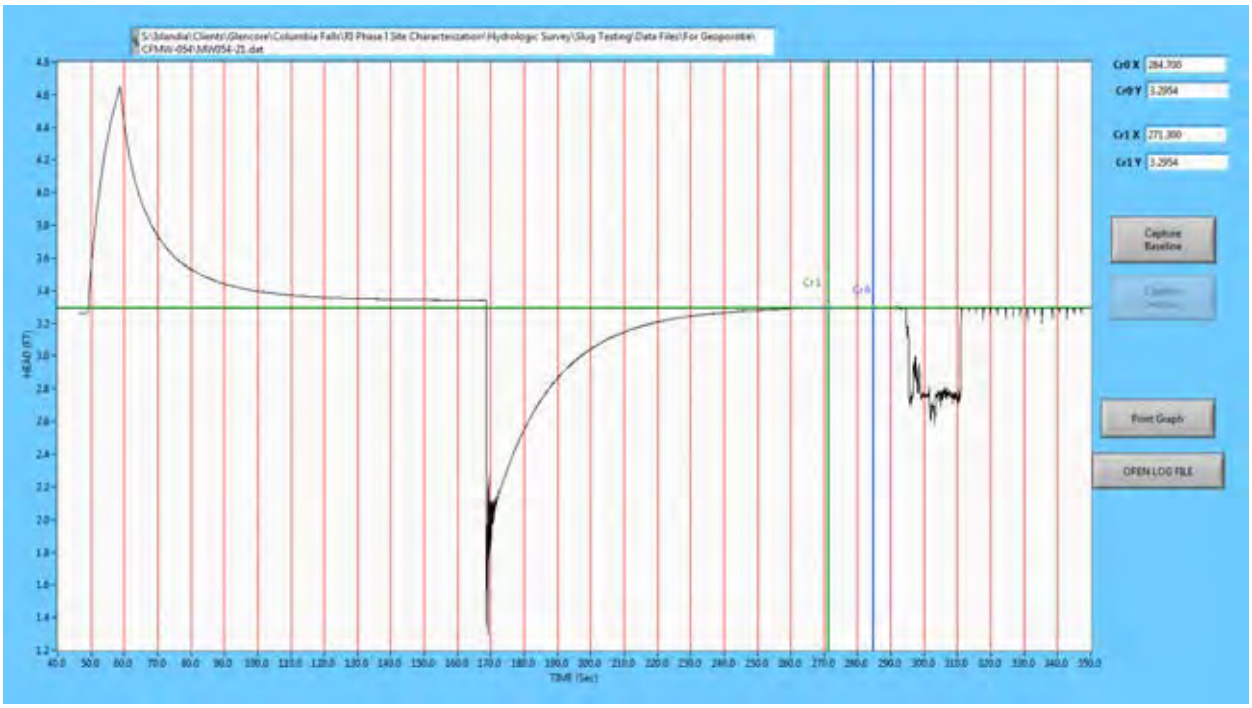
START DATE: 7/11/2017
START TIME: 9:29 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW054-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-054
1 Foot Displacement
Test #2





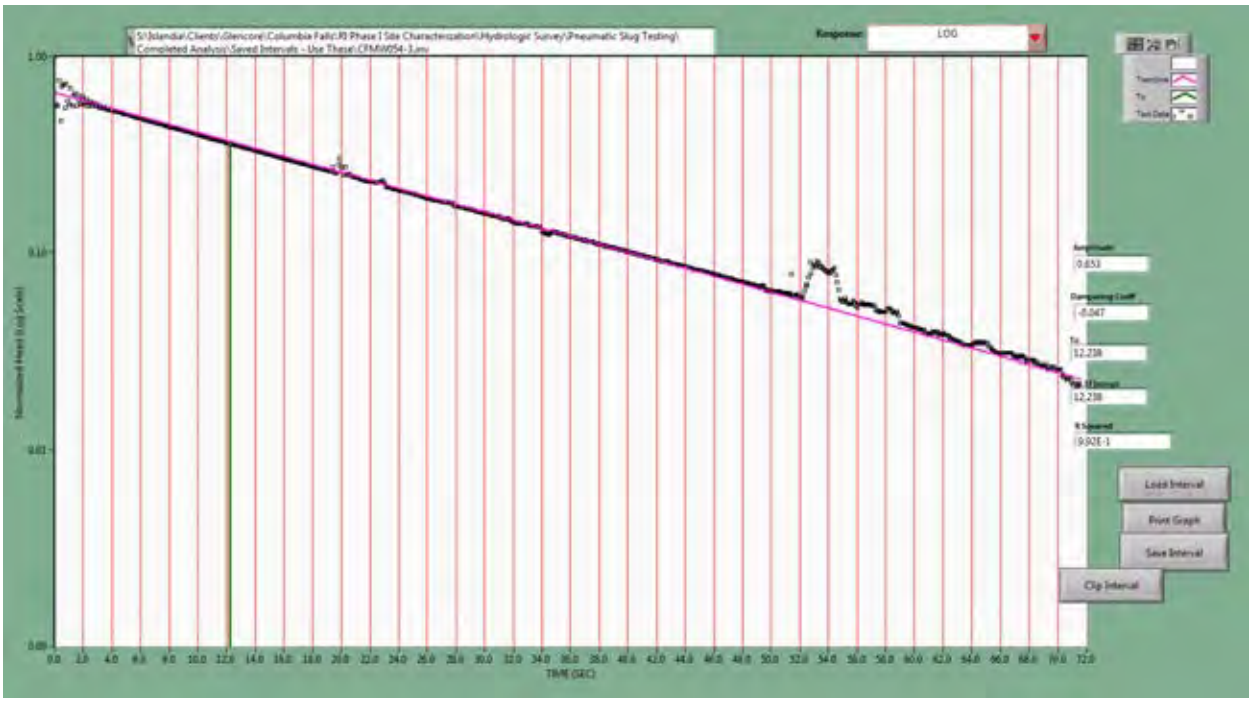
CFMW-054
2 Foot Displacement
Test #1



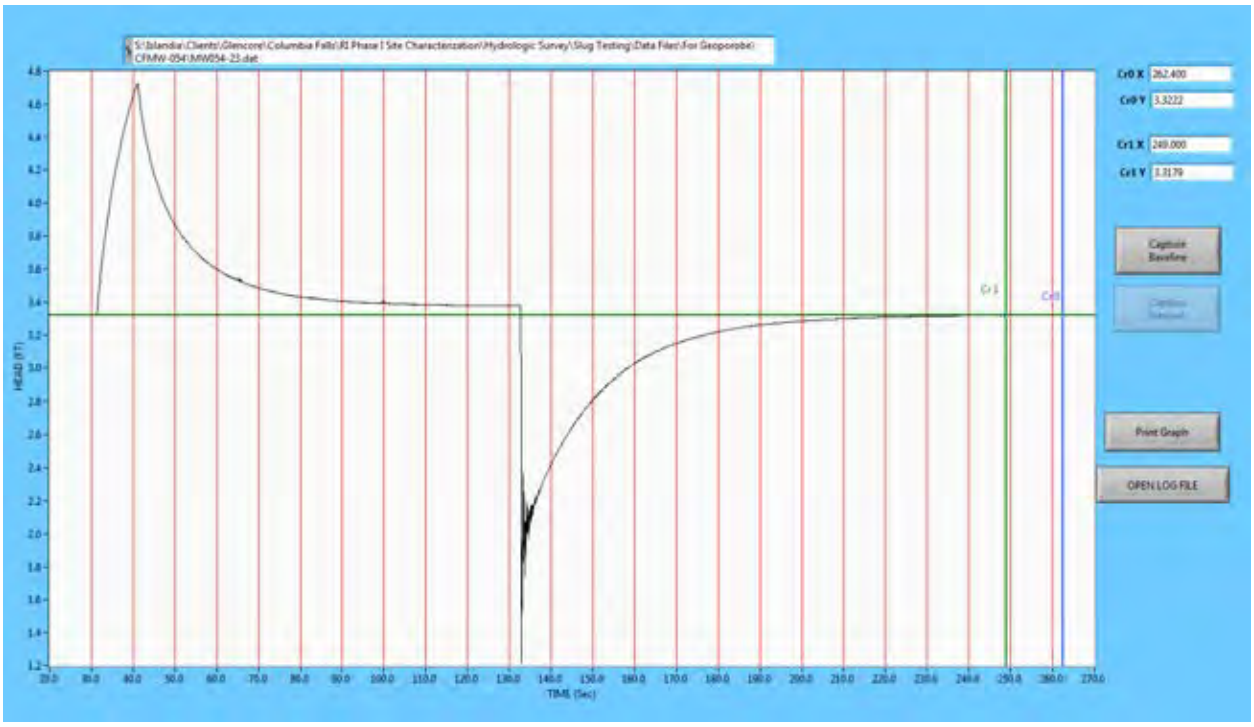
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/11/2017
START TIME: 9:36 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW054-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-054
2 Foot Displacement
Test #1



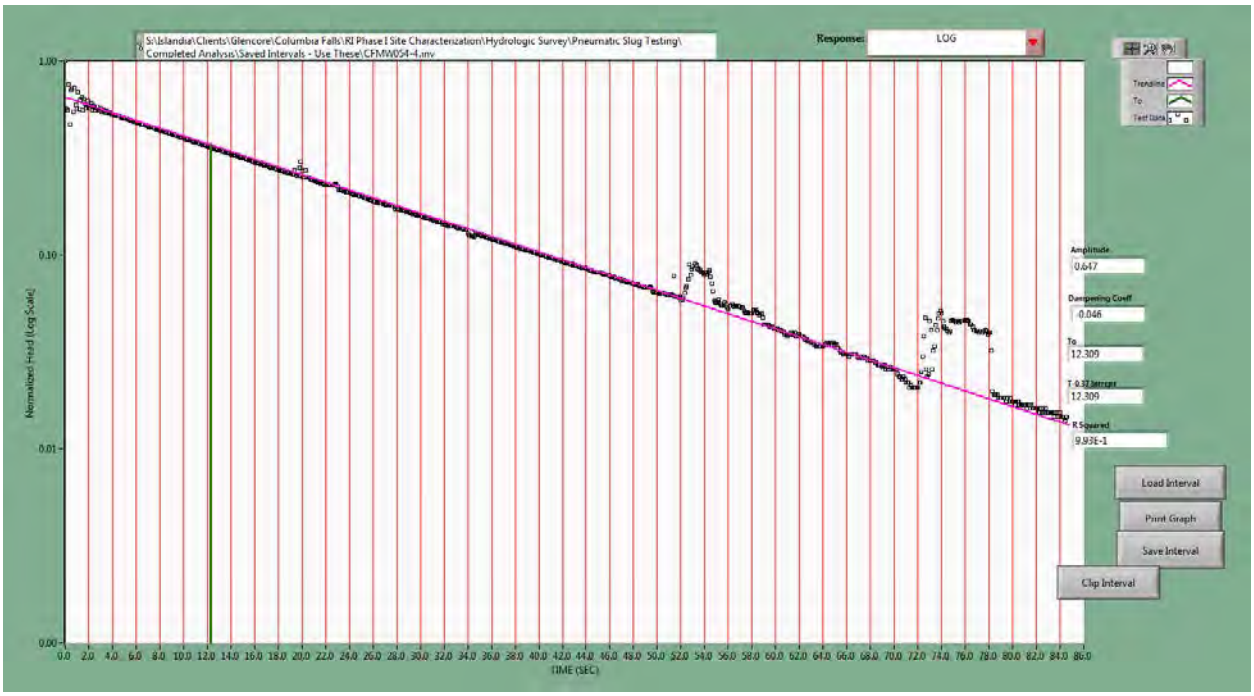
CFMW-054
2 Foot Displacement
Test #2

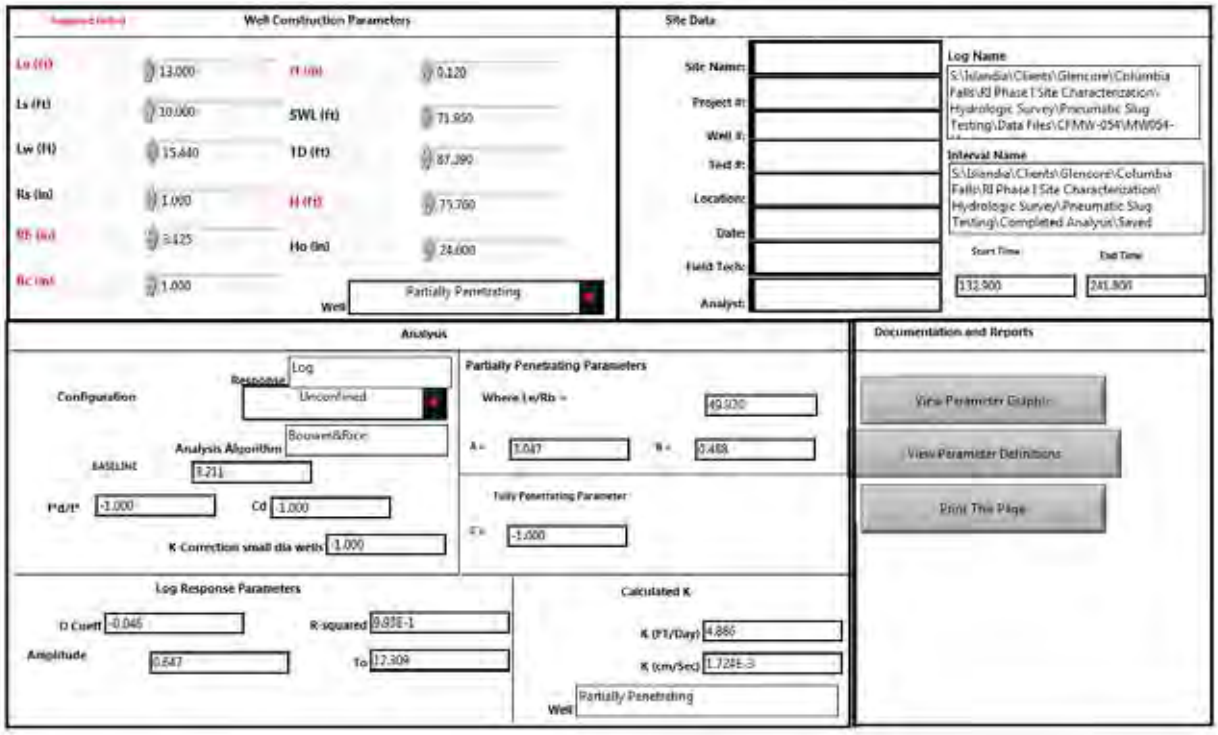


SITE INFORMATION -- SLUG TEST REV. 3.0

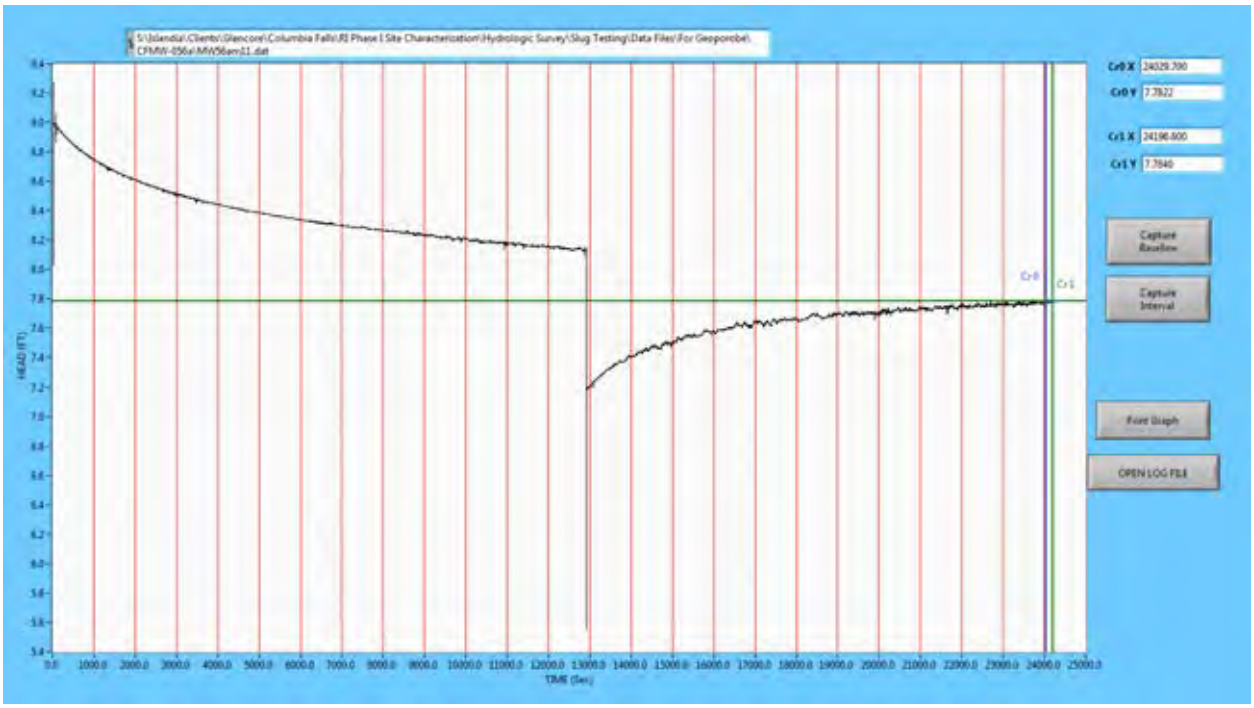
START DATE: 7/11/2017
START TIME: 9:51 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW054-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-054
2 Foot Displacement
Test #2





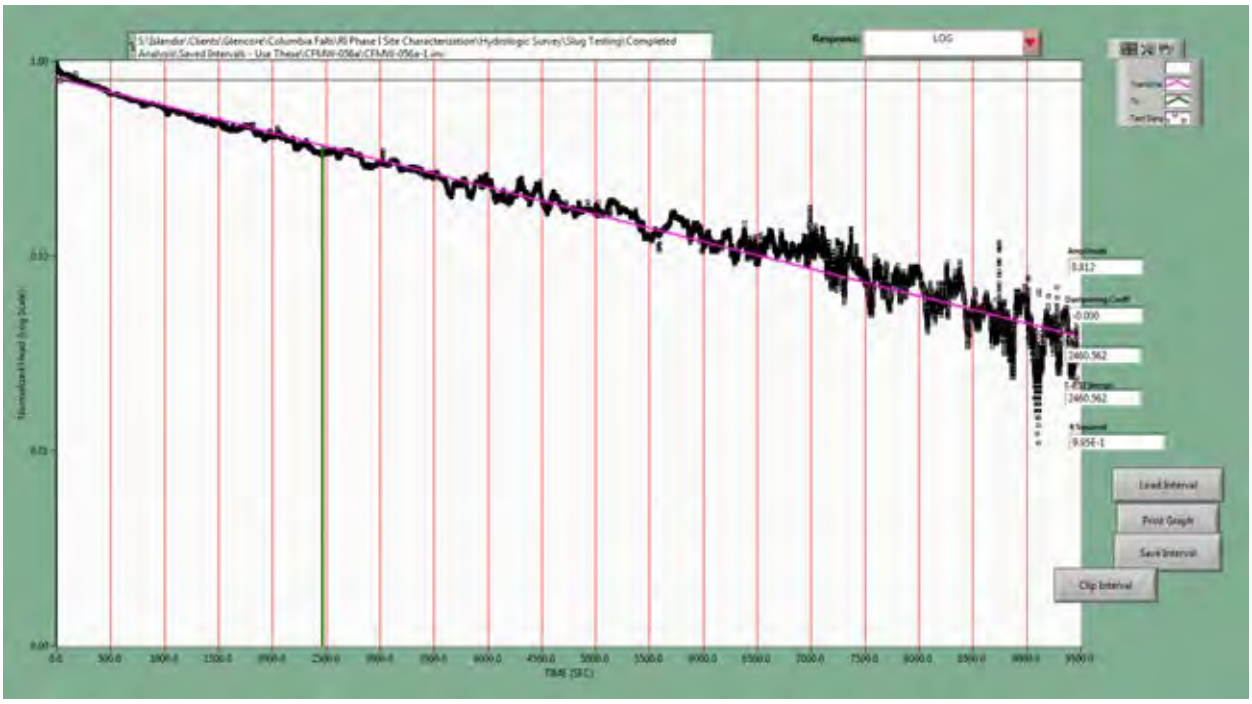
CFMW-056a
1 Foot Displacement
Test #1



SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/20/2017
START TIME: 10:51 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW56AM11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-056a
1 Foot Displacement
Test #1



Well Construction Parameters

Le (ft)	15.000	rs (in)	0.120
Lc (ft)	10.000	SWL (ft)	70.670
Lw (ft)	66.800	TD (ft)	137.520
Rs (in)	1.000	H (ft)	532.338
Rb (in)	3.125	Ro (in)	12.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:
Project #:
Well #:
Test #:
Location:
Date:
Field Tech:
Analyst:

Log Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Slug Testing\Data Files\For Geoprobe\CFMW-056a\

Interval Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Slug Testing\Completed Analysis\Saved Intervals - Use

Start Time: 12908.800 End Time: 24154.500

Analysis

Configuration: Response: Log; Unconfined

Analysis Algorithm: Bouwer&Rice

BASELINE: 7.776

r*d/r*: 1.000 Cd: 1.000

K-Correction small dia wells: -1.000

Partially Penetrating Parameters

Where Lc/Rb = 57.600

A = 3.258 B = 0.525

Fully Penetrating Parameters

C = -1.000

Log Response Parameters

D Coeff: -0.000 R-squared: 9.95E-1

Amplitude: 0.812 To: 2460.562

Calculated K

K (FT/Day): 0.025

K (cm/Sec): 8.873E-6

Well: Partially Penetrating

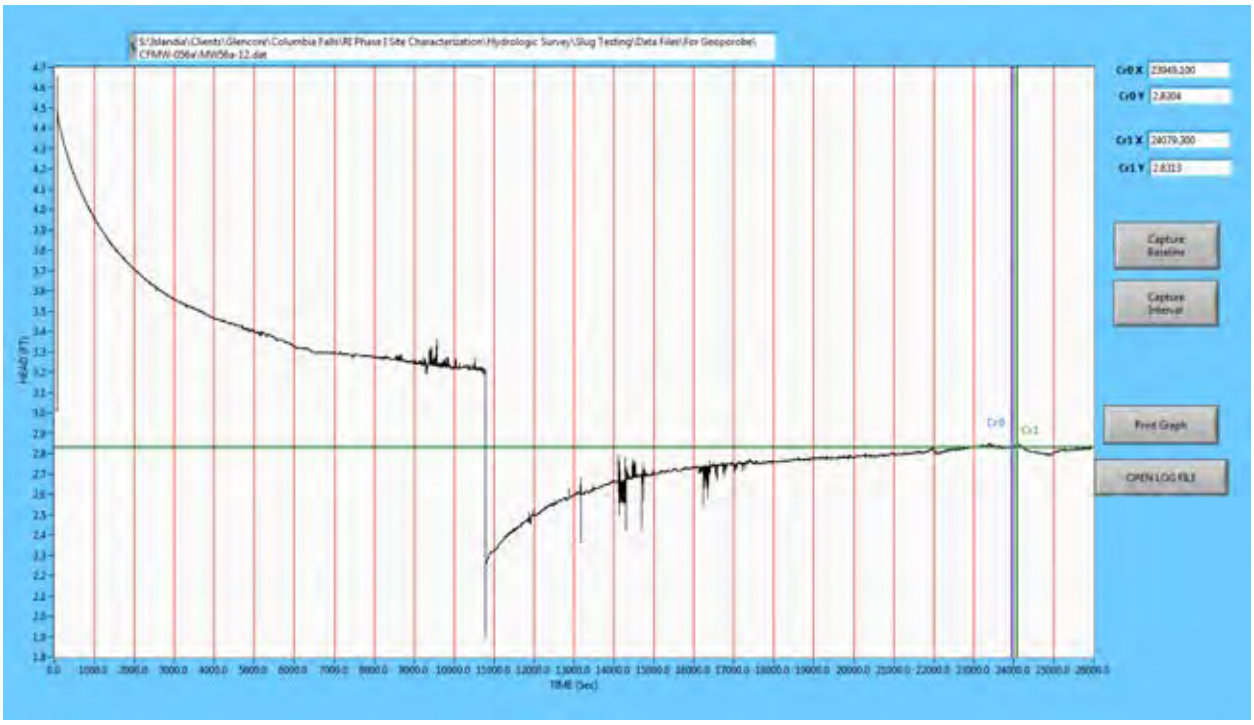
Documentation and Reports

View Parameter Graphic

View Parameter Definitions

Print This Page

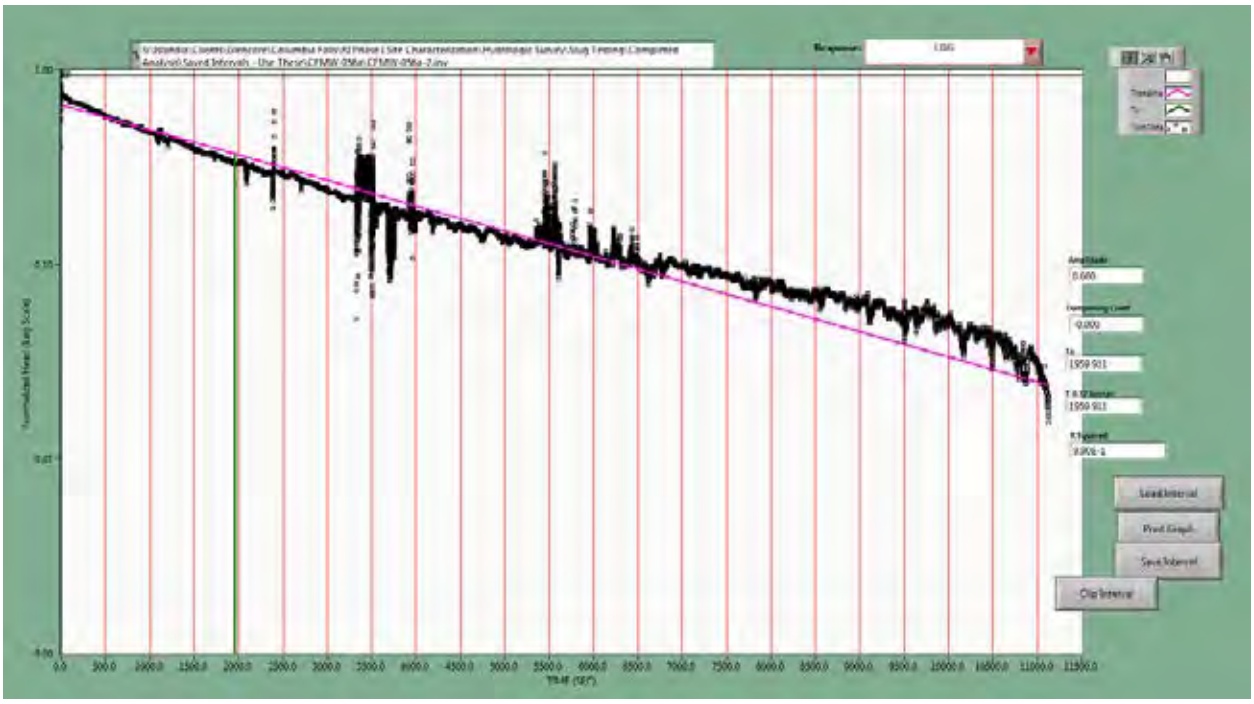
CFMW-056a
1 Foot Displacement
Test #2



SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/27/2017
START TIME: 9:22 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW56A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-056a
1 Foot Displacement
Test #2



Well Construction Parameters

Le (ft)	15.000	rb (in)	0.120
Ls (ft)	10.000	SWL (ft)	70.670
Lw (ft)	66.850	TD (ft)	137.520
Rs (in)	1.000	H (ft)	532.338
Rb (in)	3.125	Ho (in)	12.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:
Project #:
Well #:
Test #:
Location:
Date:
Field Tech:
Analyst:

Log Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Slug Testing\Data Files\For Geoprobe\CFMW-056a\MW56a-

Interval Name: S:\Islandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Slug Testing\Completed Analysis\Saved Intervals - Use

Start Time: 10780.500
End Time: 24078.800

Analysis

Configuration: Response: Log; Unconfined
Analysis Algorithm: Bouwer&Rice
ln(Re/rw): 2.831
L*d/L*: -1.000
Cd: -1.000
K-Correction small dia wells: -1.000

Partially Penetrating Parameters
Where Le/Rb = 57.600
A = 3.258
B = 0.525

Fully Penetrating Parameters
C = 1.000

Log Response Parameters

D Coeff: -0.000
R-squared: 9.90E-1
Amplitude: 0.660
To: 1959.911

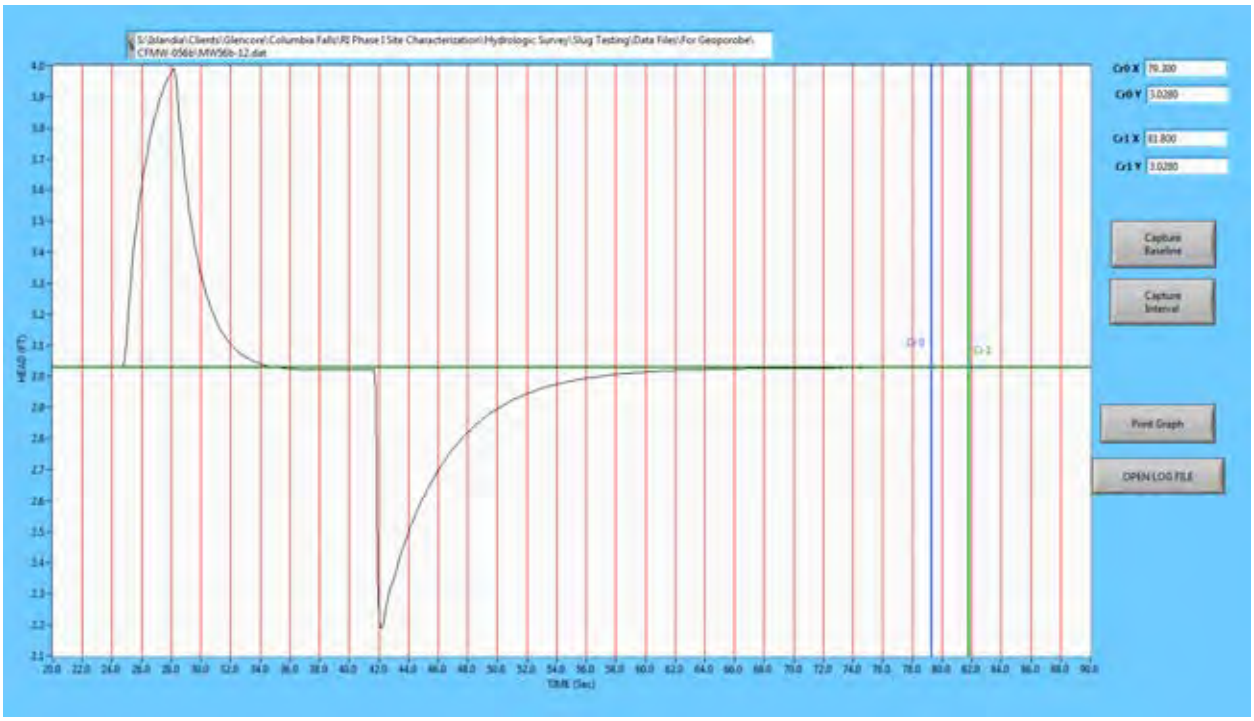
Calculated K

K (FT/Day): 0.032
K (cm/Sec): 1.114E-5
Well: Partially Penetrating

Documentation and Reports

View Parameter Graphic
View Parameter Definitions
Print This Page

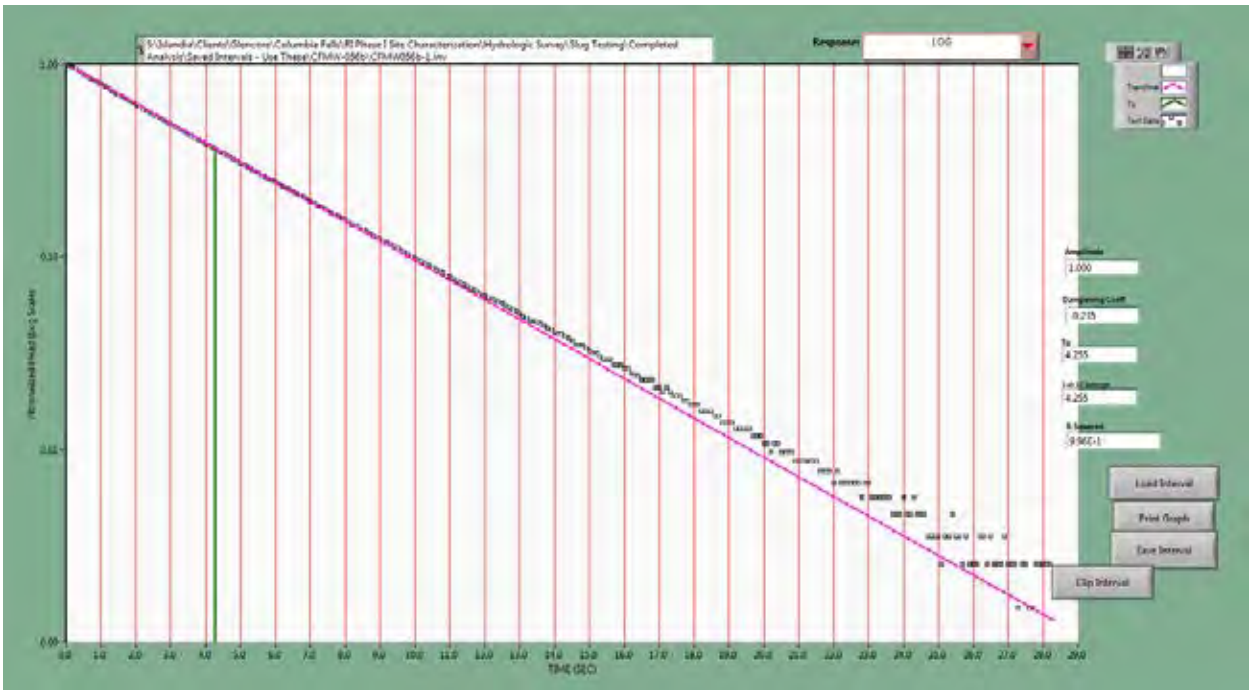
CFMW-056b
1 Foot Displacement
Test #1

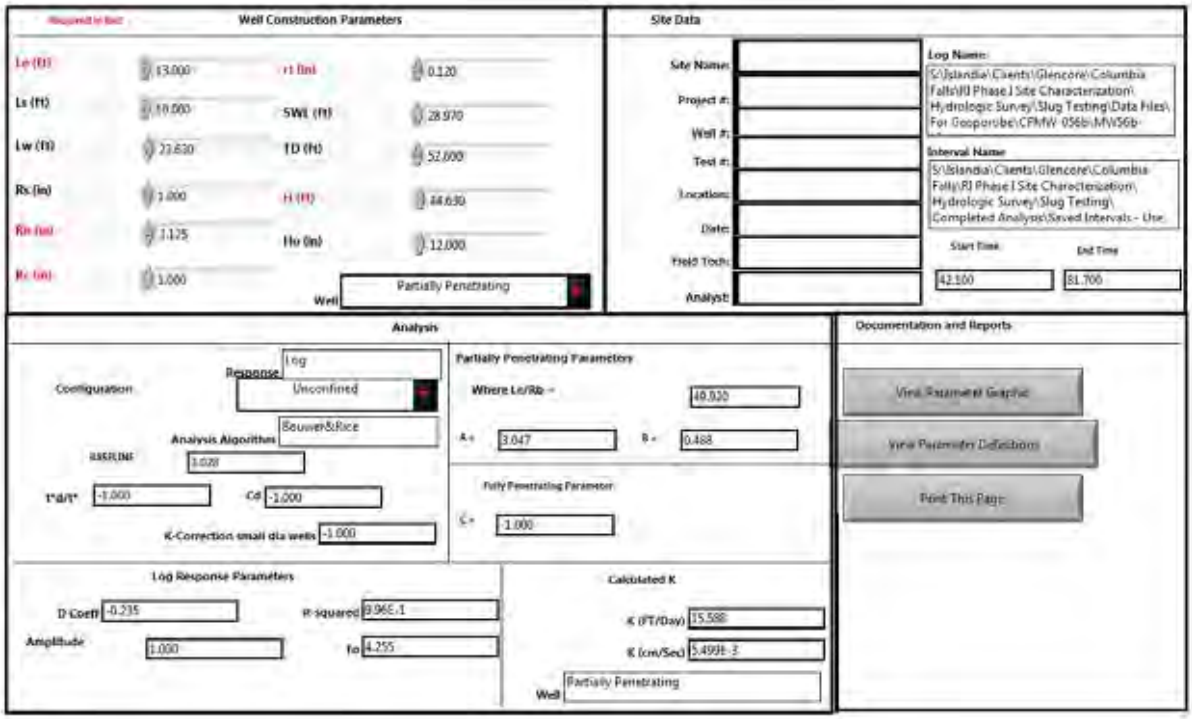


SITE INFORMATION -- SLUG TEST REV. 3.0

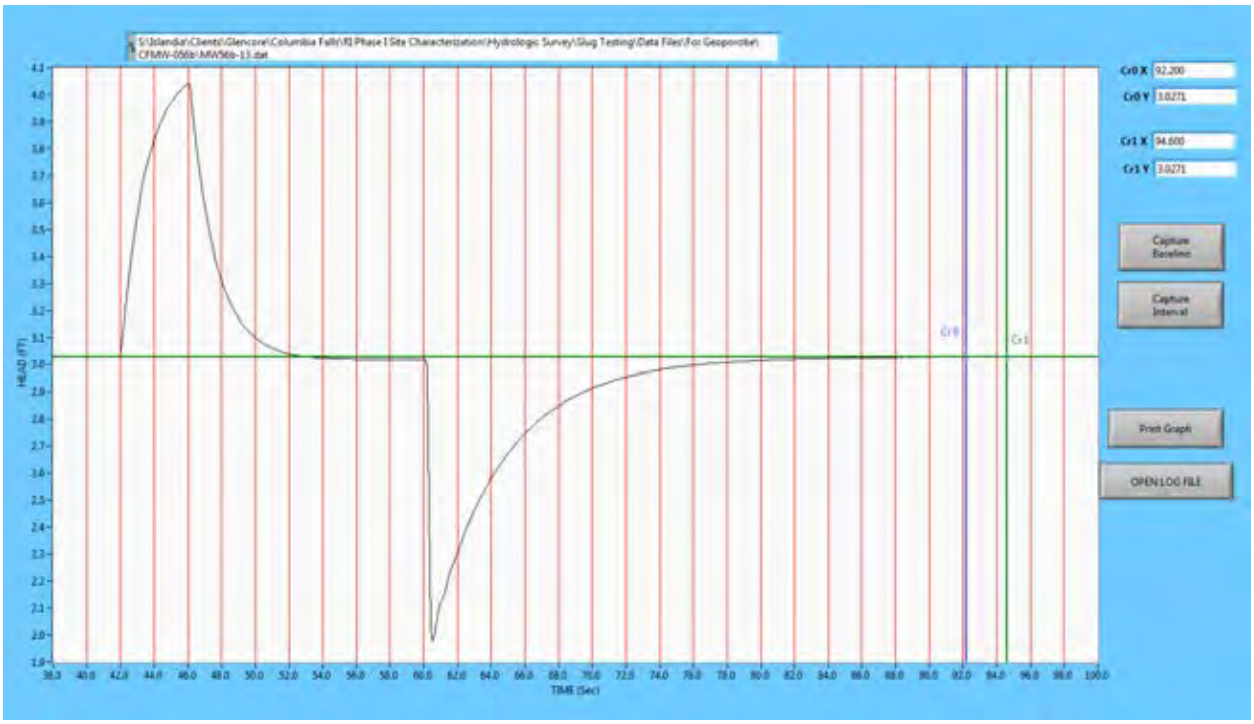
START DATE: 7/12/2017
START TIME: 9:52 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW56B-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-056b
1 Foot Displacement
Test #1





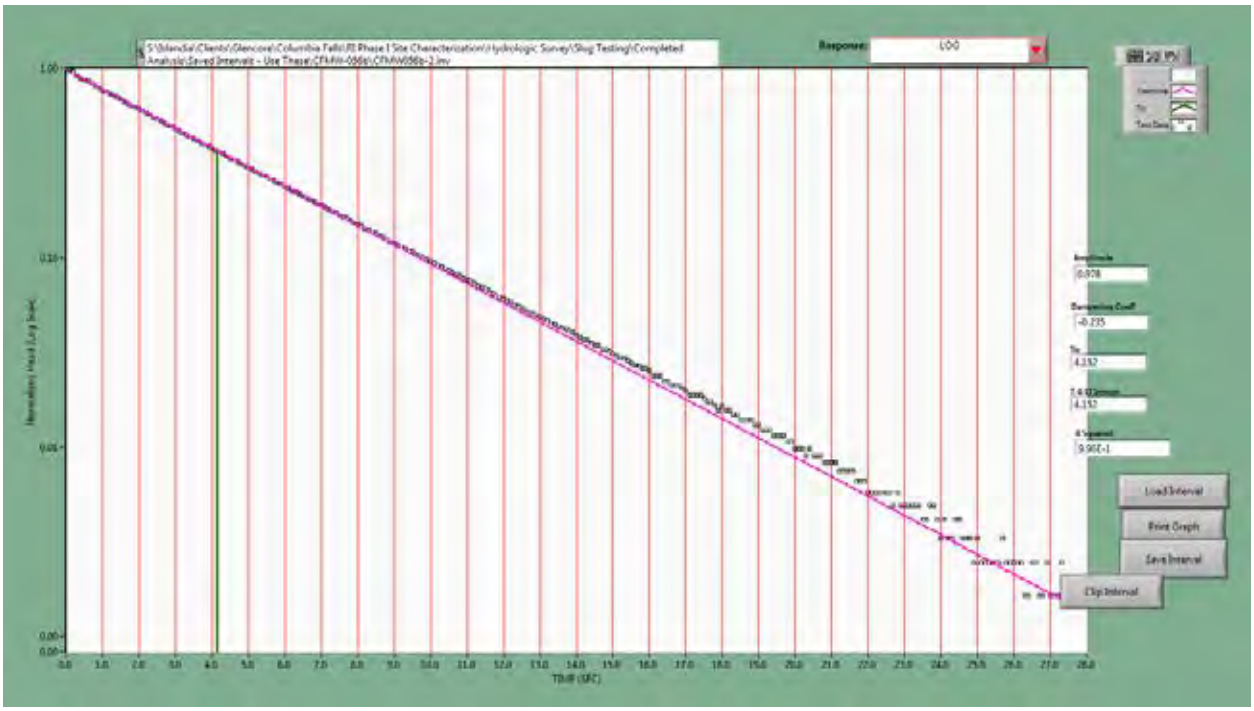
CFMW-056b
1 Foot Displacement
Test #2

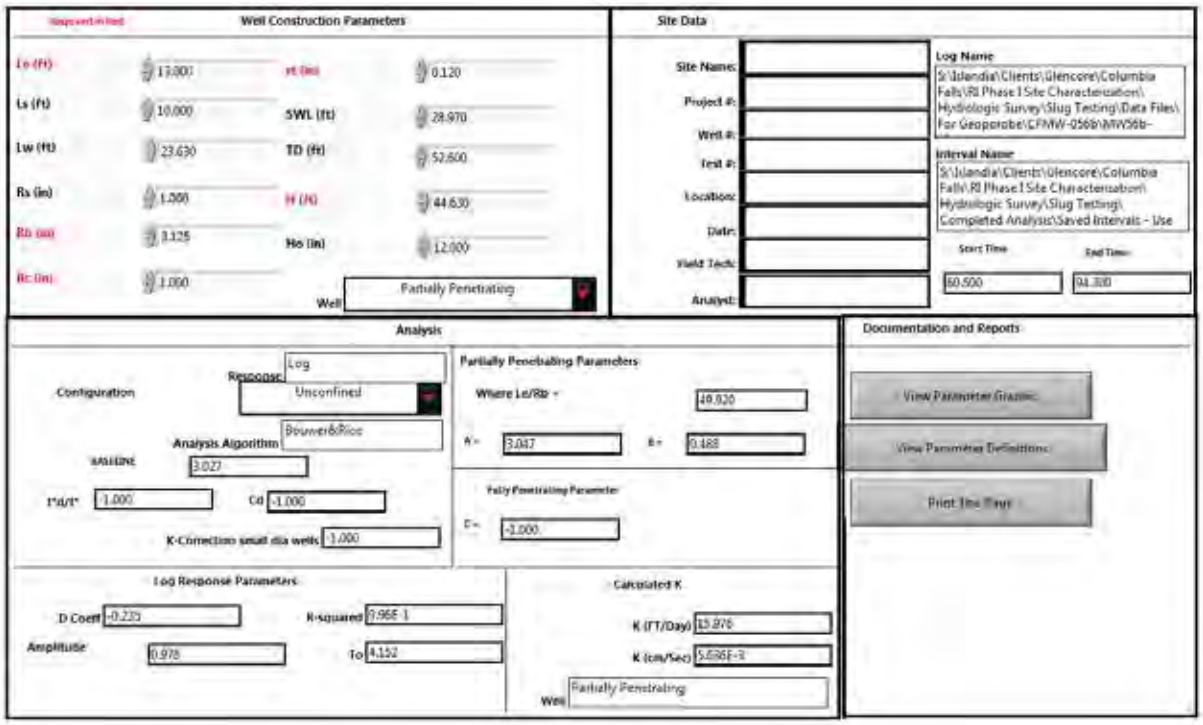


SITE INFORMATION -- SLUG TEST REV. 3.0

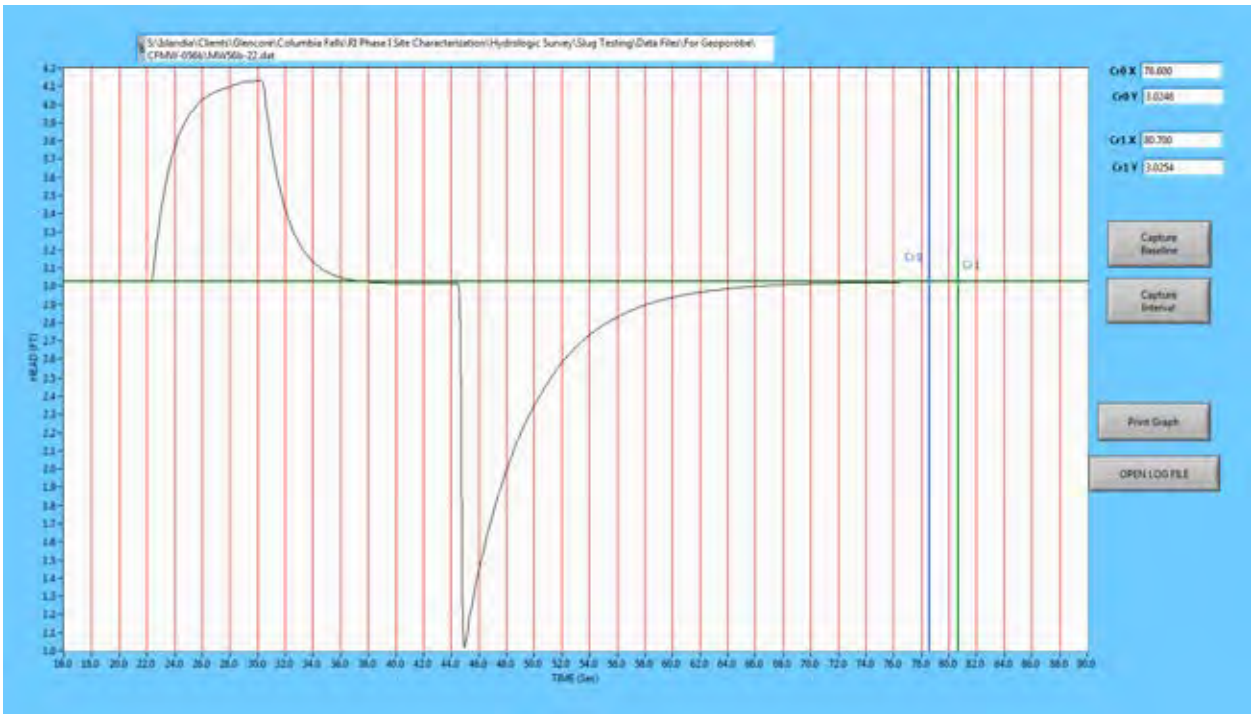
START DATE: 7/12/2017
START TIME: 9:54 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW56B-13.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-056b
1 Foot Displacement
Test #2





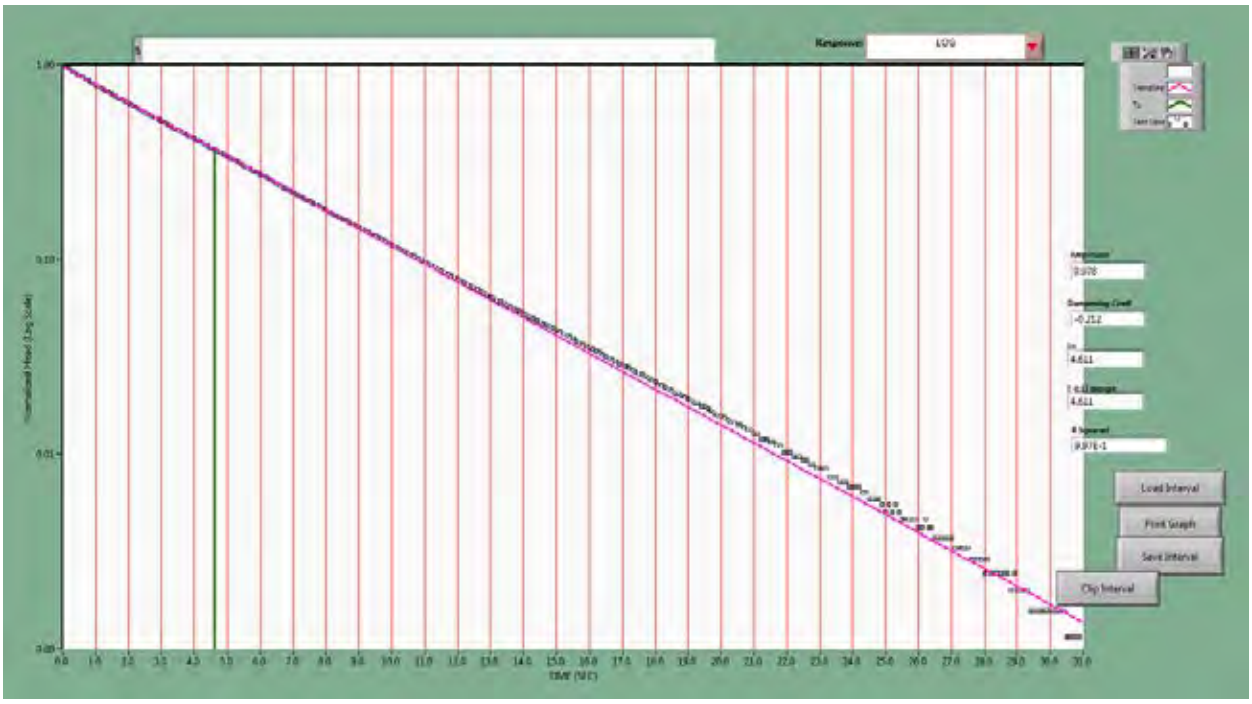
CFMW-056b
2 Foot Displacement
Test #1

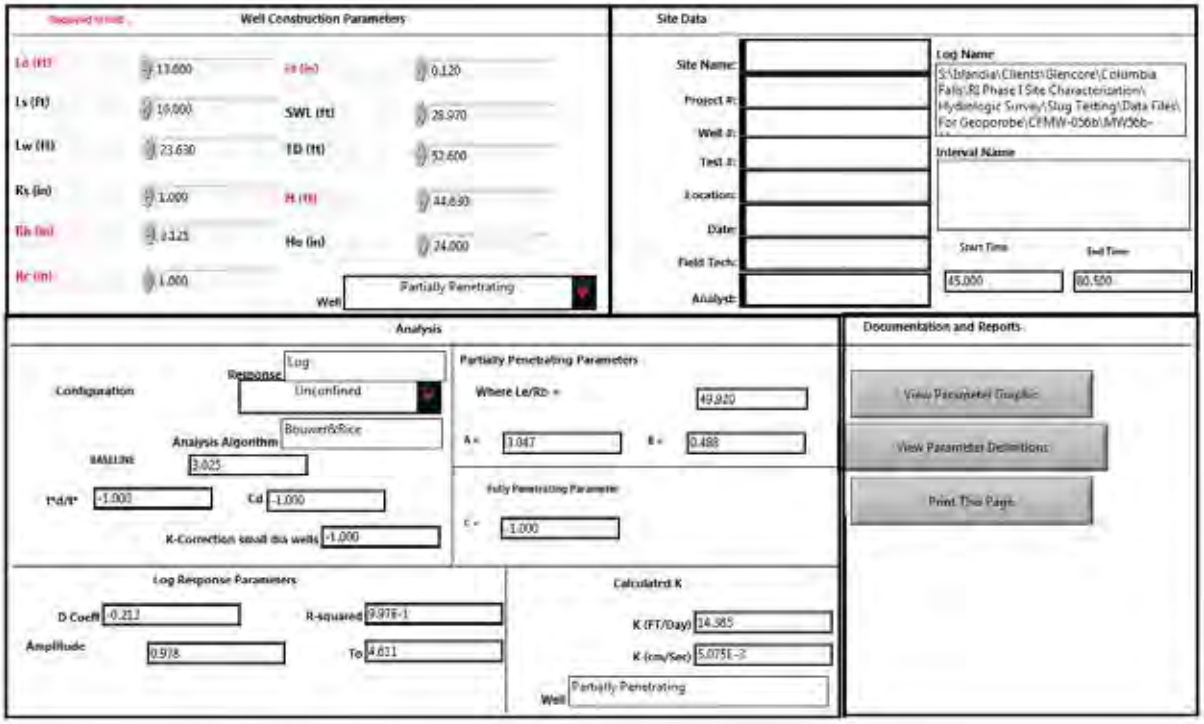


SITE INFORMATION -- SLUG TEST REV. 3.0

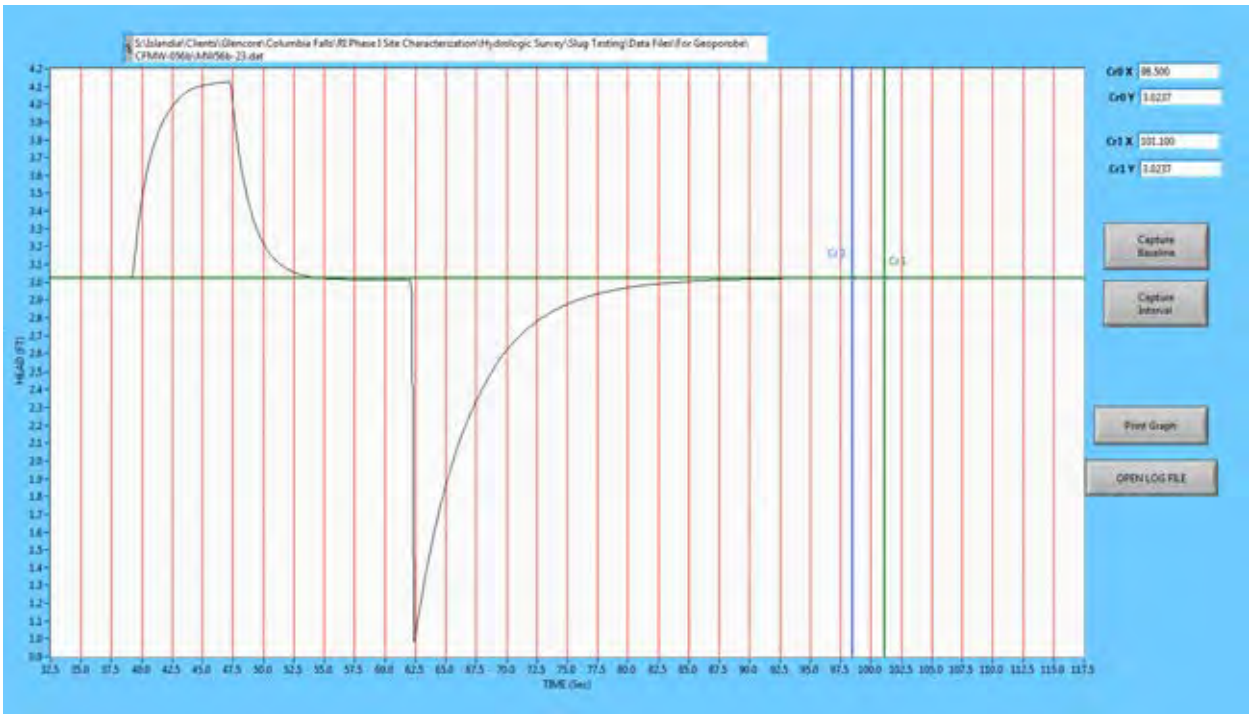
START DATE: 7/12/2017
START TIME: 9:57 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW56B-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-056b
2 Foot Displacement
Test #1





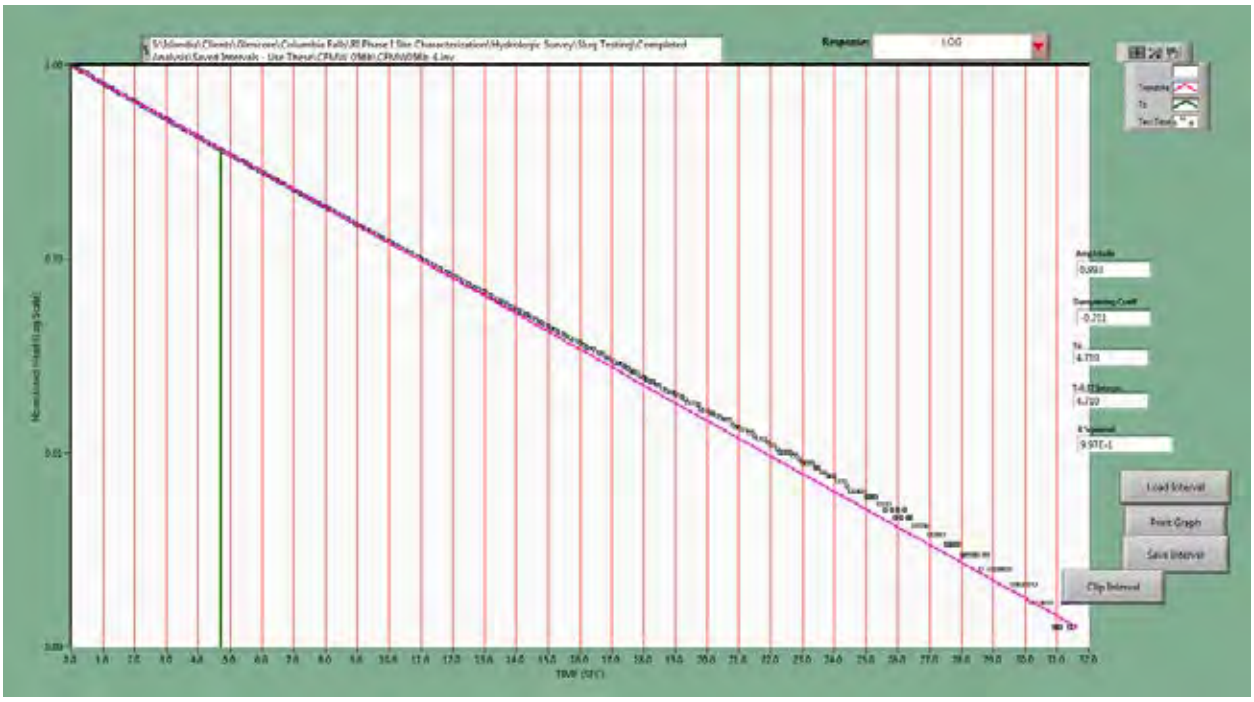
CFMW-056b
2 Foot Displacement
Test #2

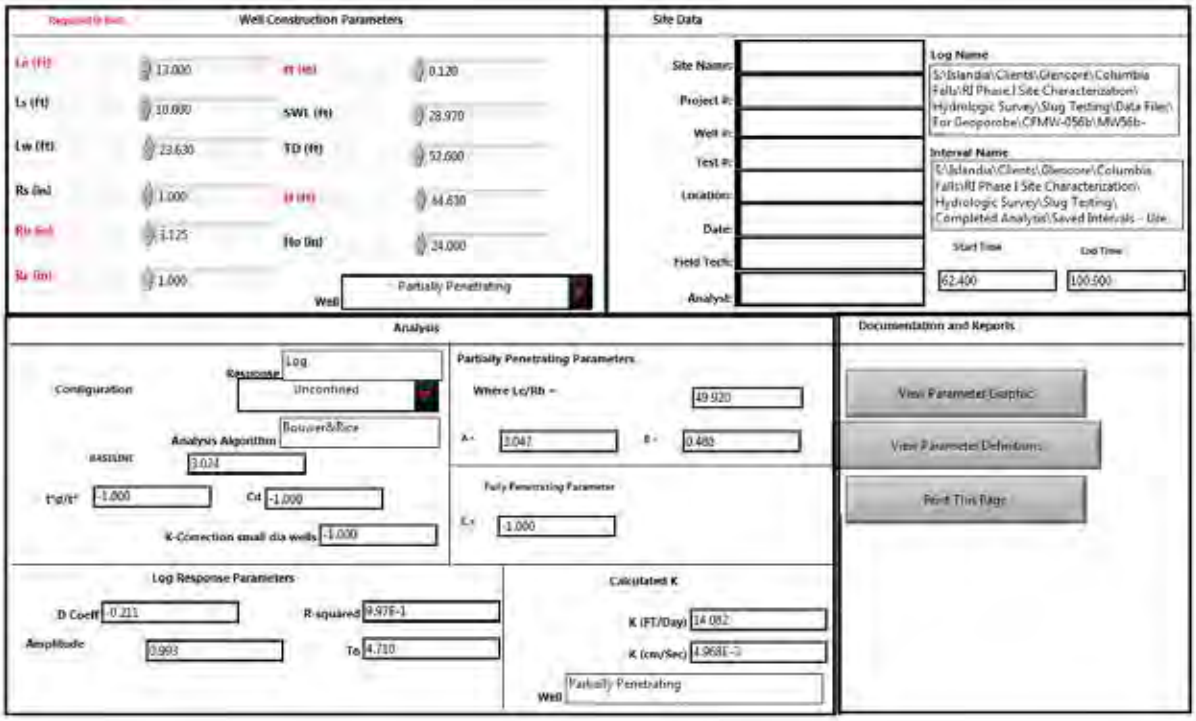


SITE INFORMATION -- SLUG TEST REV. 3.0

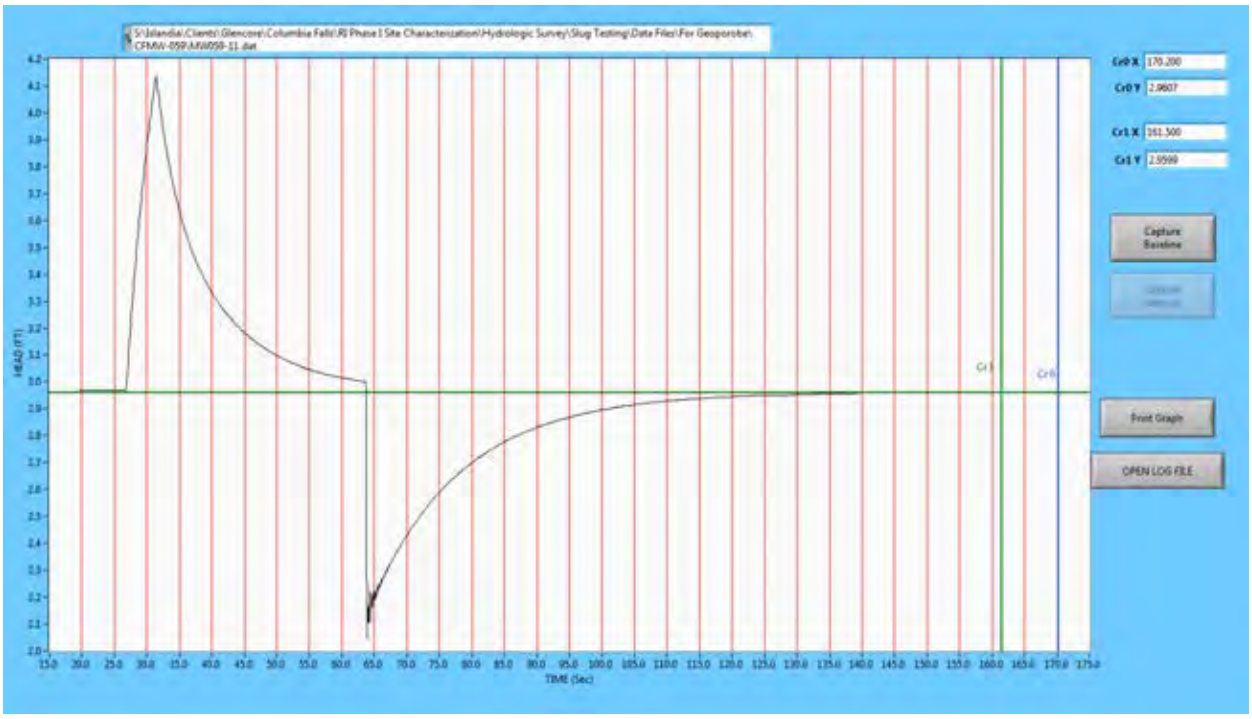
START DATE: 7/12/2017
START TIME: 9:59 AM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW56B-23.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-056b
2 Foot Displacement
Test #2





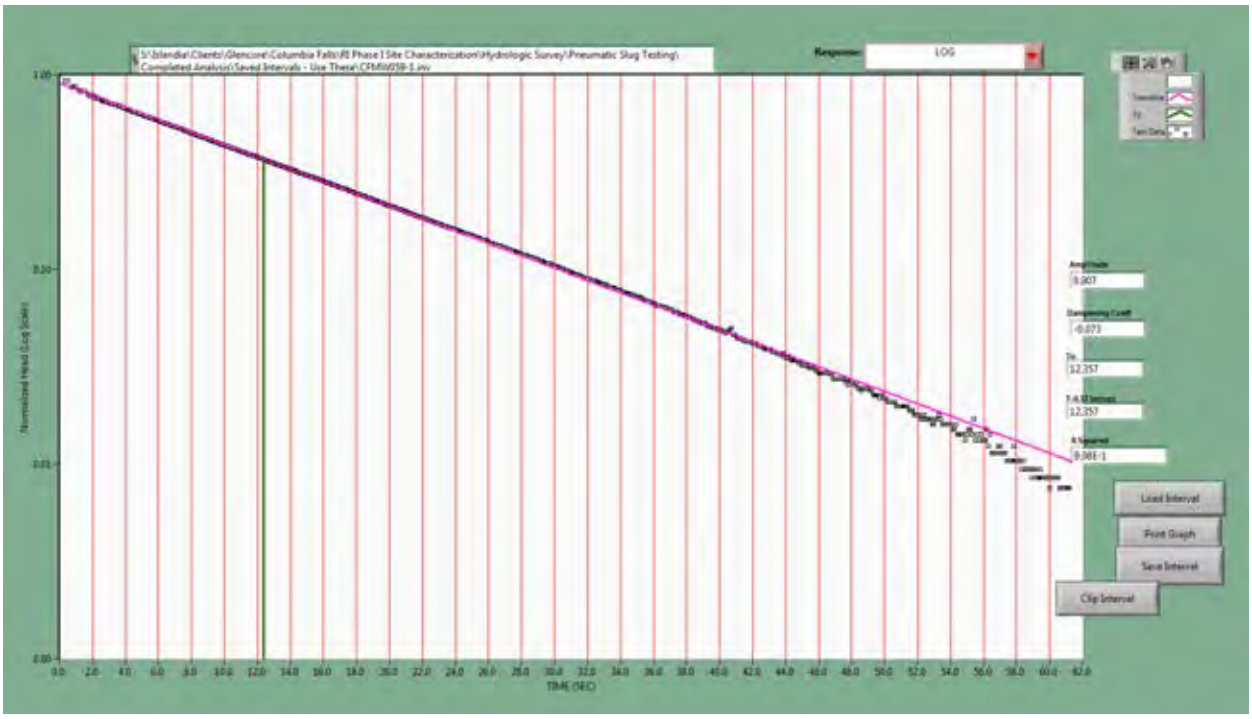
CFMW-059
1 Foot Displacement
Test #1

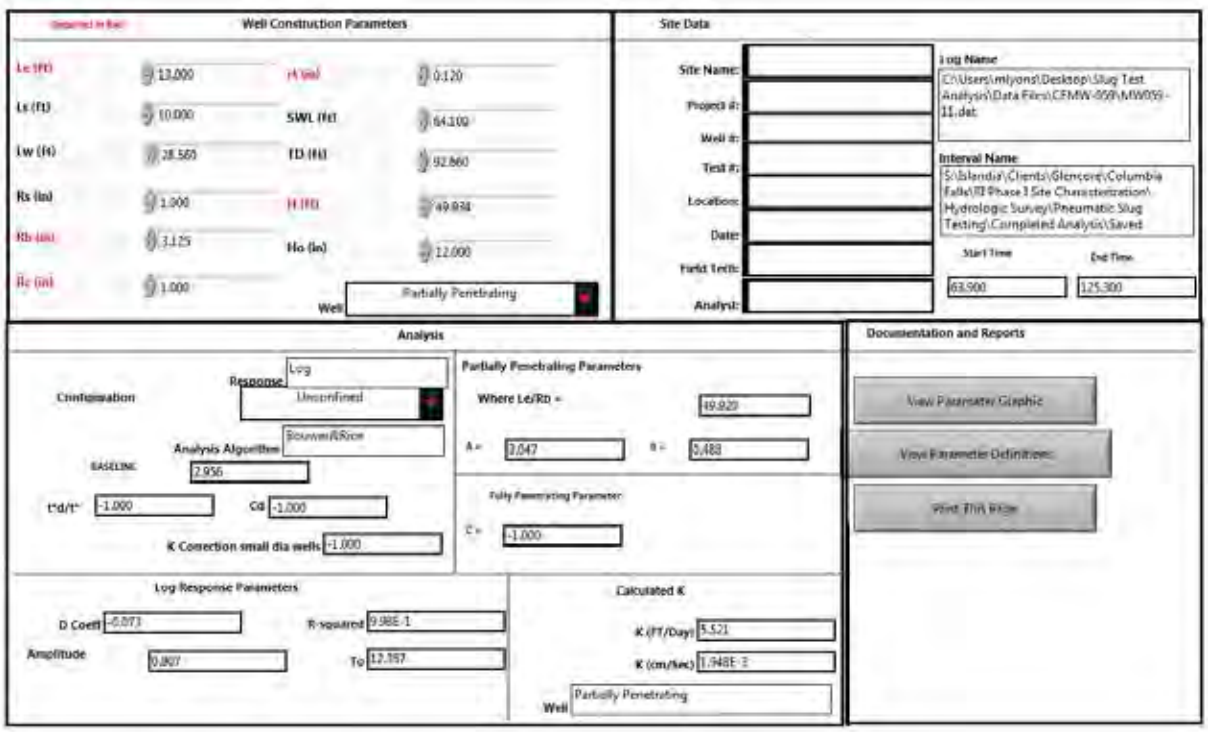


SITE INFORMATION -- SLUG TEST REV. 3.0

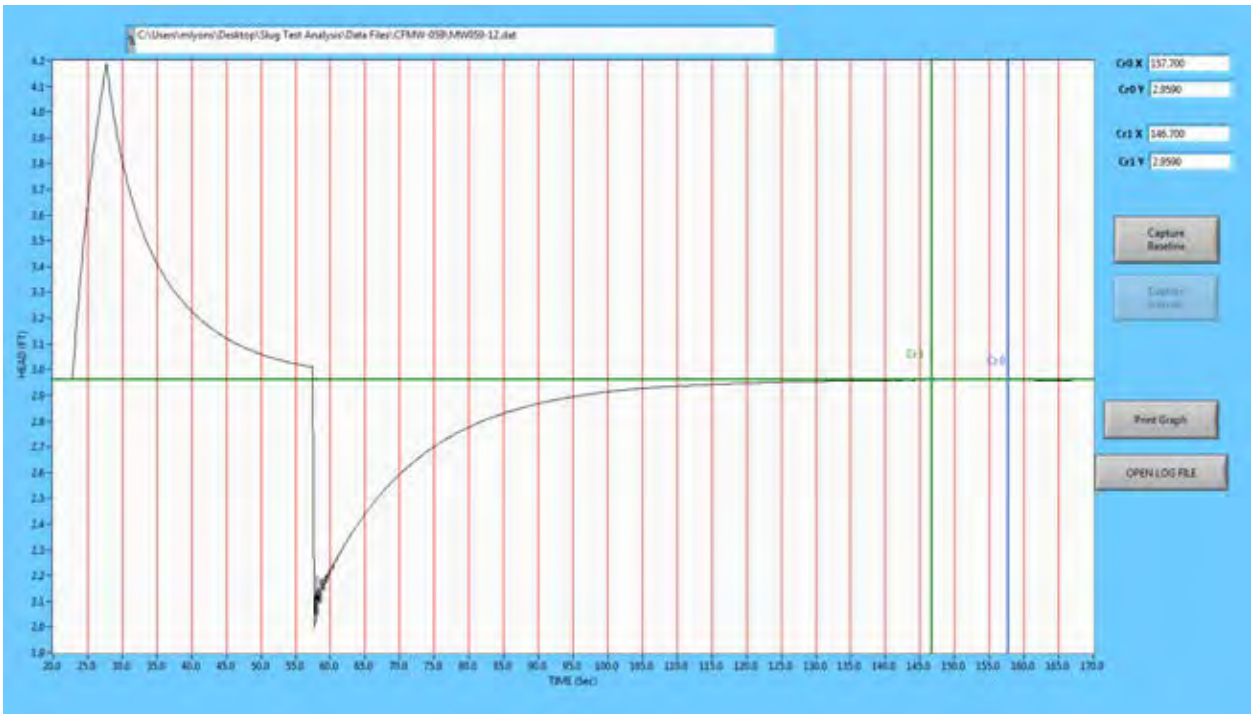
START DATE: 7/12/2017
START TIME: 2:39 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW059-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-059
1 Foot Displacement
Test #1





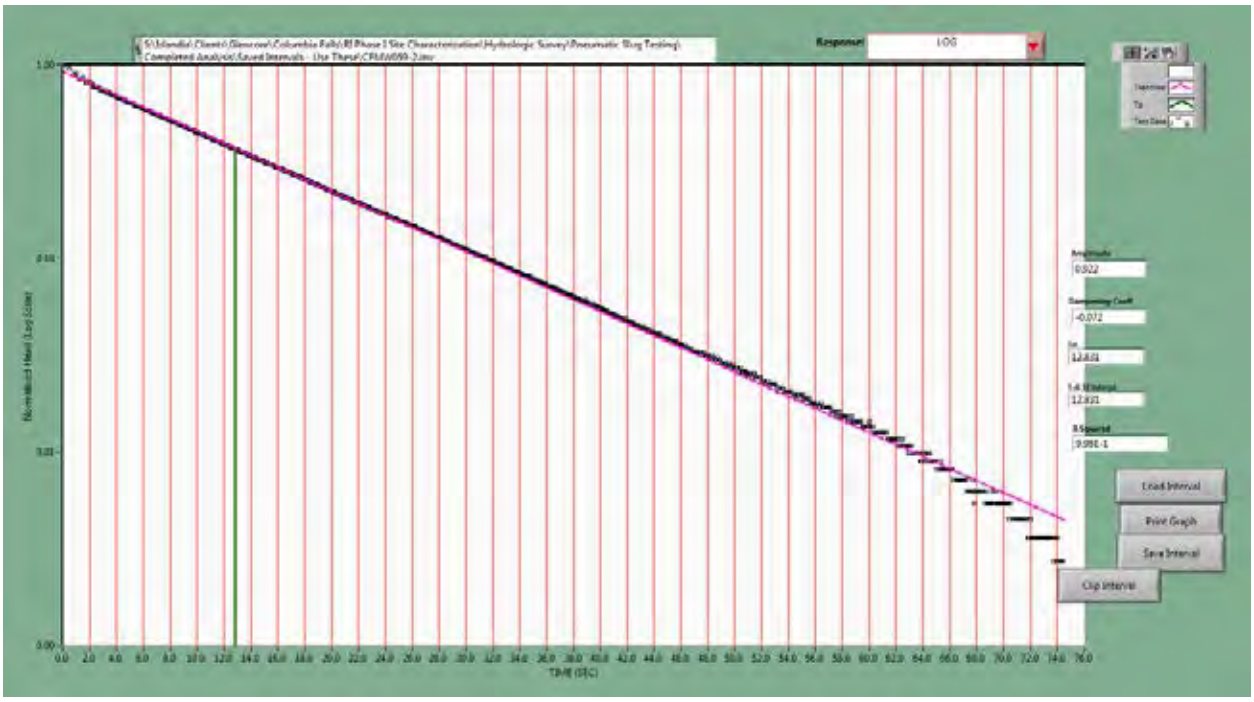
CFMW-059
1 Foot Displacement
Test #2

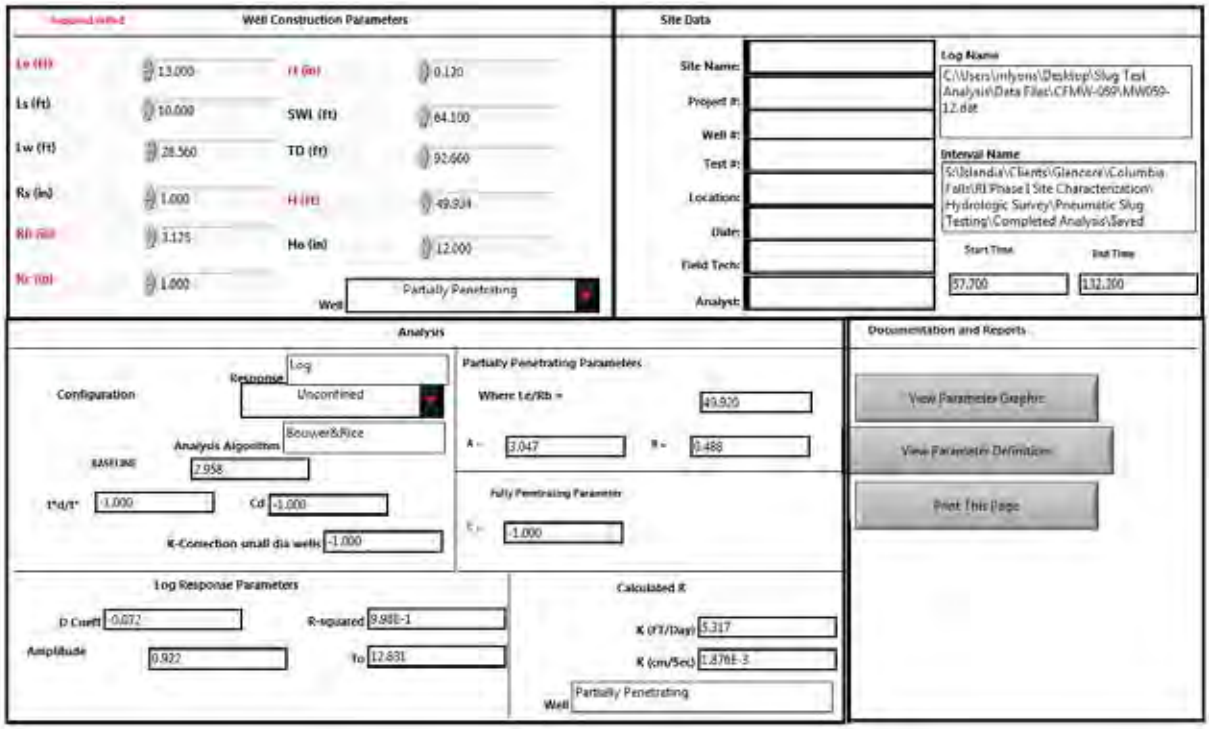


SITE INFORMATION -- SLUG TEST REV. 3.0

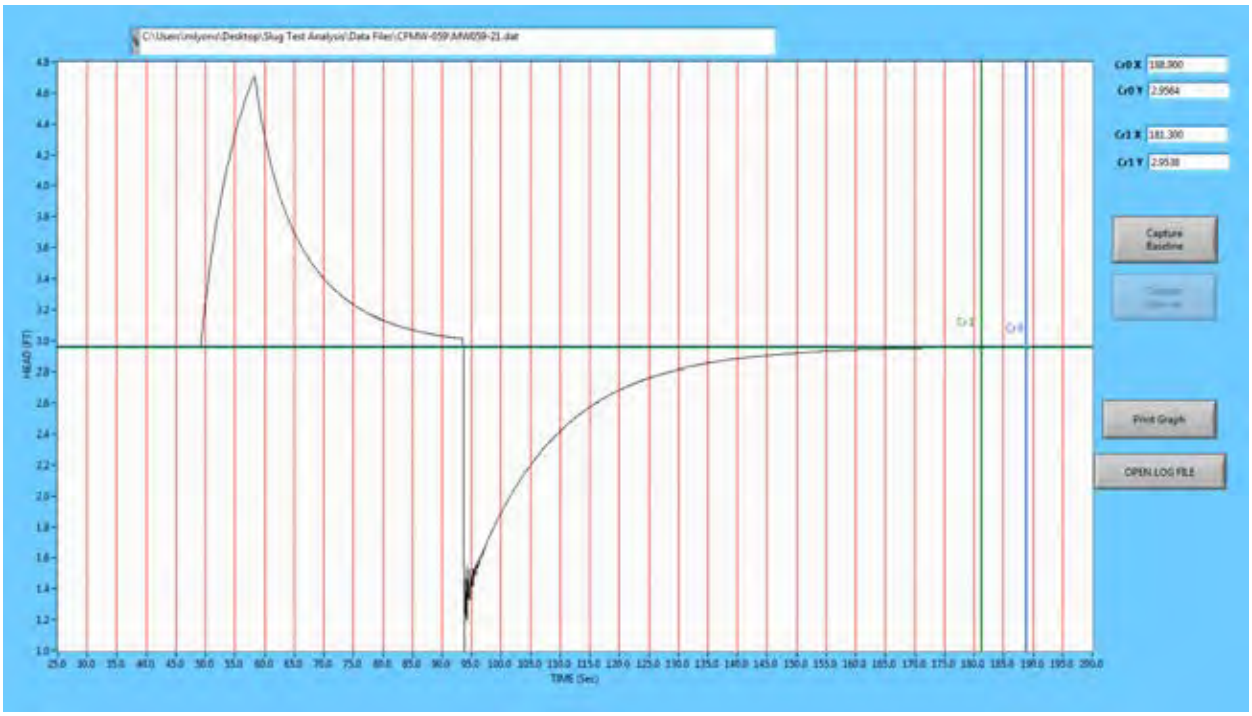
START DATE: 7/12/2017
START TIME: 2:42 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW059-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-059
1 Foot Displacement
Test #2





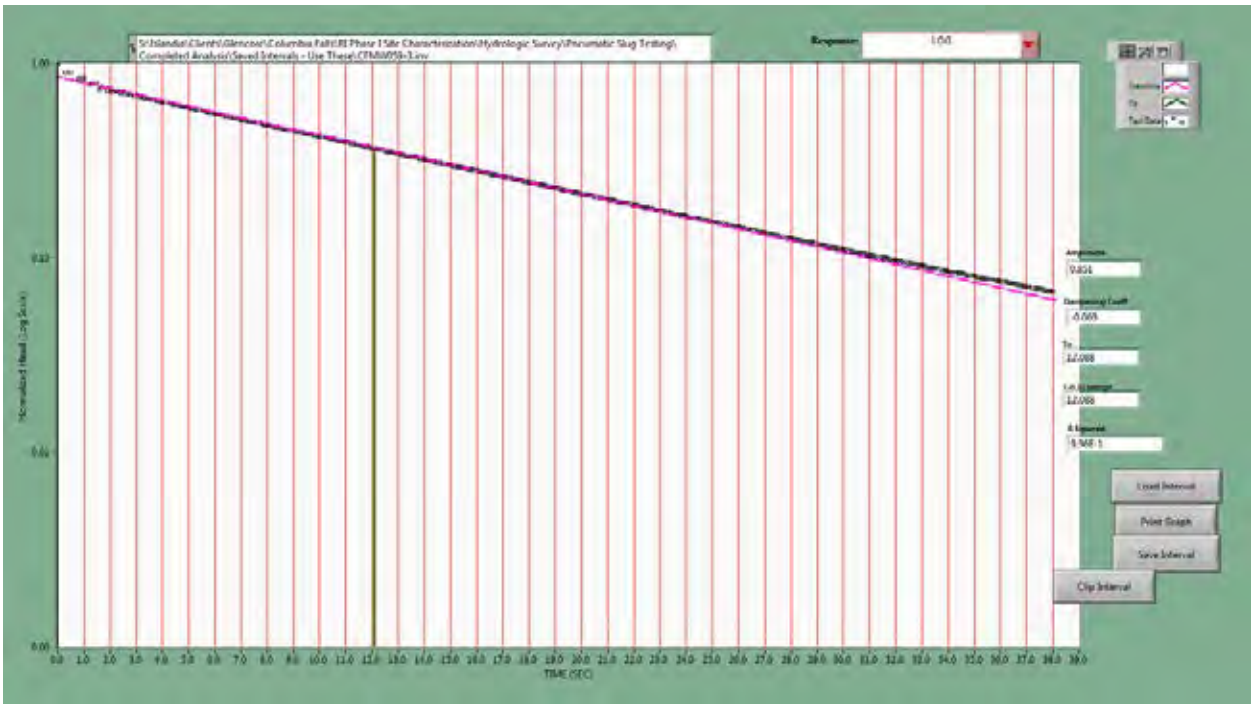
CFMW-059
2 Foot Displacement
Test #1

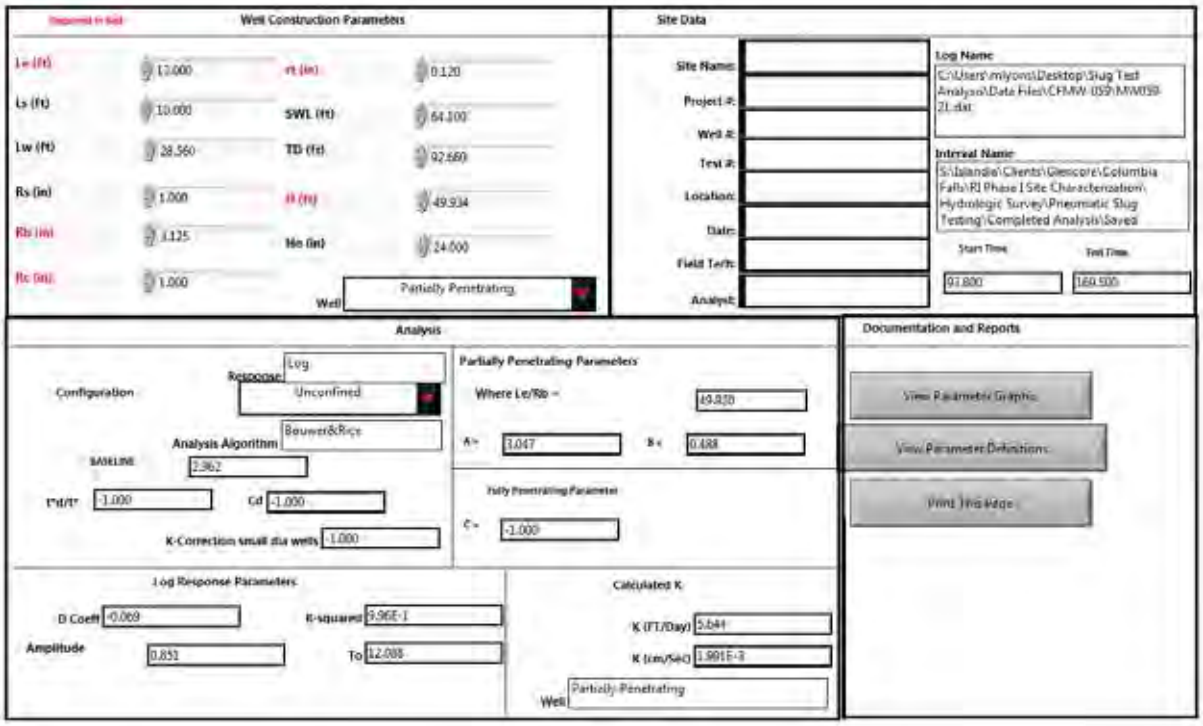


SITE INFORMATION -- SLUG TEST REV. 3.0

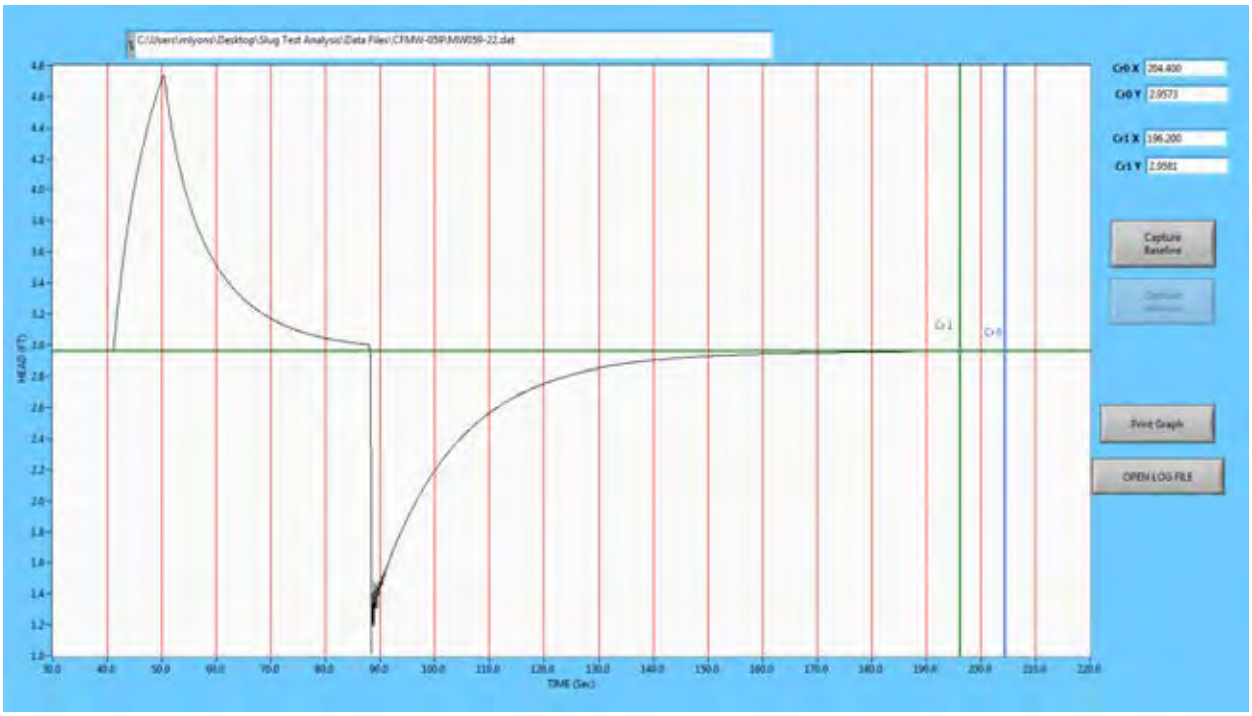
START DATE: 7/12/2017
START TIME: 2:45 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW059-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-059
2 Foot Displacement
Test #1





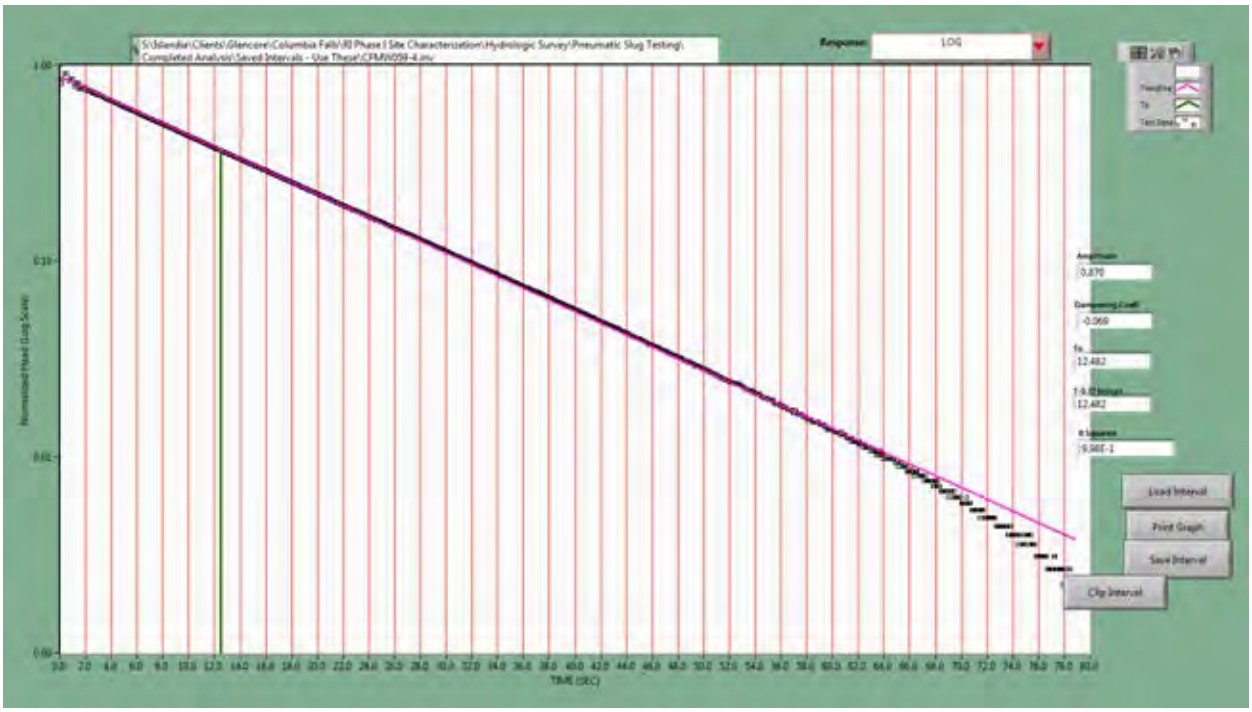
CFMW-059
2 Foot Displacement
Test #2

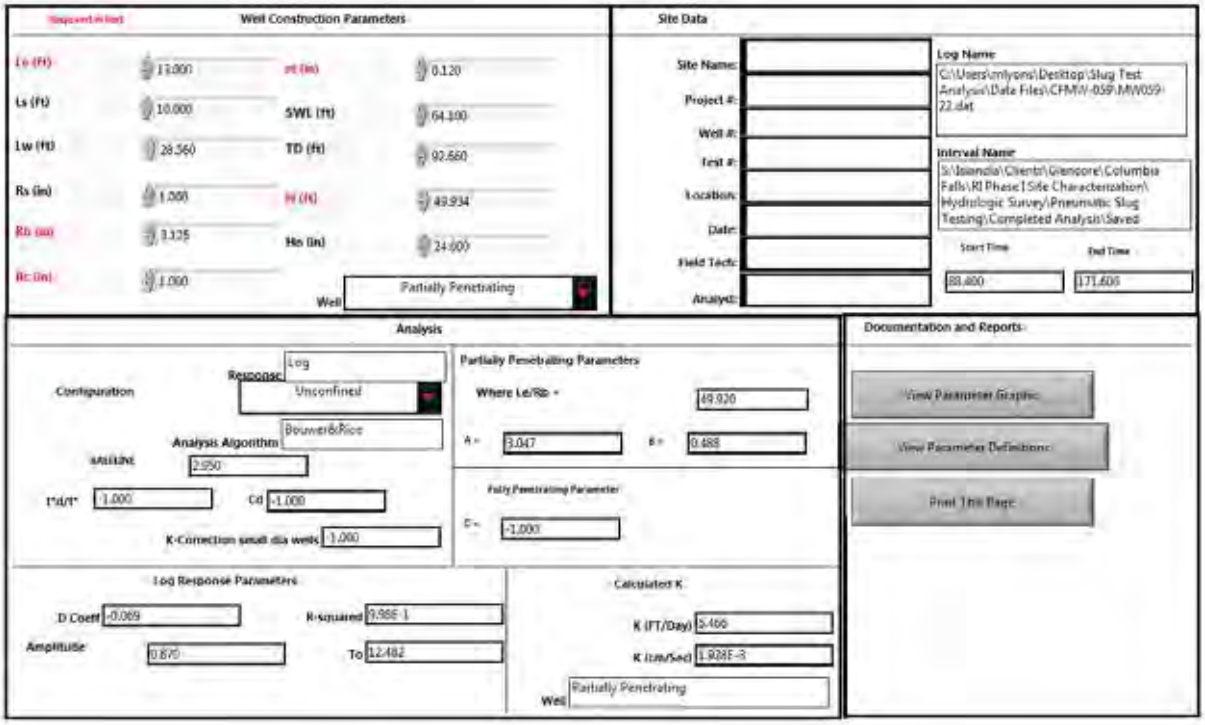


SITE INFORMATION -- SLUG TEST REV. 3.0

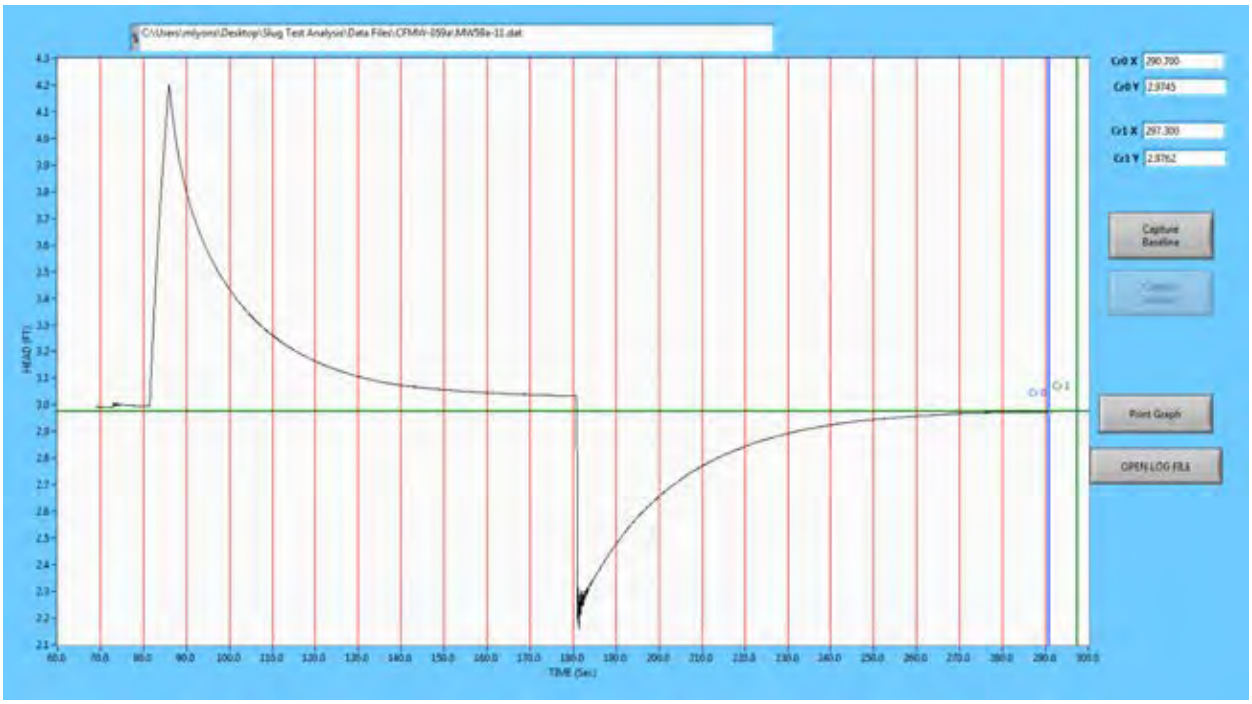
START DATE: 7/12/2017
START TIME: 2:49 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW059-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-059
2 Foot Displacement
Test #2





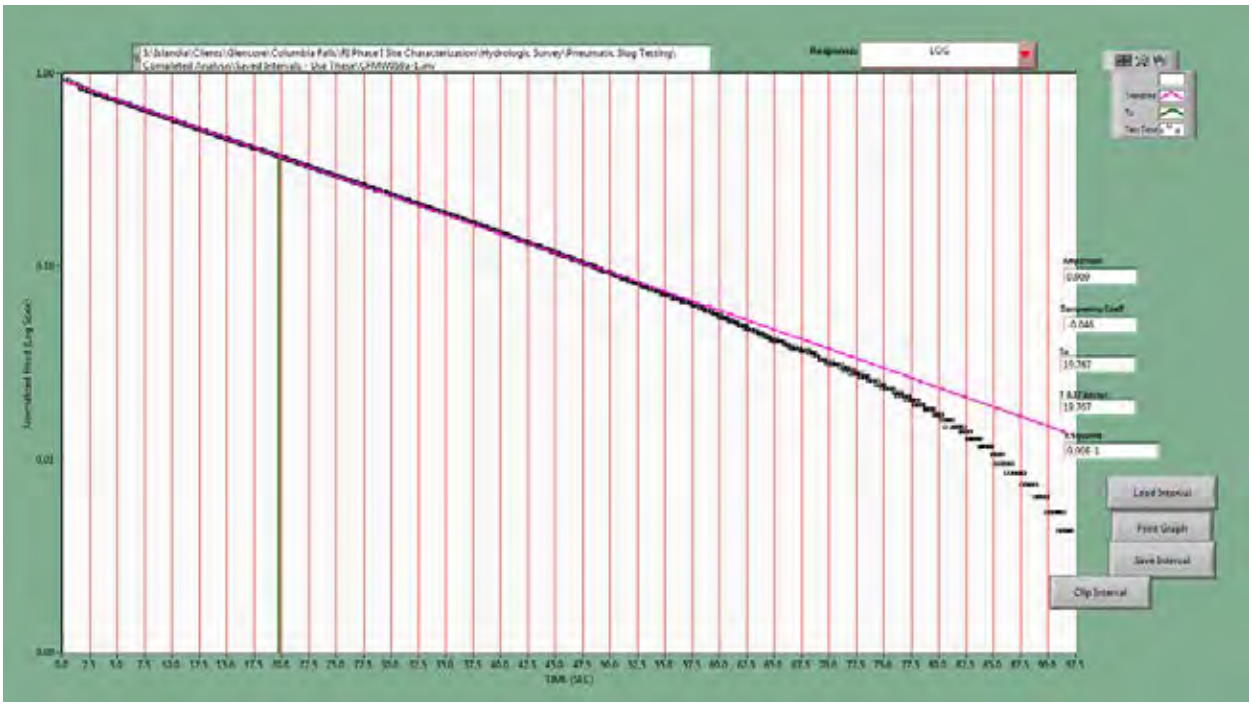
CFMW-059a
1 Foot Displacement
Test #1

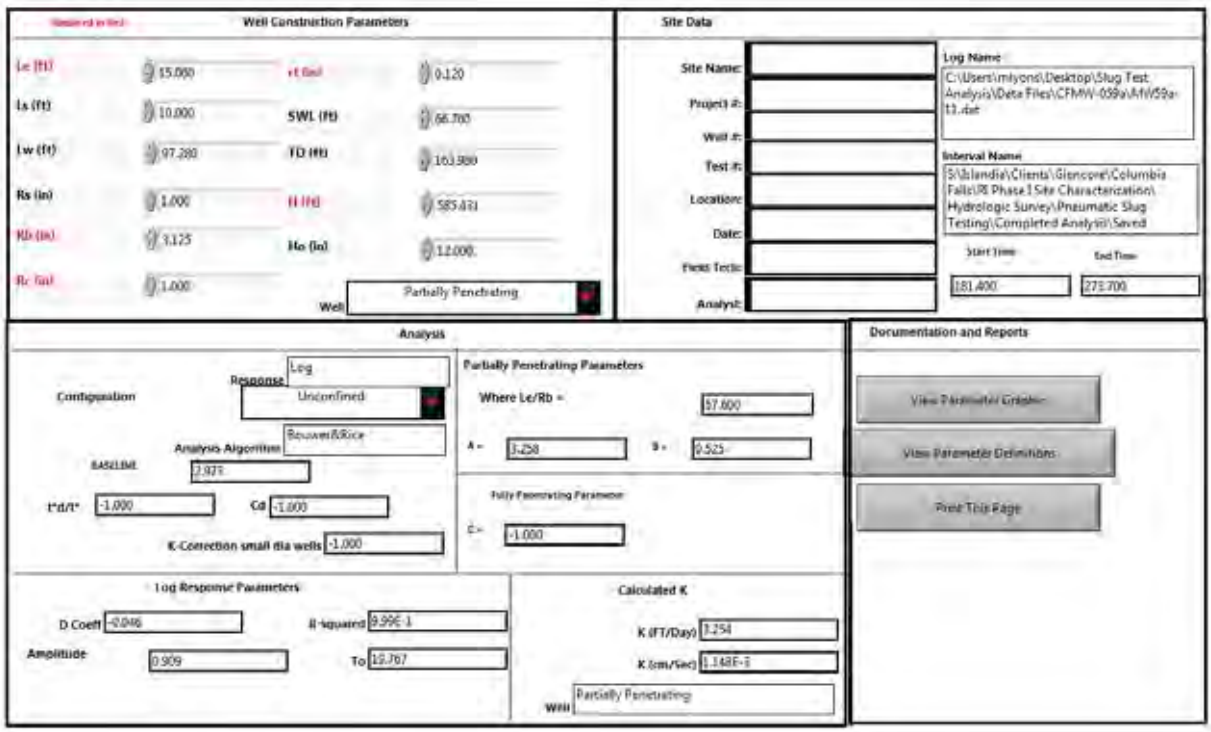


SITE INFORMATION -- SLUG TEST REV. 3.0

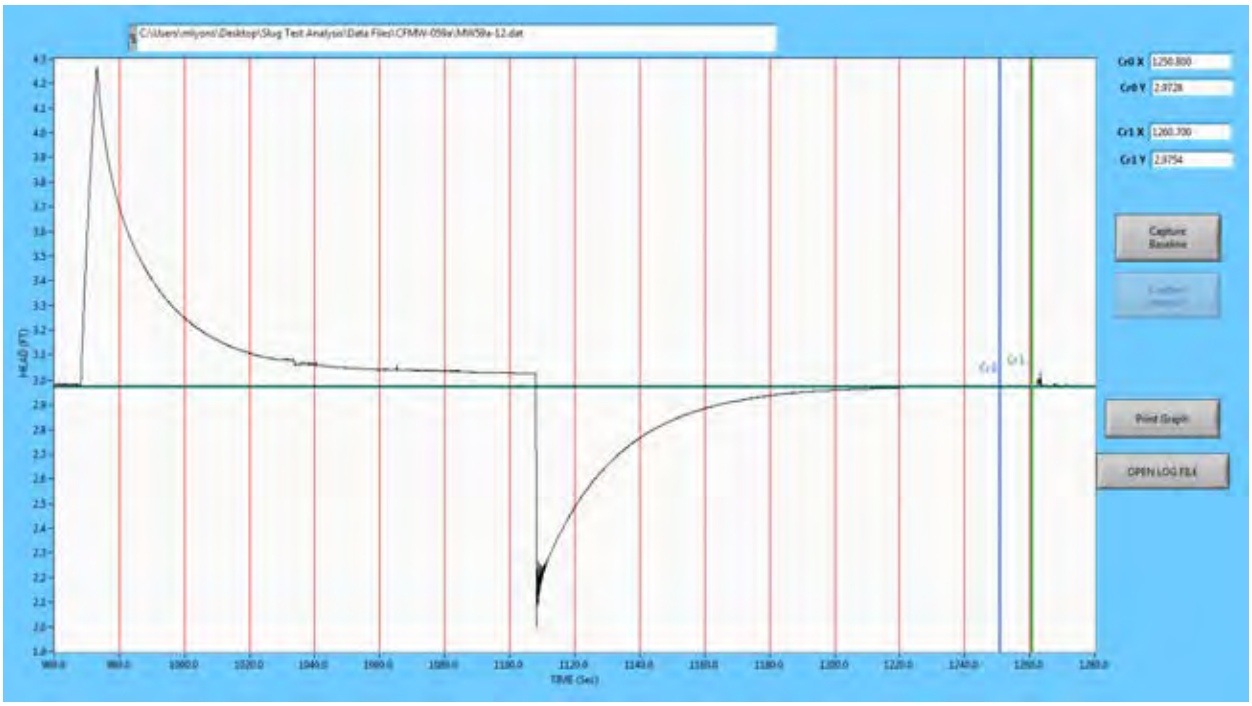
START DATE: 7/12/2017
START TIME: 3:02 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW59A-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-059a
1 Foot Displacement
Test #1





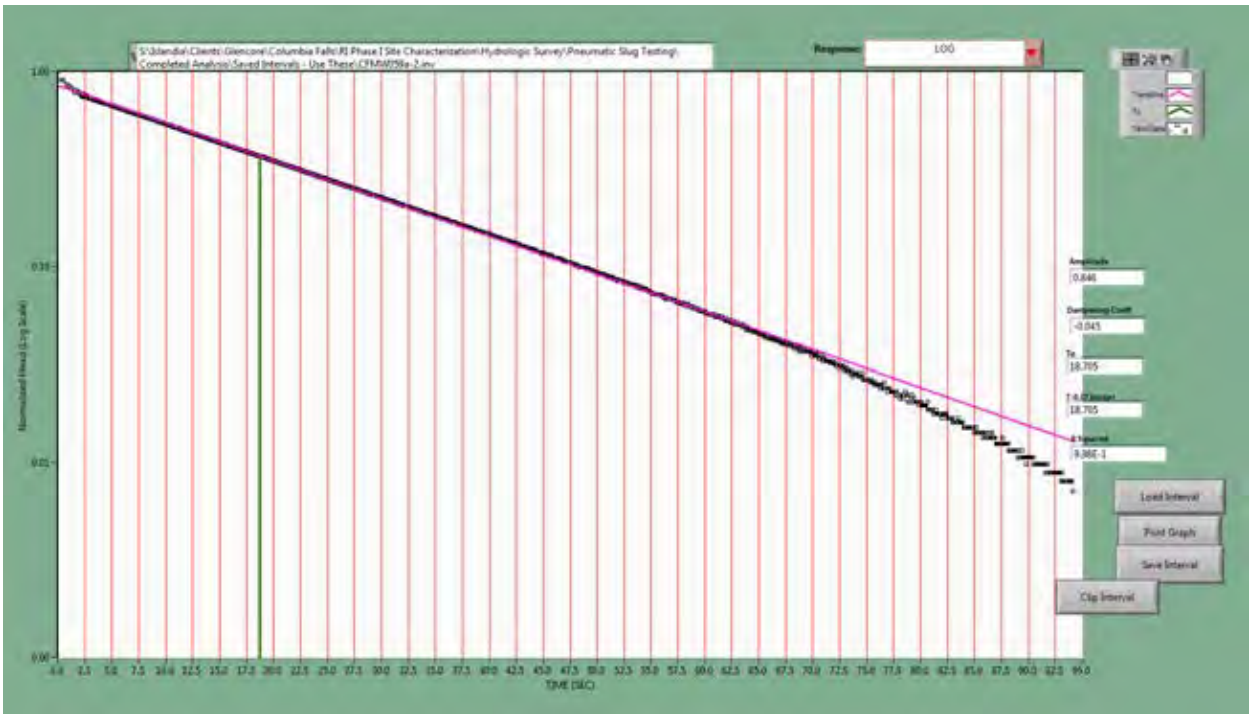
CFMW-059a
1 Foot Displacement
Test #2



SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/12/2017
START TIME: 3:07 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW59A-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-059a
1 Foot Displacement
Test #2



Well Construction Parameters

Le (ft)	15.000	rt (in)	0.120
Ls (ft)	10.000	SWL (ft)	66.700
Lw (ft)	97.280	TD (ft)	163.080
Rs (in)	1.000	H (ft)	585.431
Rb (in)	3.125	Ho (in)	12.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:
Project #:
Well #:
Test #:
Location:
Date:
Field Tech:
Analyst:

Log Name: C:\Users\mlyons\Desktop\Slug Test Analysis\Data Files\CFMW-059a\MW59a-12.dat

Interval Name: S:\Jolandia\Clients\Glencore\Columbia Falls\RI Phase I Site Characterization\Hydrologic Survey\Pneumatic Slug Testing\Completed Analysis\Saved

Start Time: 1108.300
End Time: 1211.200

Analysis

Configuration: Unconfined
Response: Log
Analysis Algorithm: Bouwer&Rice
BASELINE: 2.969
Pd/T: -1.000
Cd: -1.000
K Correction small dia wells: -1.000

Partially Penetrating Parameters

Where Le/Rb = 57.600
A = 3.258
B = 0.525

Fully Penetrating Parameter

C = -1.000

Log Response Parameters

D Coeff: -0.043
R-squared: 9.98E-1
Amplitude: 0.846
To: 18.705

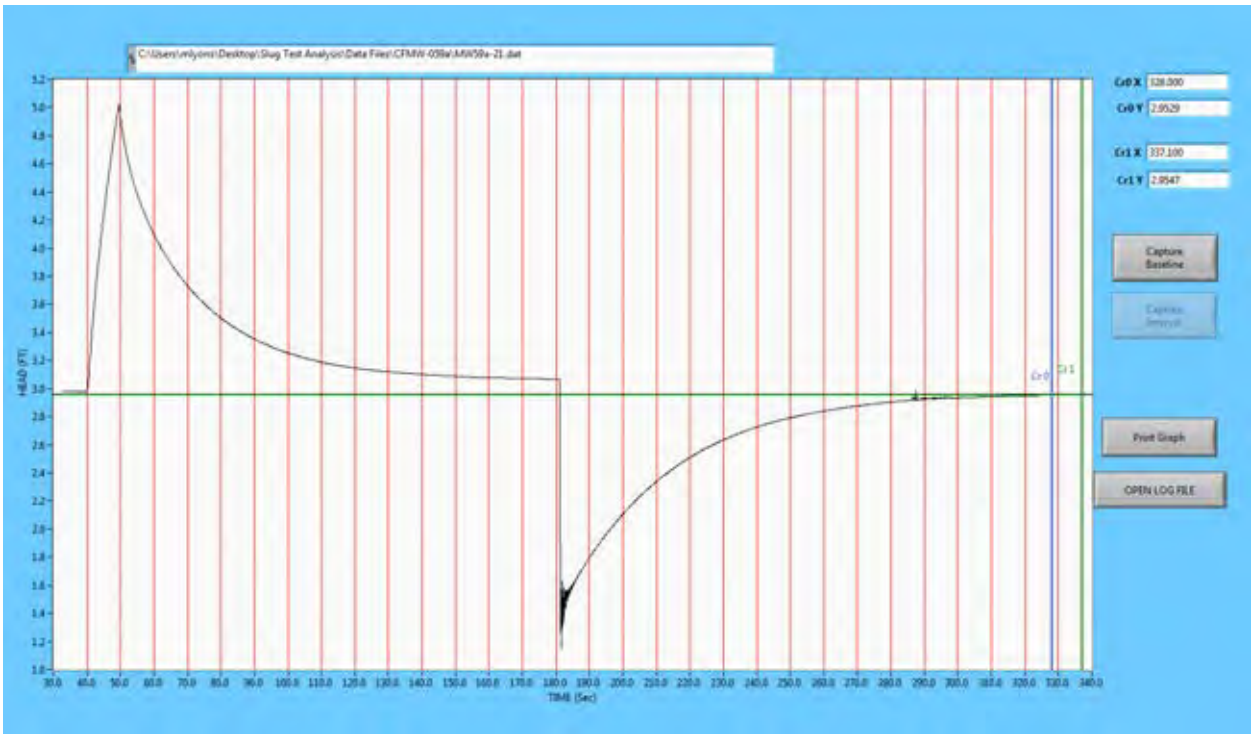
Calculated K

K (FT/Day): 3.438
K (cm/Sec): 1.21E-3
Well: Partially Penetrating

Documentation and Reports

View Parameter Graphic
View Parameter Definitions
Print This Page

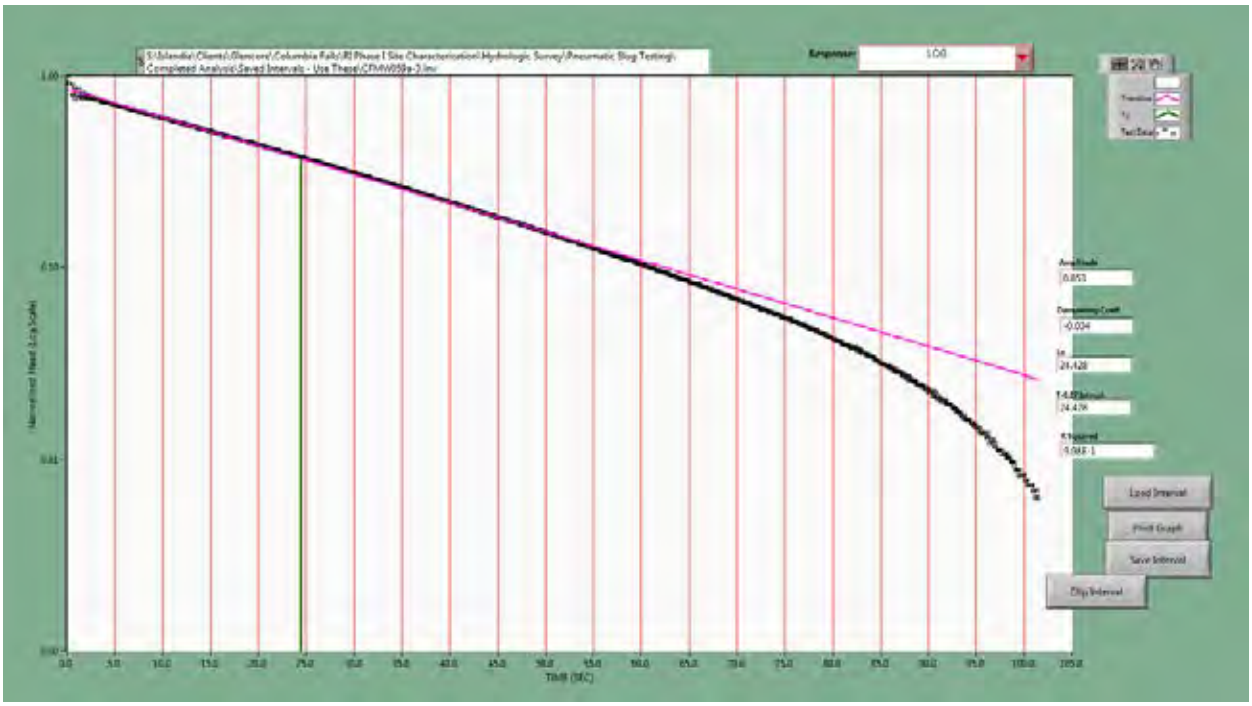
CFMW-059a
2 Foot Displacement
Test #1

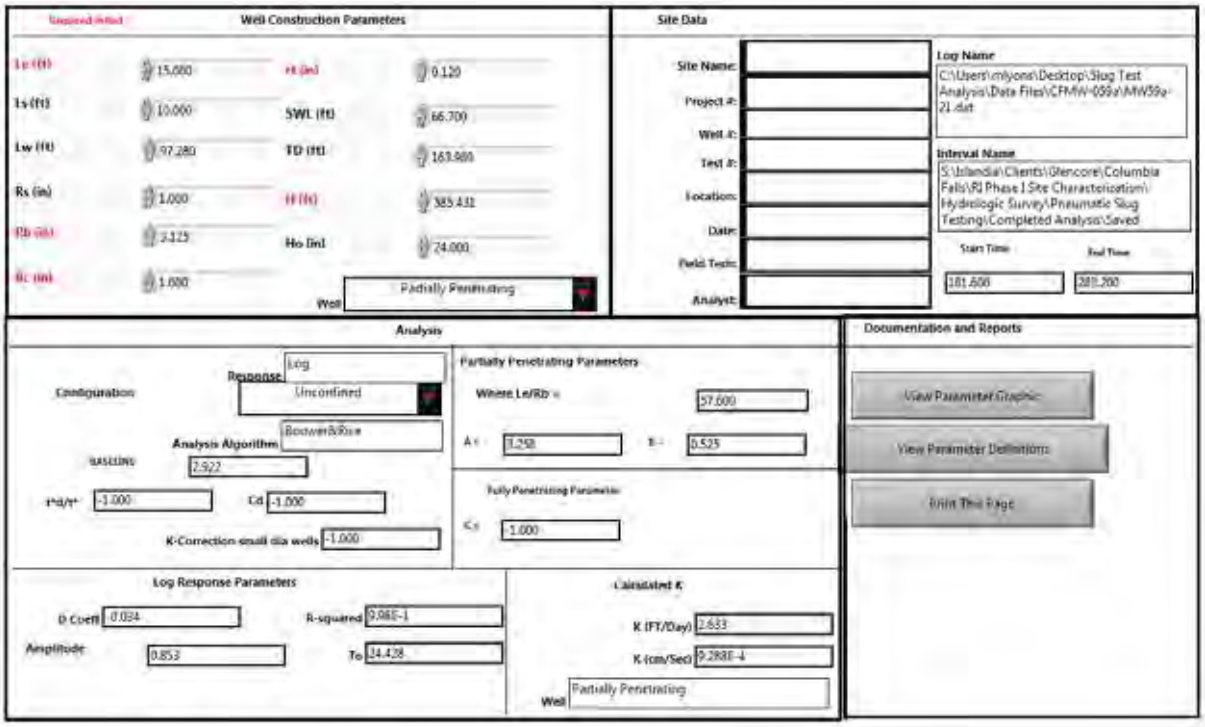


SITE INFORMATION -- SLUG TEST REV. 3.0

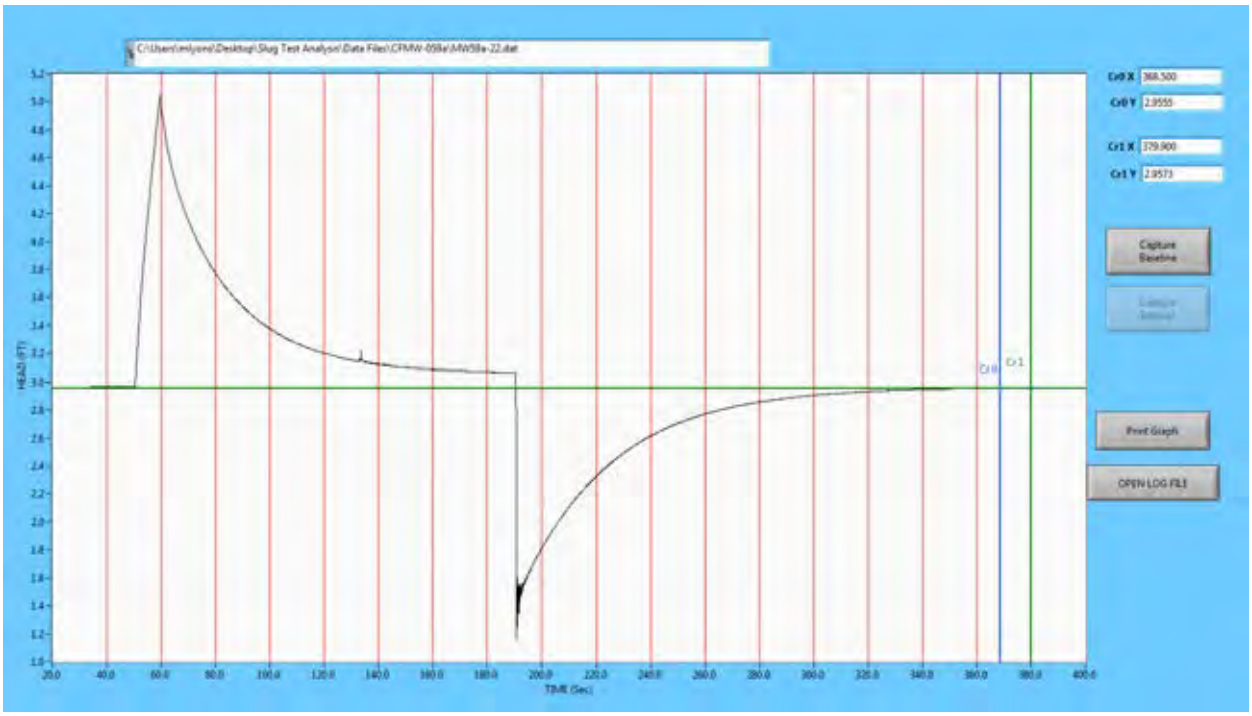
START DATE: 7/12/2017
START TIME: 3:29 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW59A-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-059a
2 Foot Displacement
Test #1





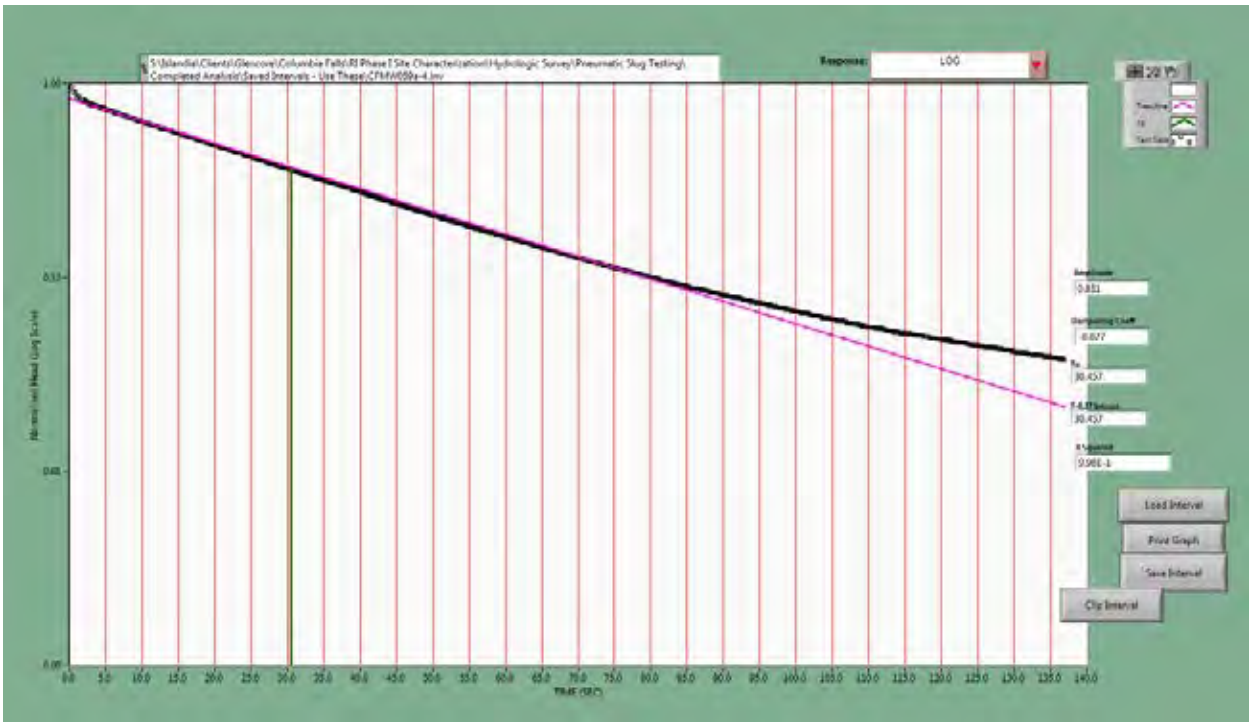
CFMW-059a
2 Foot Displacement
Test #2

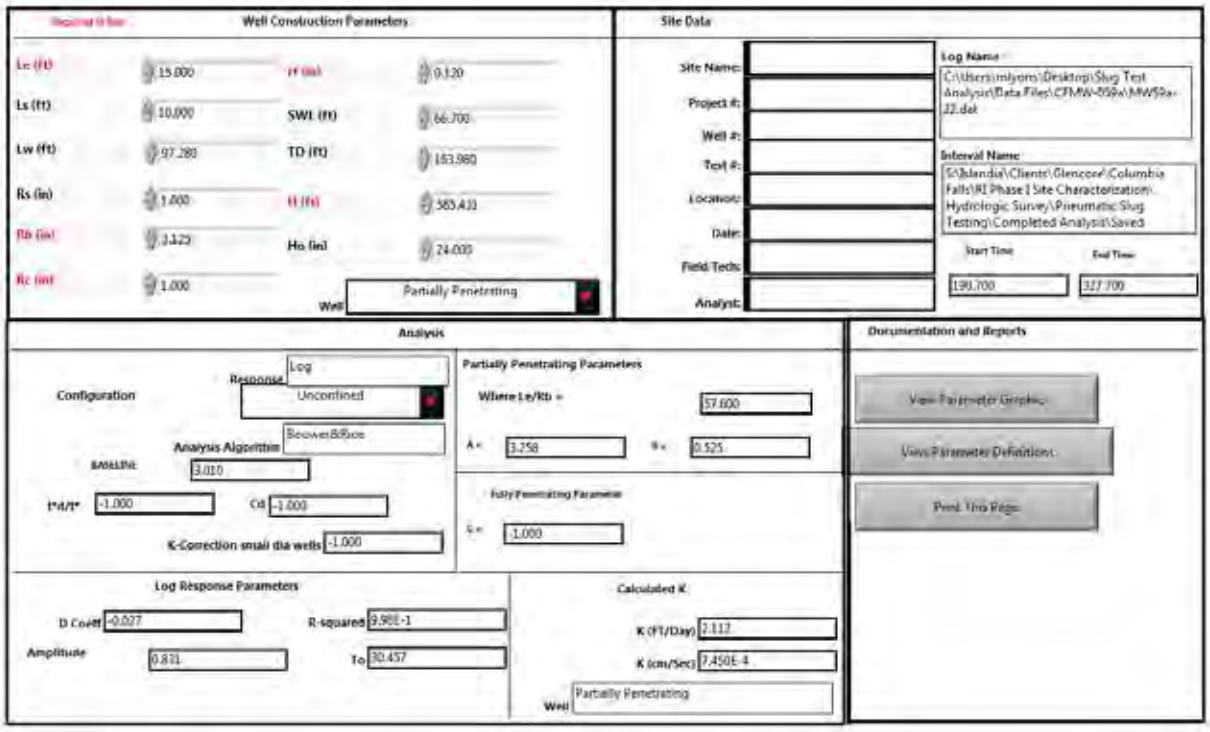


SITE INFORMATION -- SLUG TEST REV. 3.0

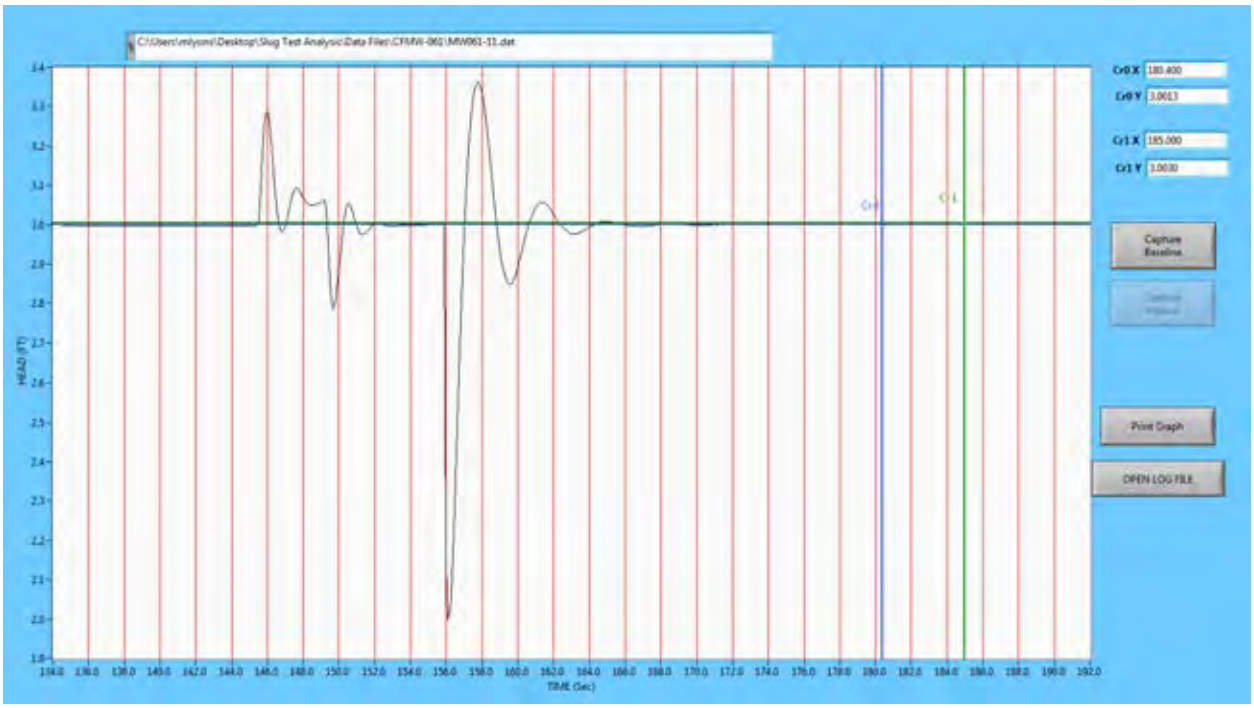
START DATE: 7/12/2017
START TIME: 3:35 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW59A-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-059a
2 Foot Displacement
Test #2





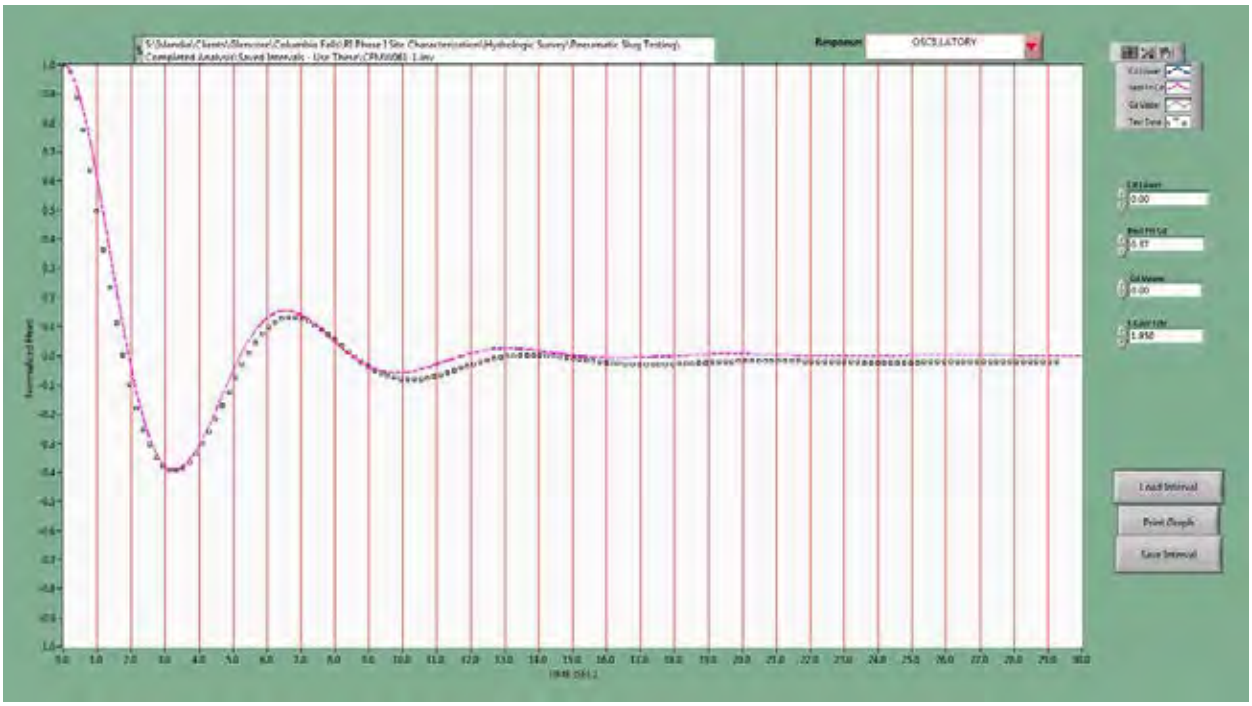
CFMW-061
1 Foot Displacement
Test #1

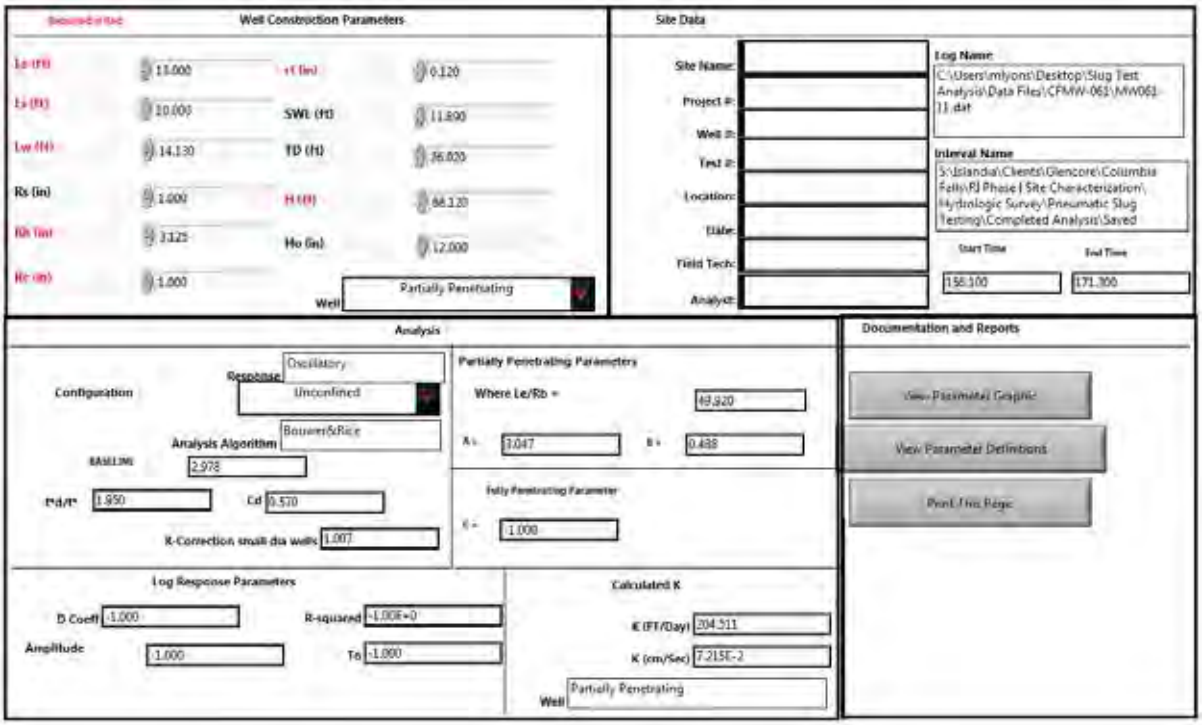


SITE INFORMATION -- SLUG TEST REV. 3.0

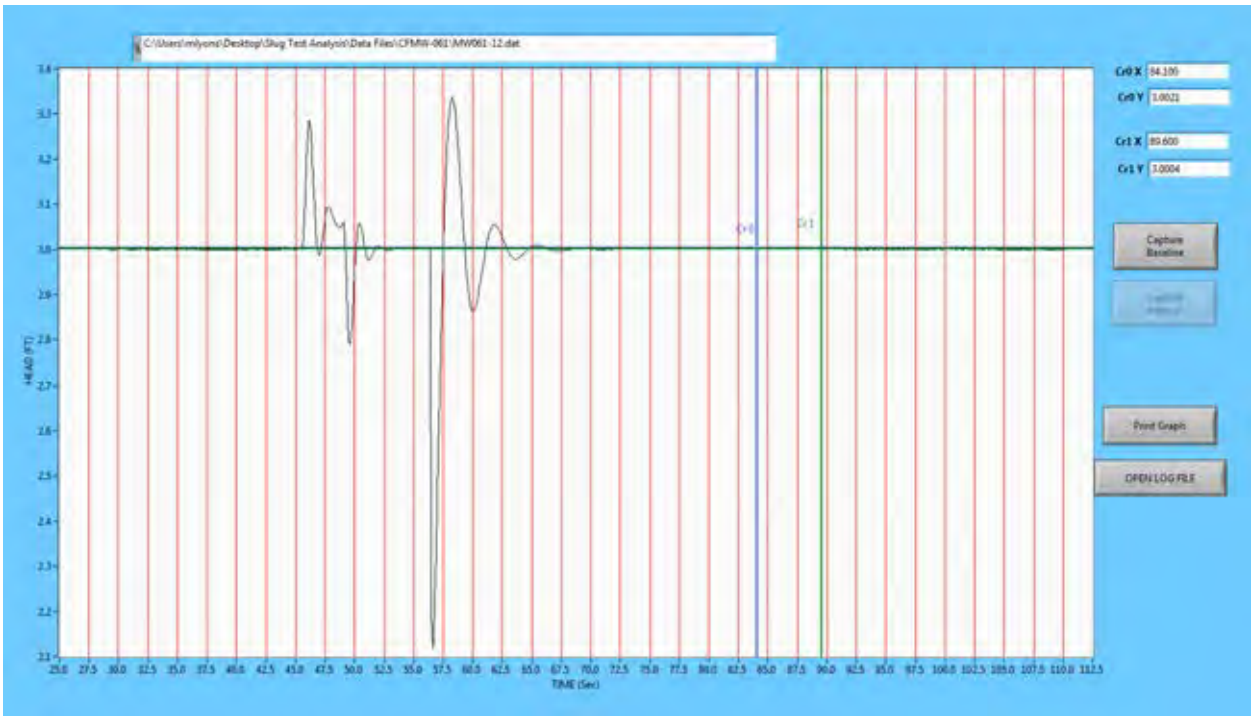
START DATE: 7/13/2017
START TIME: 2:59 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW061-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-061
1 Foot Displacement
Test #1





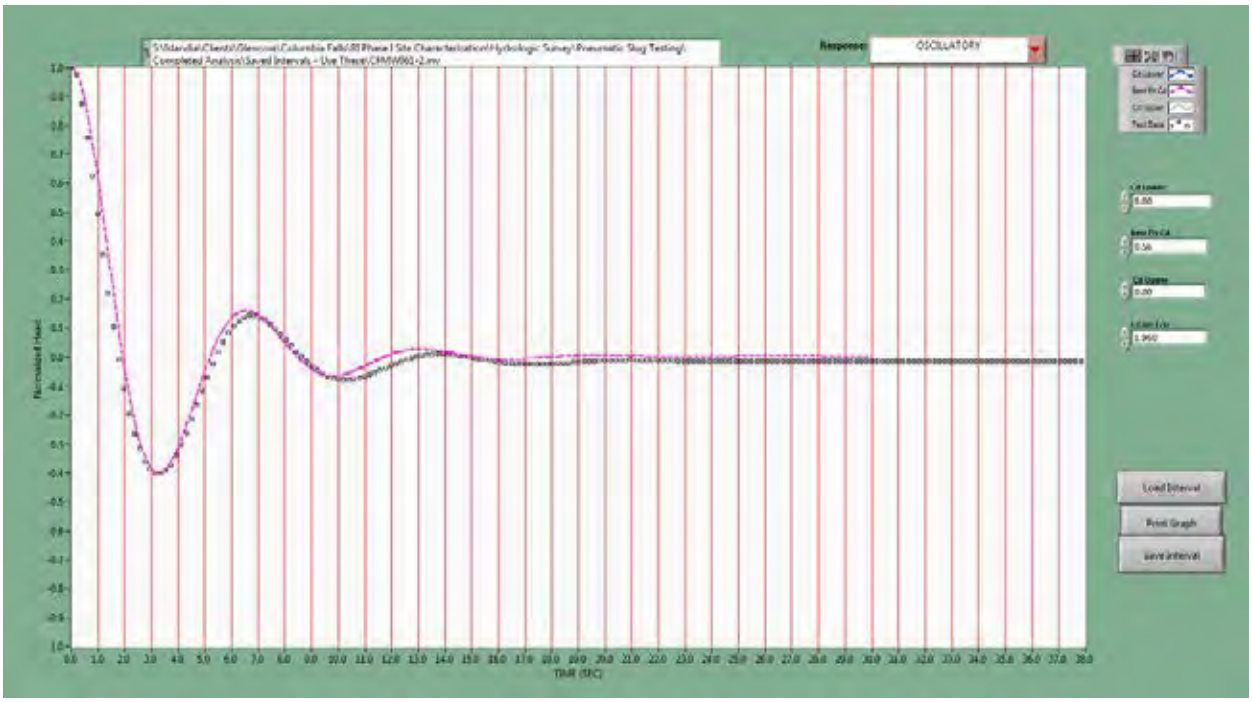
CFMW-061
1 Foot Displacement
Test #2

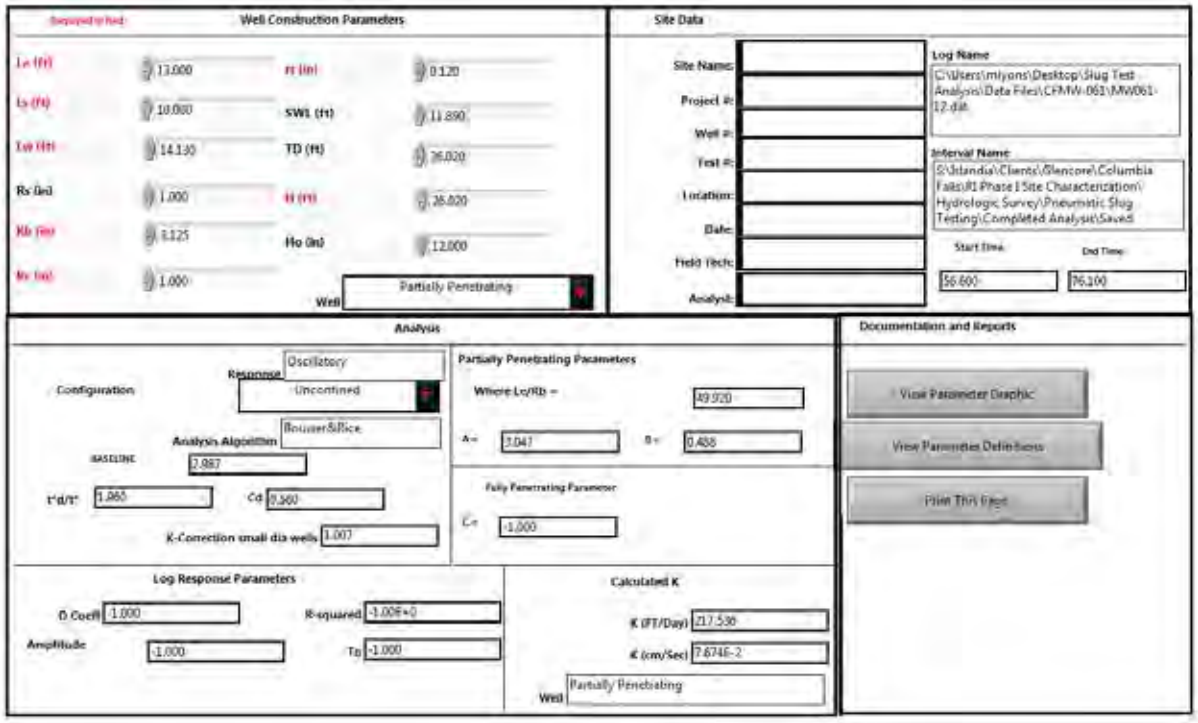


SITE INFORMATION -- SLUG TEST REV. 3.0

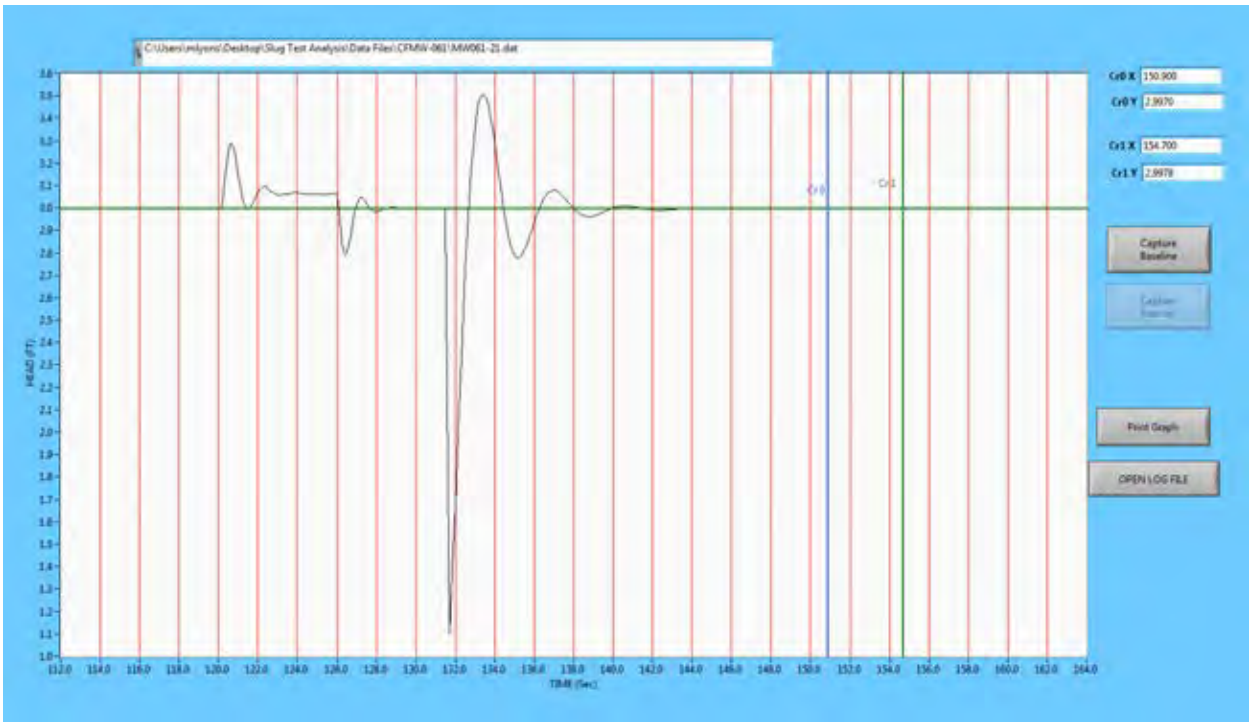
START DATE: 7/13/2017
START TIME: 3:03 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW061-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-061
1 Foot Displacement
Test #2





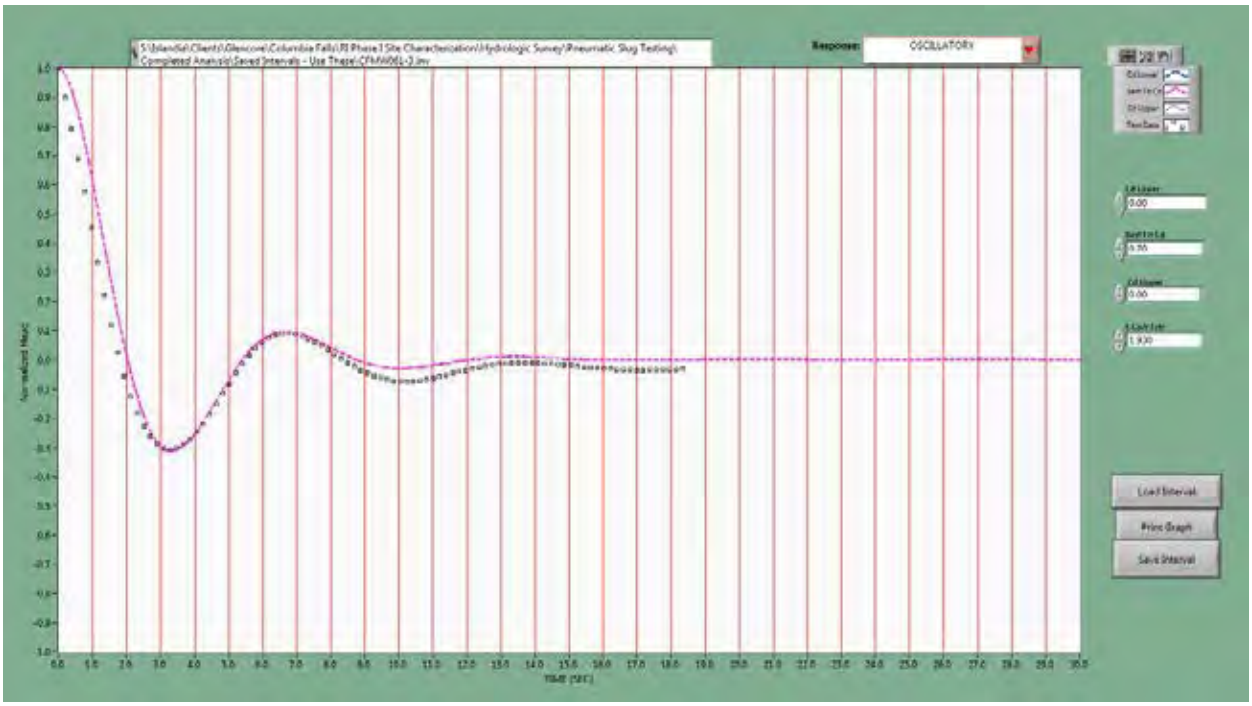
CFMW-061
2 Foot Displacement
Test #1

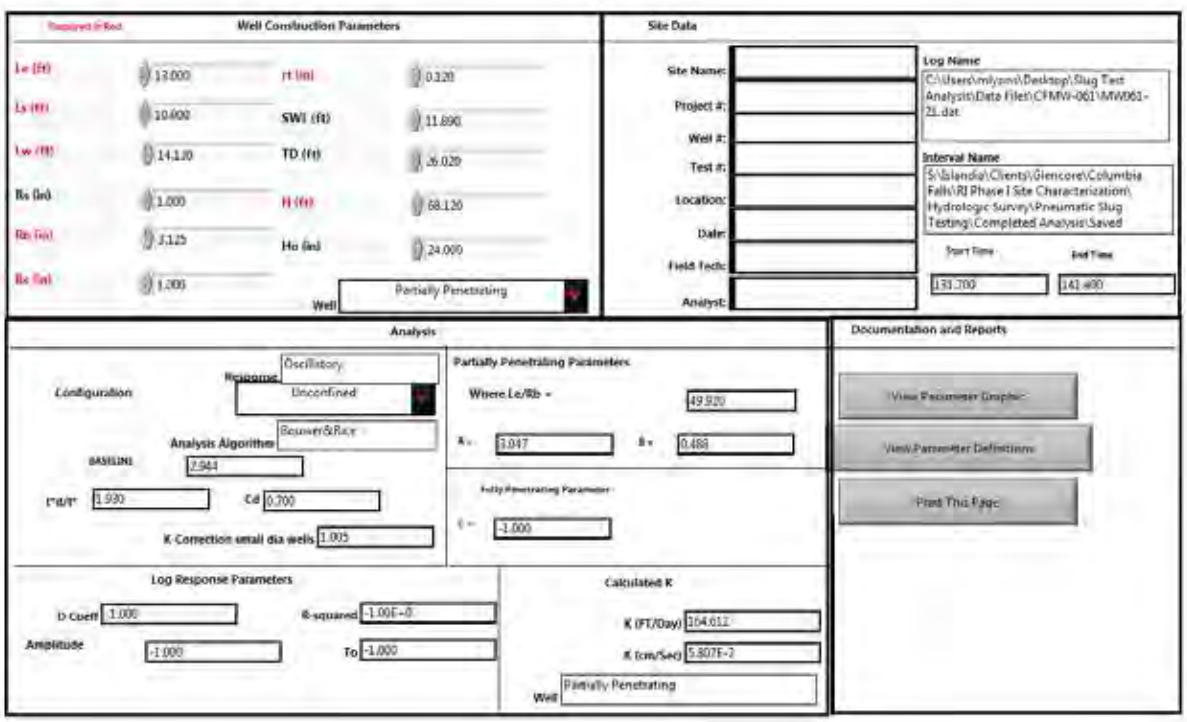


SITE INFORMATION -- SLUG TEST REV. 3.0

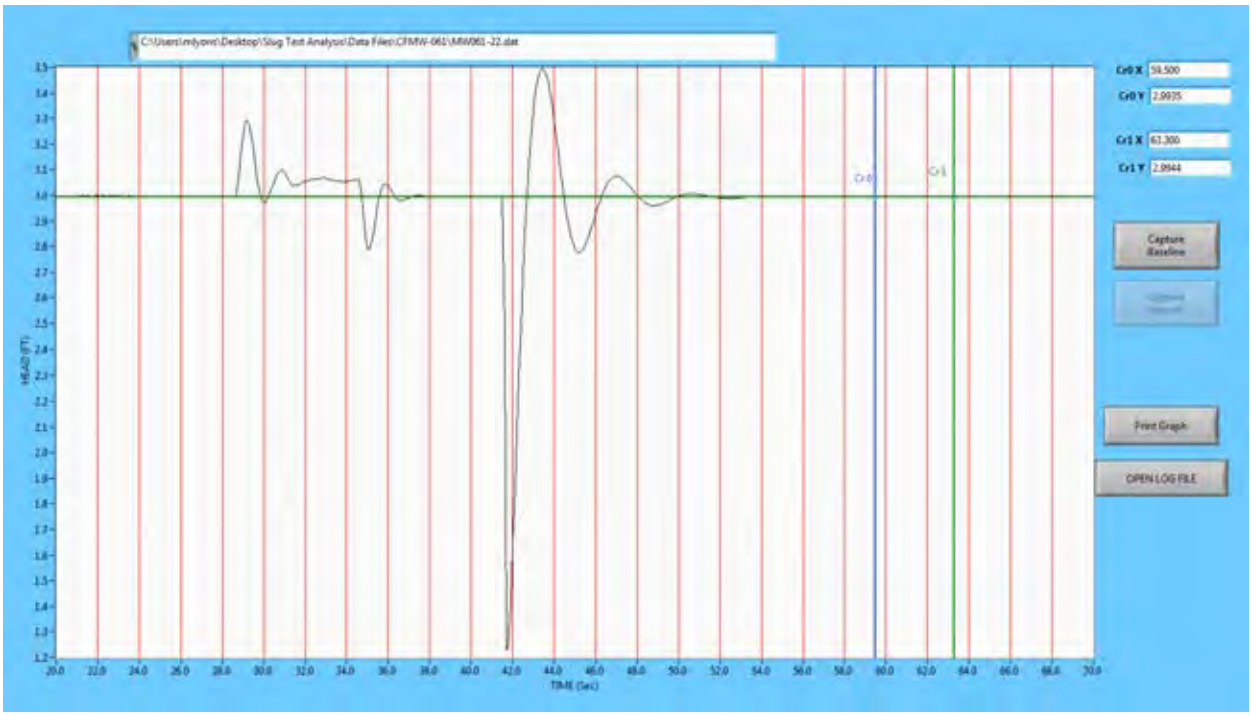
START DATE: 7/13/2017
START TIME: 3:05 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW061-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-061
2 Foot Displacement
Test #1





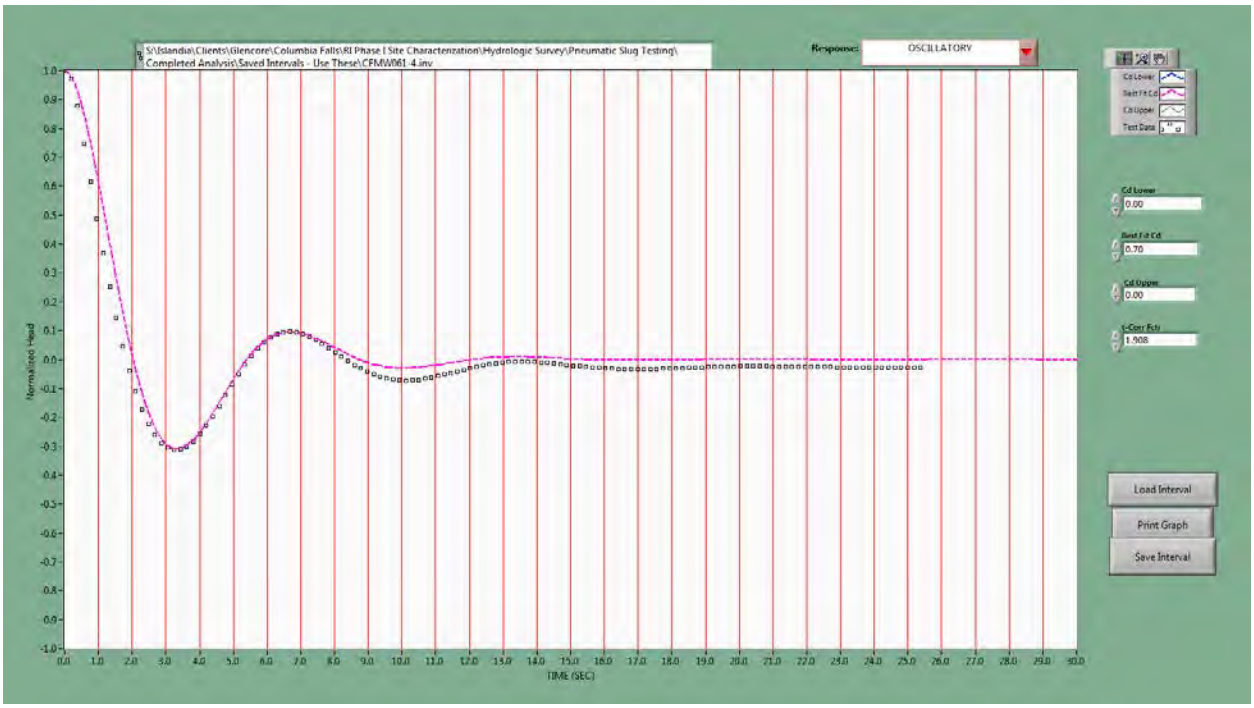
CFMW-061
2 Foot Displacement
Test #2



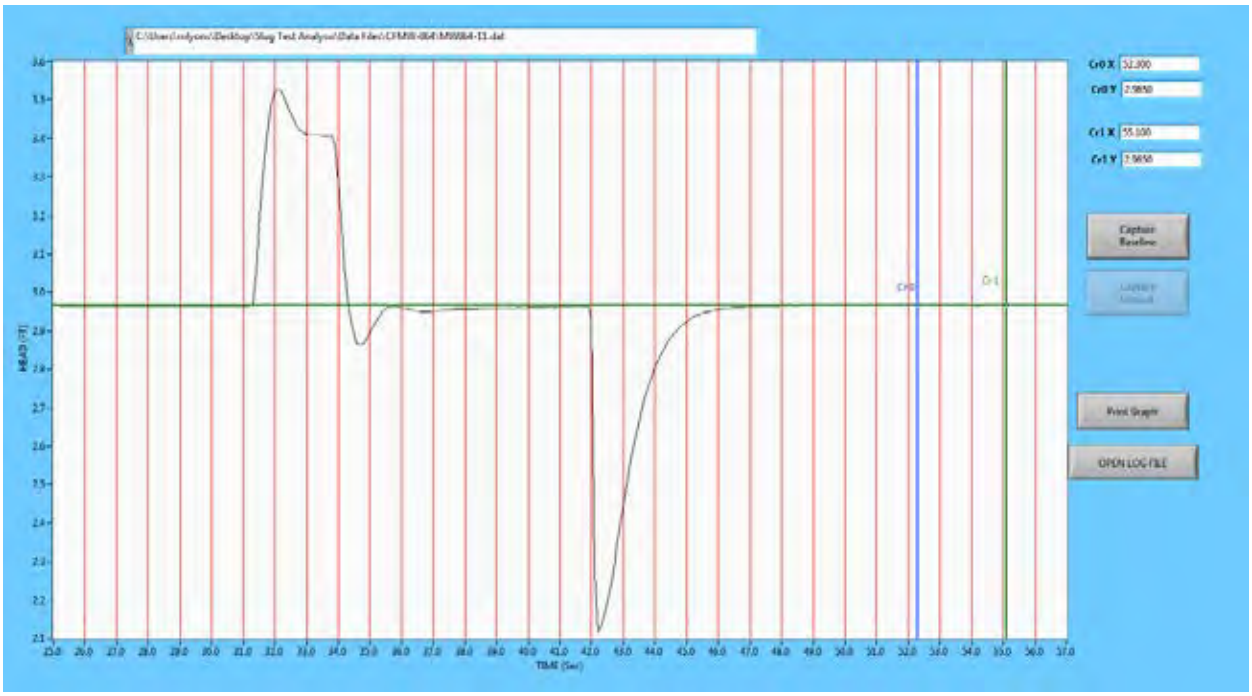
SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/13/2017
START TIME: 3:08 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW061-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-061
2 Foot Displacement
Test #2



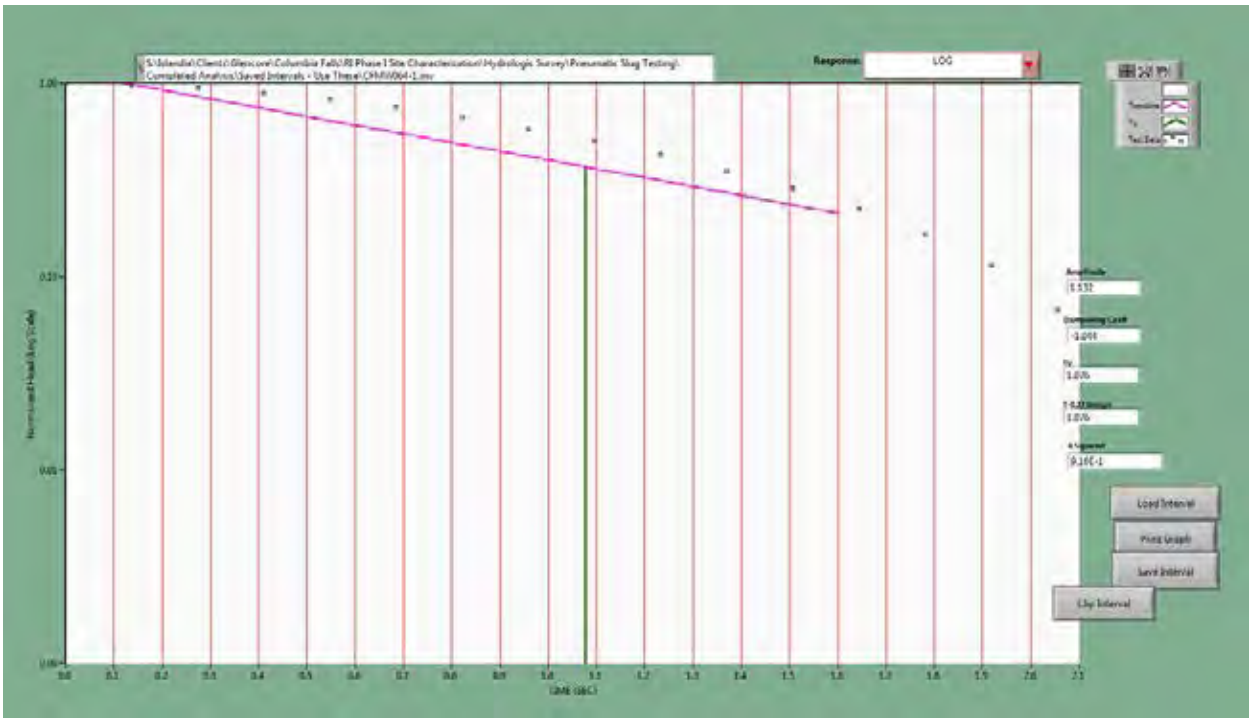
CFMW-064
1 Foot Displacement
Test #1

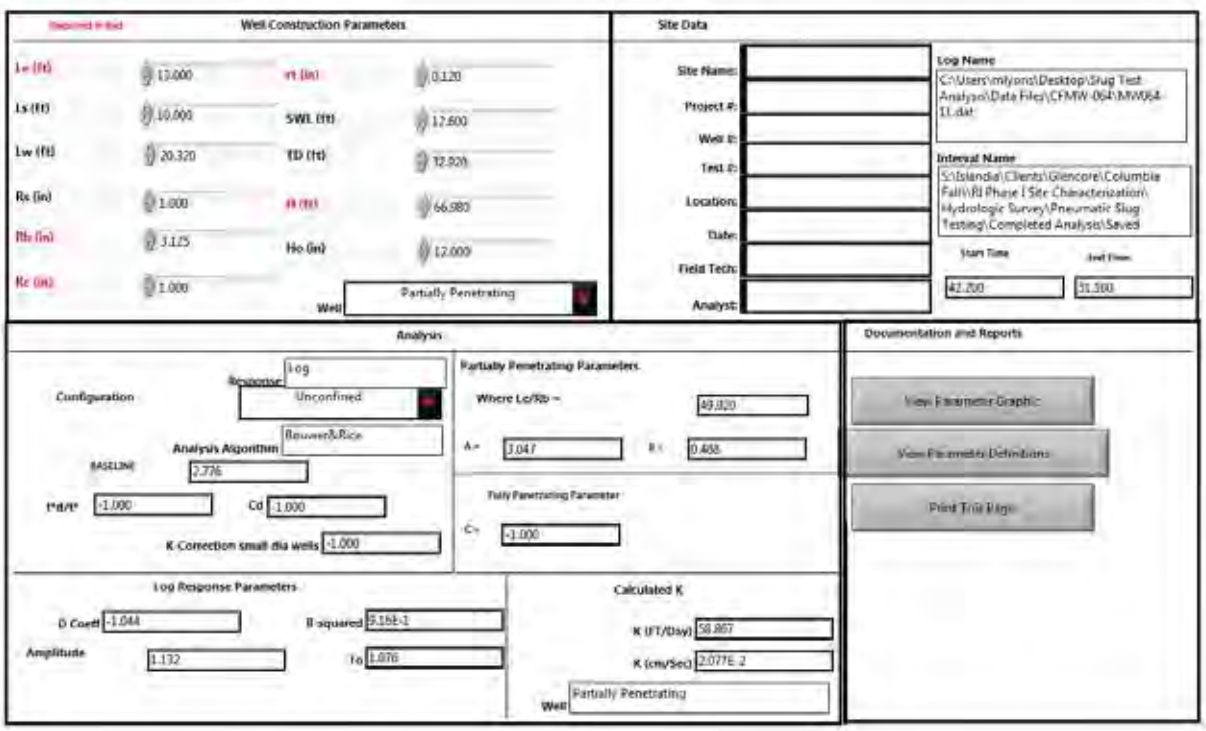


SITE INFORMATION -- SLUG TEST REV. 3.0

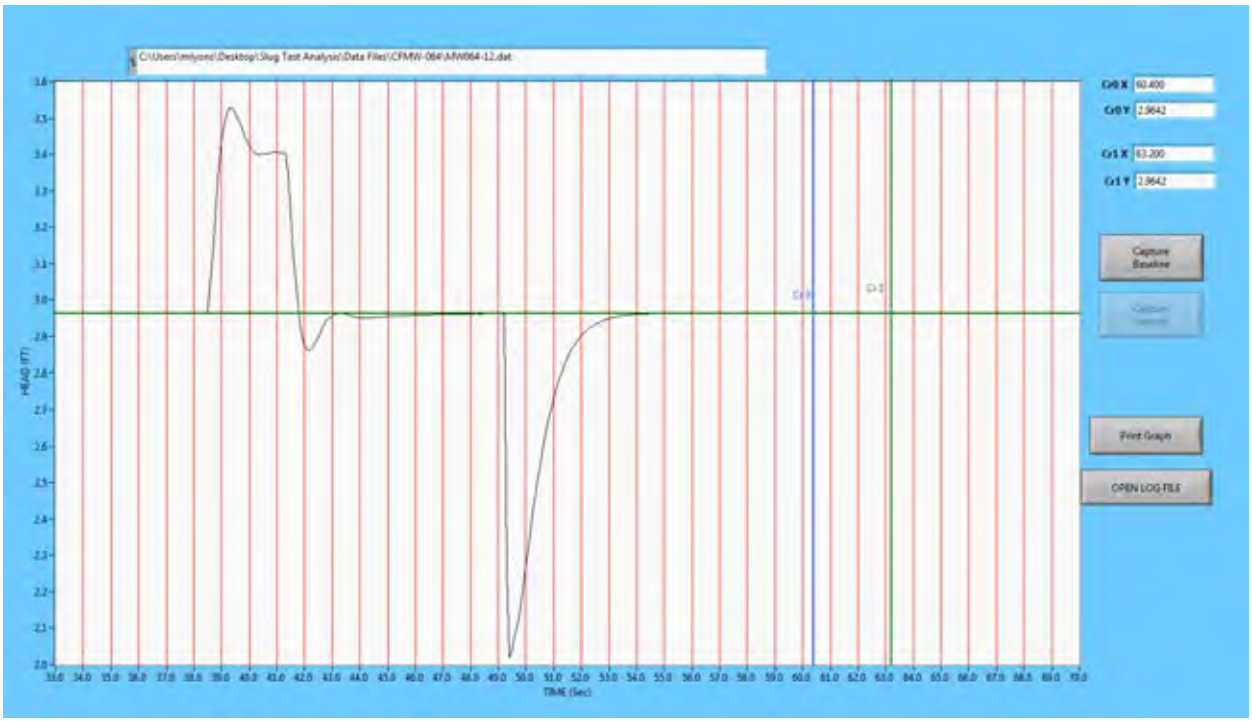
START DATE: 7/13/2017
START TIME: 2:21 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW064-11.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-064
1 Foot Displacement
Test #1





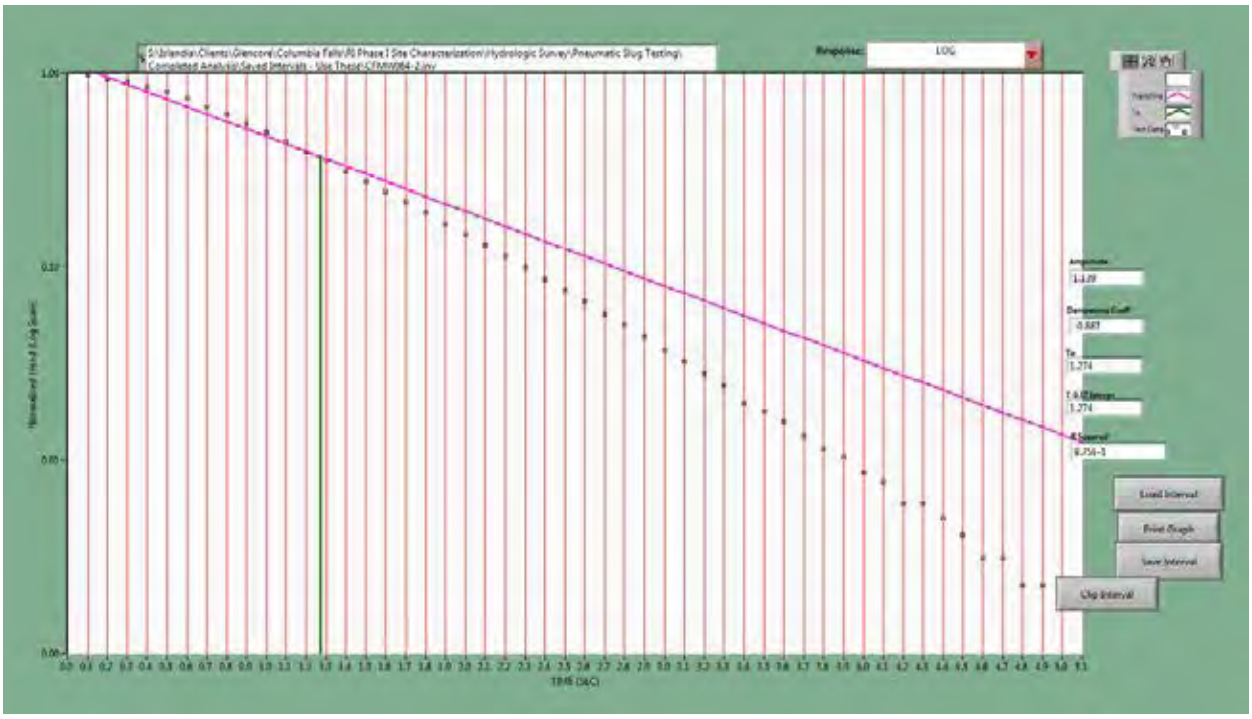
CFMW-064
1 Foot Displacement
Test #2

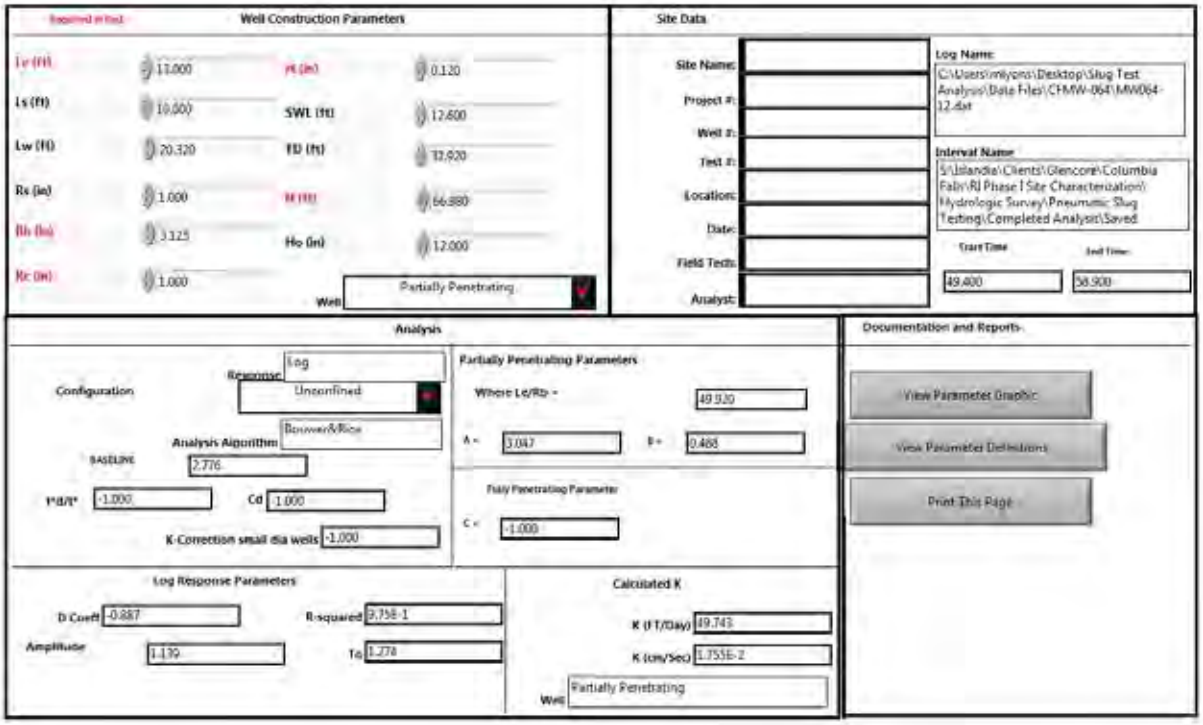


SITE INFORMATION -- SLUG TEST REV. 3.0

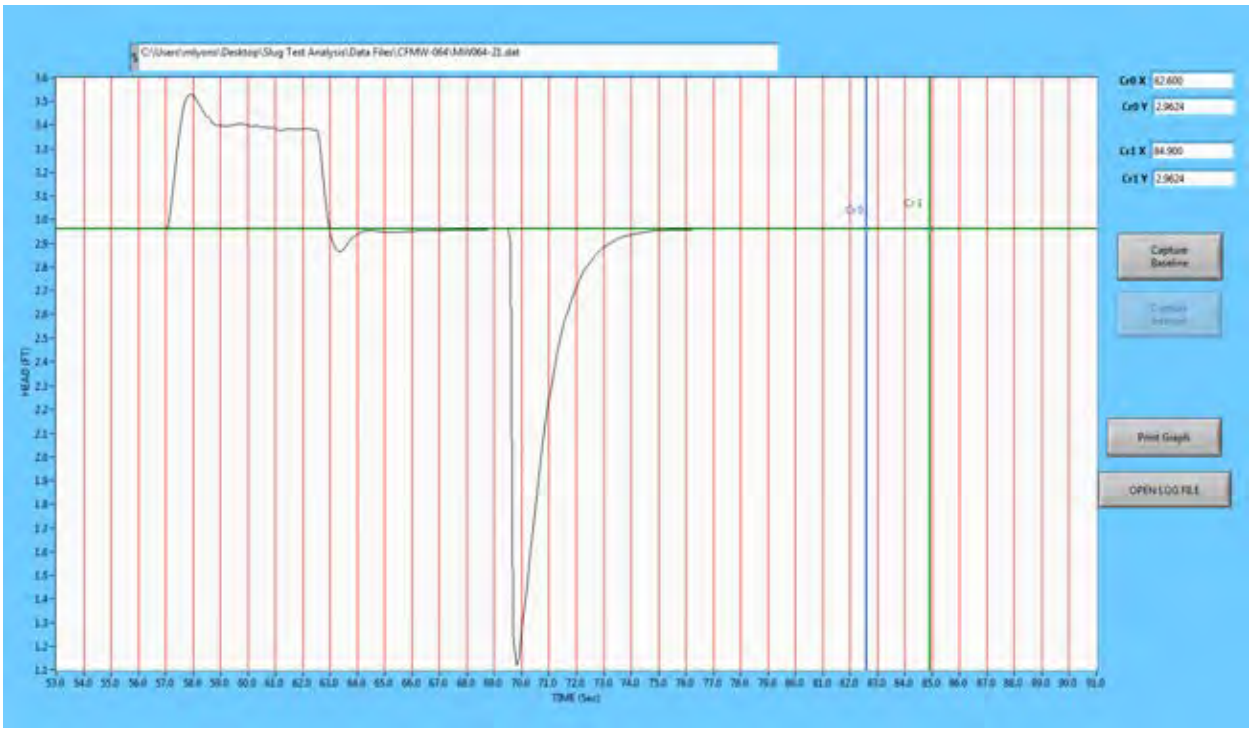
START DATE: 7/13/2017
START TIME: 2:22 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW064-12.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-064
1 Foot Displacement
Test #2





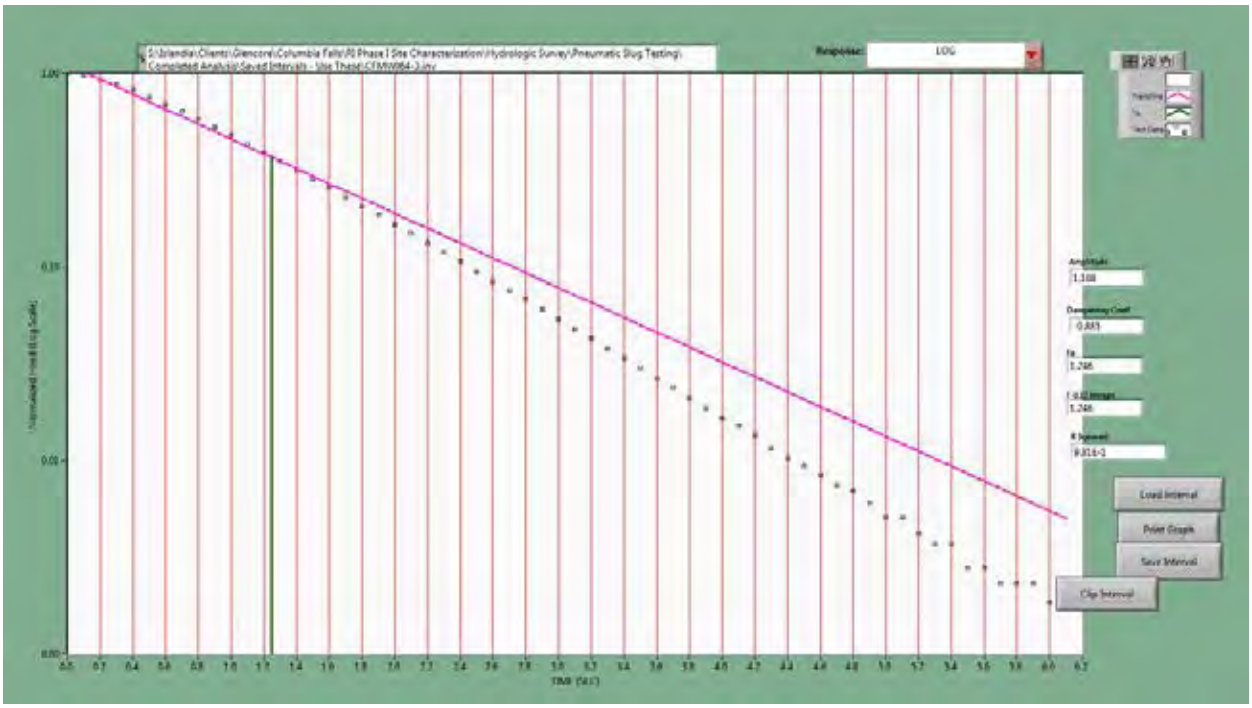
CFMW-064
2 Foot Displacement
Test #1

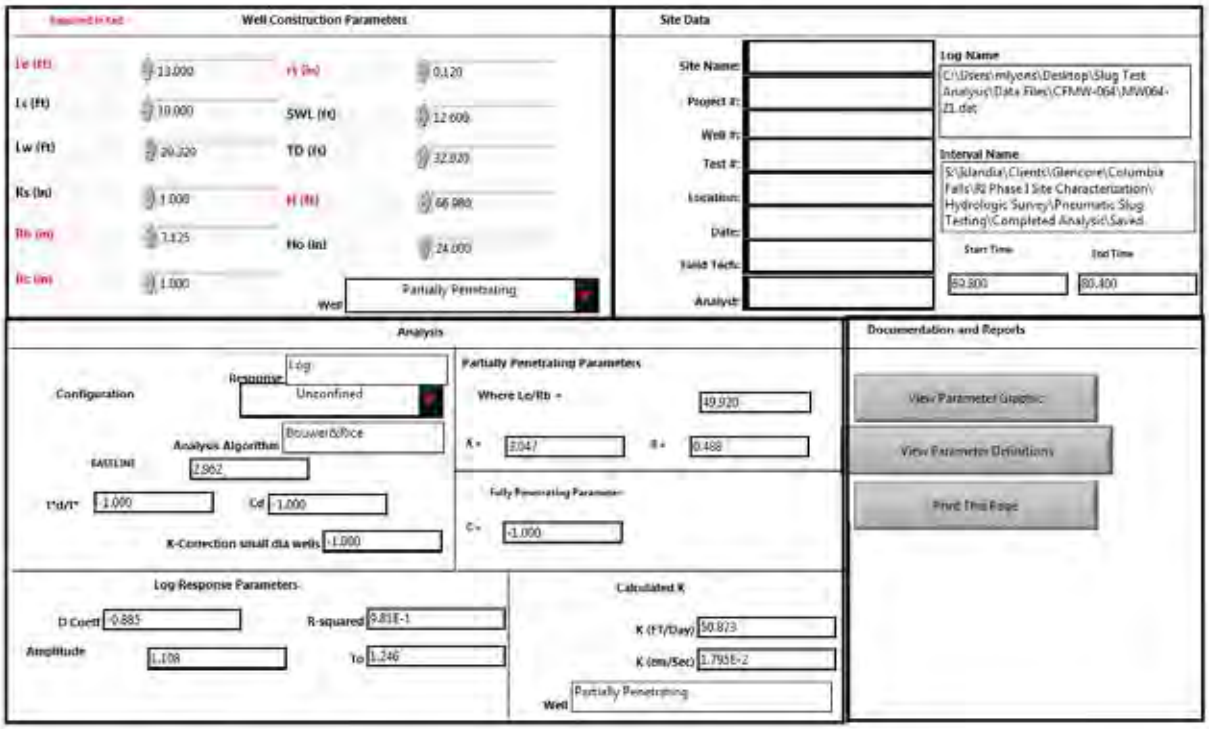


SITE INFORMATION -- SLUG TEST REV. 3.0

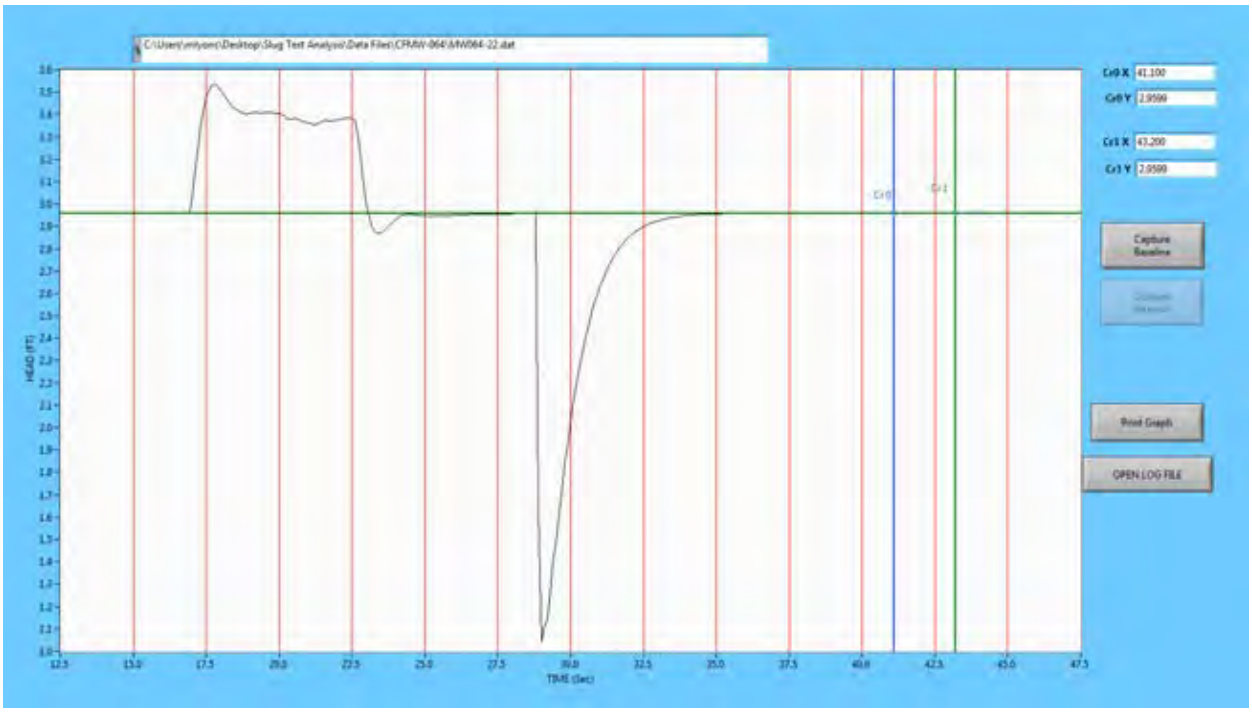
START DATE: 7/13/2017
START TIME: 2:23 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW064-21.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-064
2 Foot Displacement
Test #1





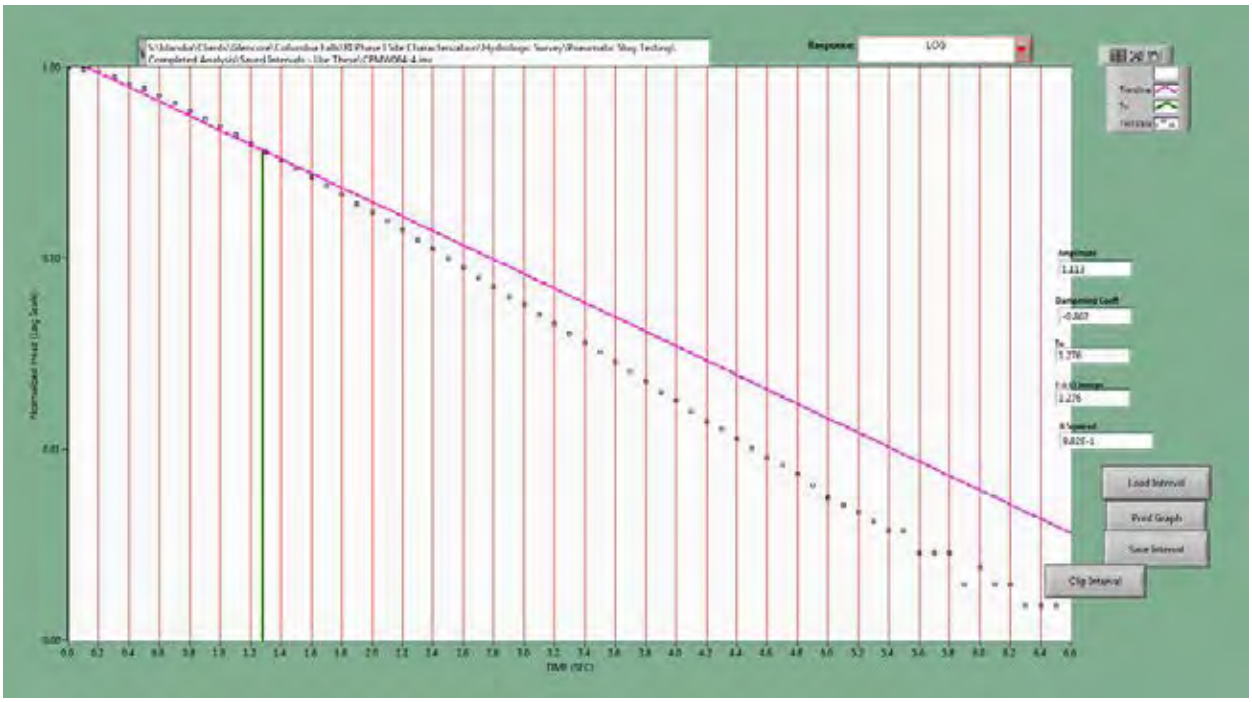
CFMW-064
2 Foot Displacement
Test #2



SITE INFORMATION -- SLUG TEST REV. 3.0

START DATE: 7/13/2017
START TIME: 2:24 PM
SLUG TEST ACQ USB SLUG V3.0 Build 13232
DATA FILE NAME: C:\DIRIM95\LOGFILES\MW064-22.DAT
DATA FILE FORMAT:
TIME(S) TRANSDUCER(V) HEAD(FT) HEAD(MM) PRESSURE(MILLIBAR)
UNITS: ENGLISH
TRANSDUCER NUMBER: 12345 15 PSI (1034 MILLIBAR)
LOG FREQUENCY: 10 Hz

CFMW-064
2 Foot Displacement
Test #2



Well Construction Parameters

Le (ft)	11.000	rw (in)	0.120
Ls (ft)	10.000	SWL (ft)	12.600
Lw (ft)	20.320	TD (ft)	32.920
Rs (in)	1.000	H (ft)	66.980
Rb (in)	8.125	Hb (in)	24.000
Rc (in)	1.000		

Well: Partially Penetrating

Site Data

Site Name:
Project #:
Well #:
Test #:
Location:
Date:
Field Tech:
Analyst:

Log Name: C:\Users\mlyons\Desktop\Slug Test Analysis\Data Files\CFMW-064\MW064-2.dat

Interval Name: S:\Islandia\Clients\Glencore\Columbia Falls\Ø Phase I Site Characterization\Hydrofogic Survey\Pneumatic Slug Testing\Completed Analysis\Saved

Start Time: 29.000
End Time: 37.600

Analysis

Response: Log
Configuration: Unconfined
Analysis Algorithm: Bouwer&Rice
BASELINE: 2.960
Pd/Ut: -1.000
Cd: -1.000
K-Correction small dia wells: -1.000

Partially Penetrating Parameters

Where Le/Rb = 49.920
A = 2.047
B = 0.488

Fully Penetrating Parameter

C = -1.000

Log Response Parameters

D Coeff: -0.867
R-squared: 9.825-1
Amplitude: 1.113
To: 1.276

Calculated K

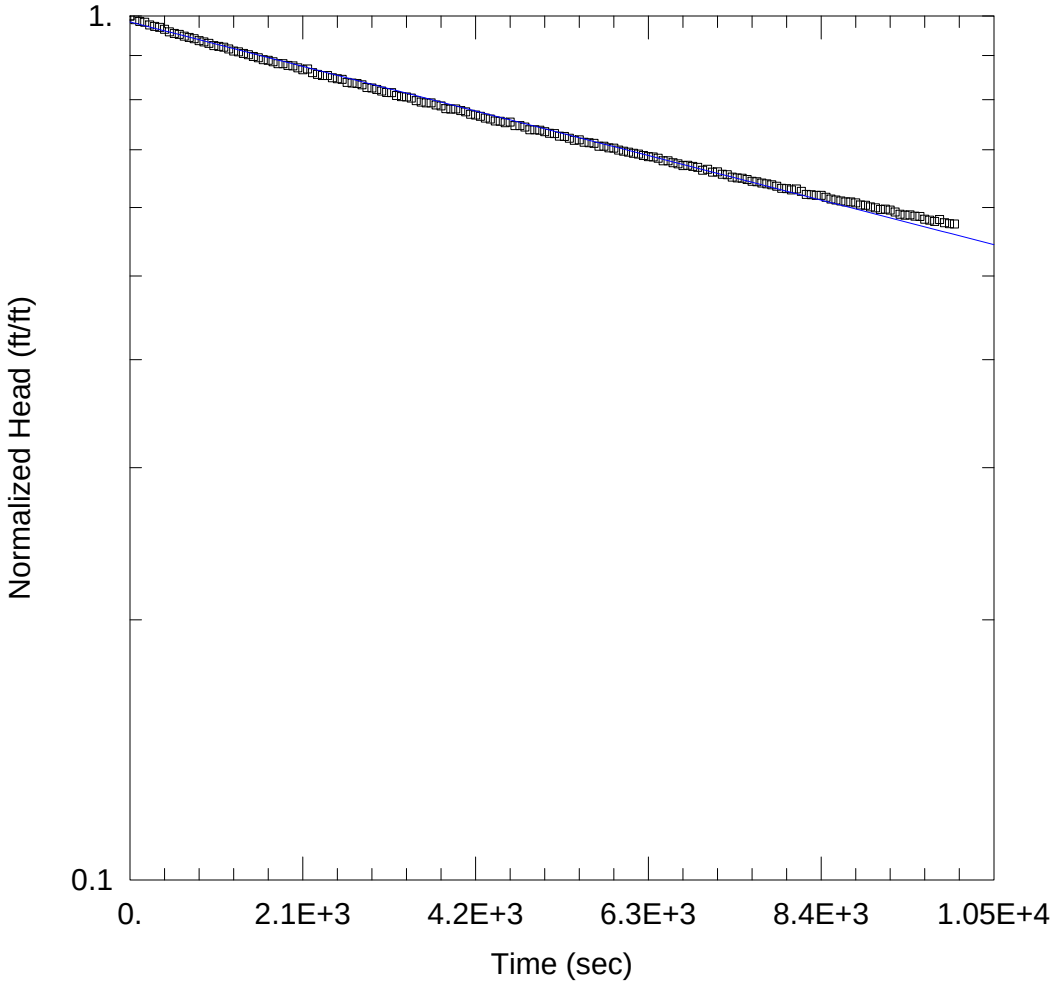
K (FT/Day): 49.846
K (cm/Sec): 1.751E-2
Well: Partially Penetrating

Documentation and Reports

View Parameter Graphic
View Parameter Definitions
Print This Page

APPENDIX J-2

Aqtesolv Software Slug Testing Curves



CFMW-008A - 2 FOOT DISPLACEMENT - TEST 1

Data Set: S:\...\CFMW-008a_a_cut - MST FINAL.aqt
Date: 11/10/17 Time: 17:46:20

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-008a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 51.61 ft Anisotropy Ratio (Kz/Kr): 0.1

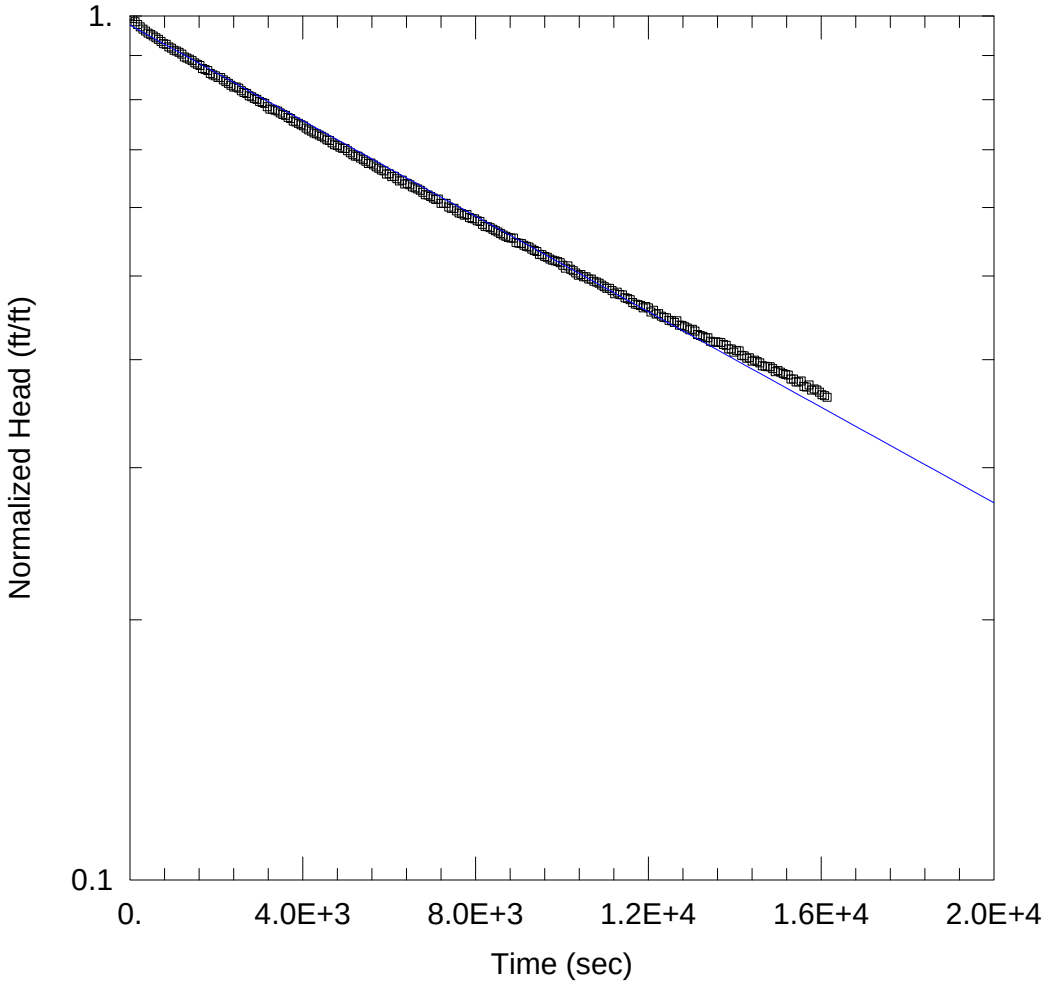
WELL DATA (CFMW-008a)

Initial Displacement: 1.973 ft Static Water Column Height: 35.32 ft
Total Well Penetration Depth: 35.32 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008315 ft/day y0 = 1.942 ft



CFMW-008A - 2 FOOT DISPLACEMENT - TEST 2

Data Set: S:\...\CFMW-008a_a_cut - MST2 FINAL.aqt
Date: 11/10/17 Time: 17:47:10

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-008a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 51.61 ft Anisotropy Ratio (Kz/Kr): 0.1

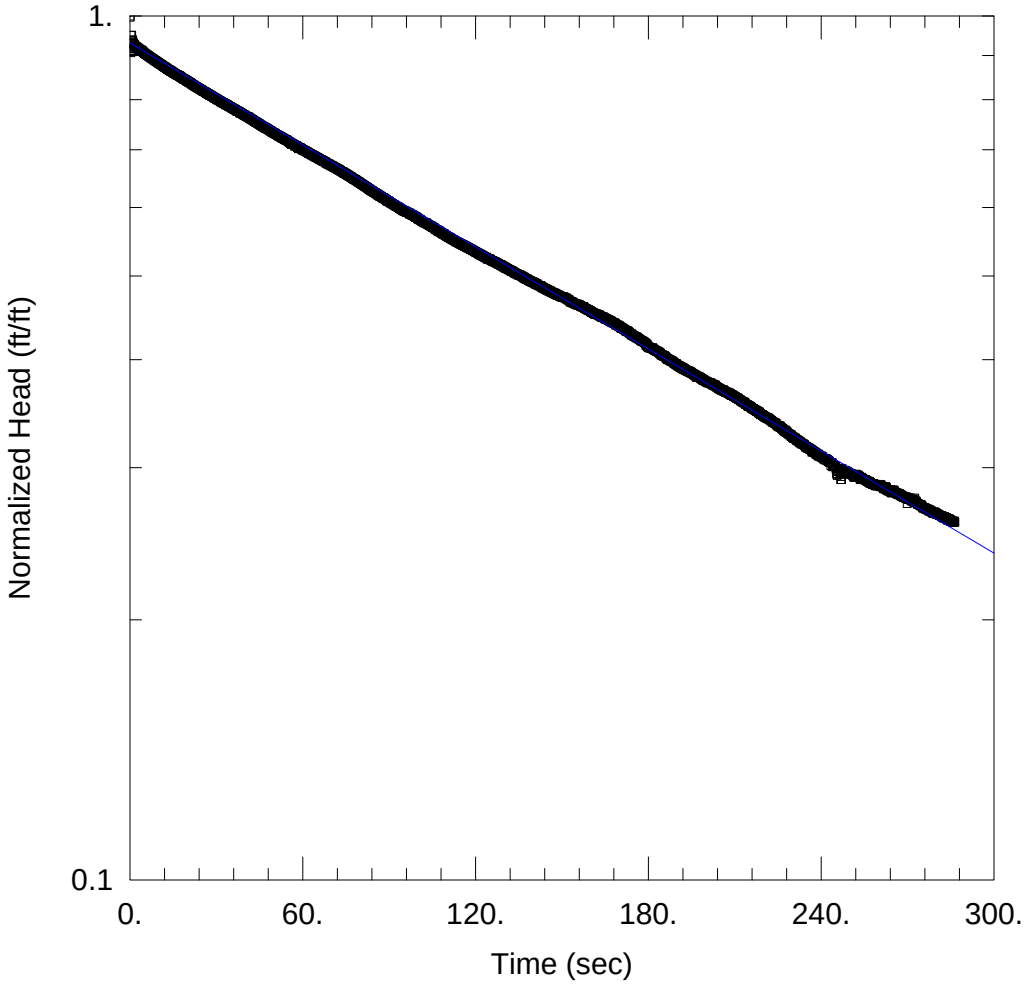
WELL DATA (CFMW-008a)

Initial Displacement: 1.992 ft Static Water Column Height: 35.32 ft
Total Well Penetration Depth: 35.32 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.009362 ft/day y0 = 1.944 ft



CFMW-028 - 1 FOOT DISPLACEMENT - TEST 1

Data Set: S:\...\CFMW-028 cut2 MW028-12 FINAL.aqt
Date: 11/10/17 Time: 17:51:09

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-028
Test Date: NA

AQUIFER DATA

Saturated Thickness: 85.51 ft
Anisotropy Ratio (Kz/Kr): 0.1

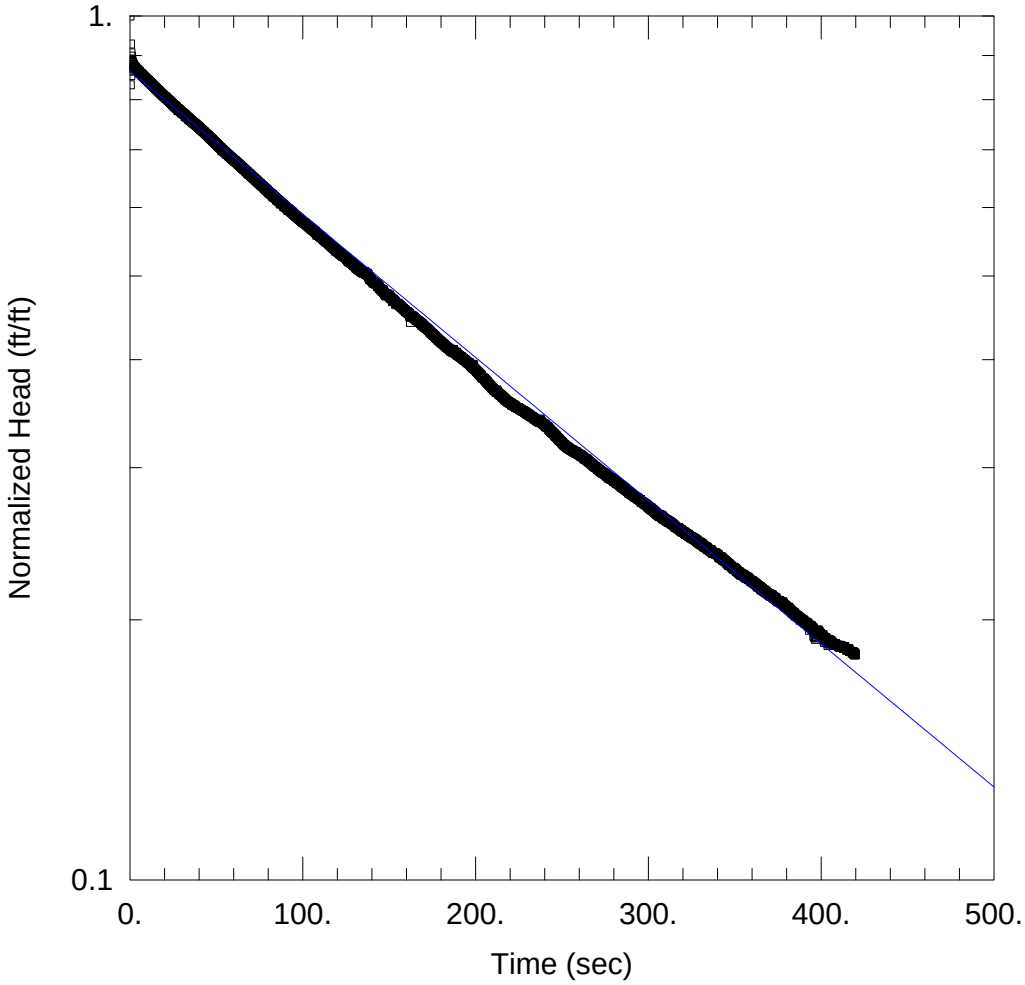
WELL DATA (CFMW-028)

Initial Displacement: -1.101 ft
Static Water Column Height: 24.19 ft
Total Well Penetration Depth: 24.19 ft
Screen Length: 10. ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.6396 ft/day
y0 = -1.024 ft



CFMW-028 - 1 FOOT DISPLACEMENT - TEST 2

Data Set: S:\...\CFMW-028 cut2 MW028-13 FINAL.aqt
Date: 11/10/17 Time: 17:51:40

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-028
Test Date: NA

AQUIFER DATA

Saturated Thickness: 85.51 ft Anisotropy Ratio (Kz/Kr): 0.1

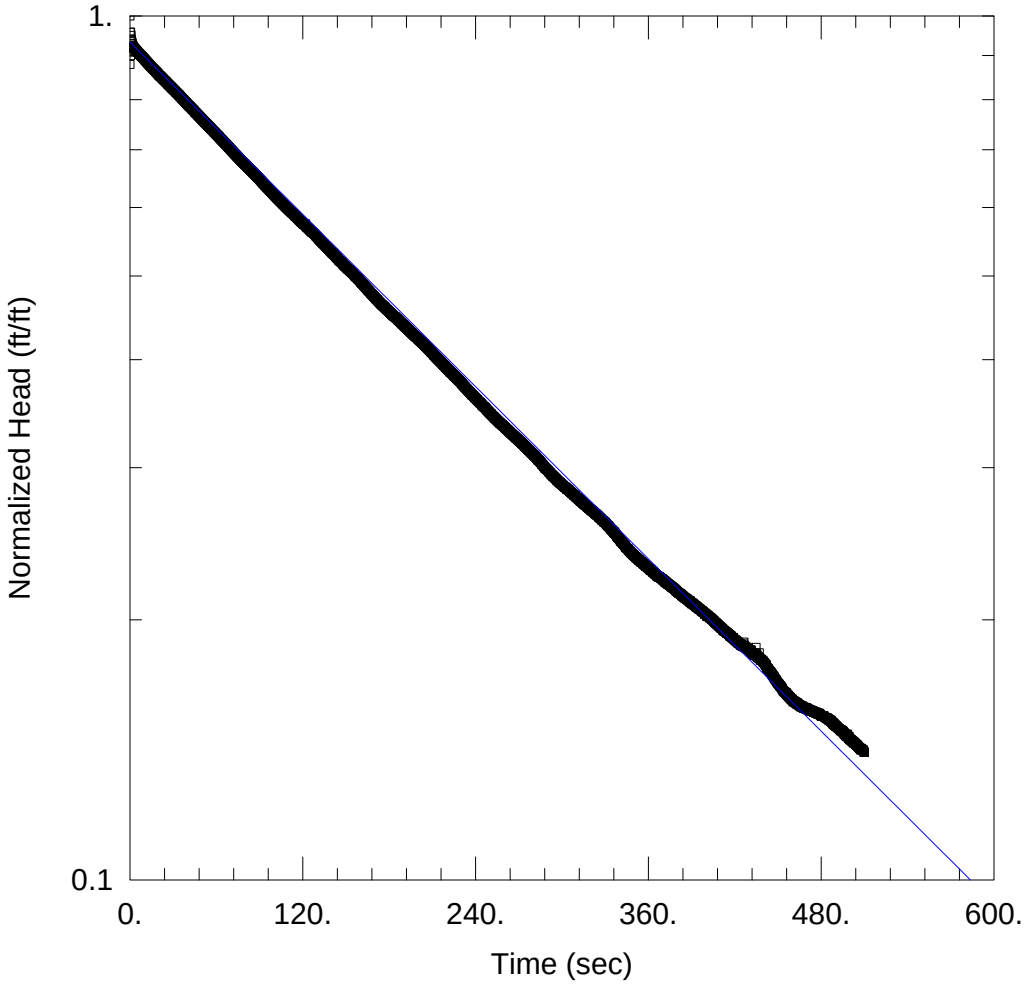
WELL DATA (CFMW-028)

Initial Displacement: -1.127 ft Static Water Column Height: 24.19 ft
Total Well Penetration Depth: 24.19 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.5385 ft/day y0 = -0.9727 ft



CFMW-028 - 2 FOOT DISPLACEMENT - TEST 1

Data Set: S:\...\CFMW-028 cut2 MW028-21 FINAL.aqt
Date: 11/10/17 Time: 17:53:05

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-028
Test Date: NA

AQUIFER DATA

Saturated Thickness: 85.51 ft Anisotropy Ratio (Kz/Kr): 0.1

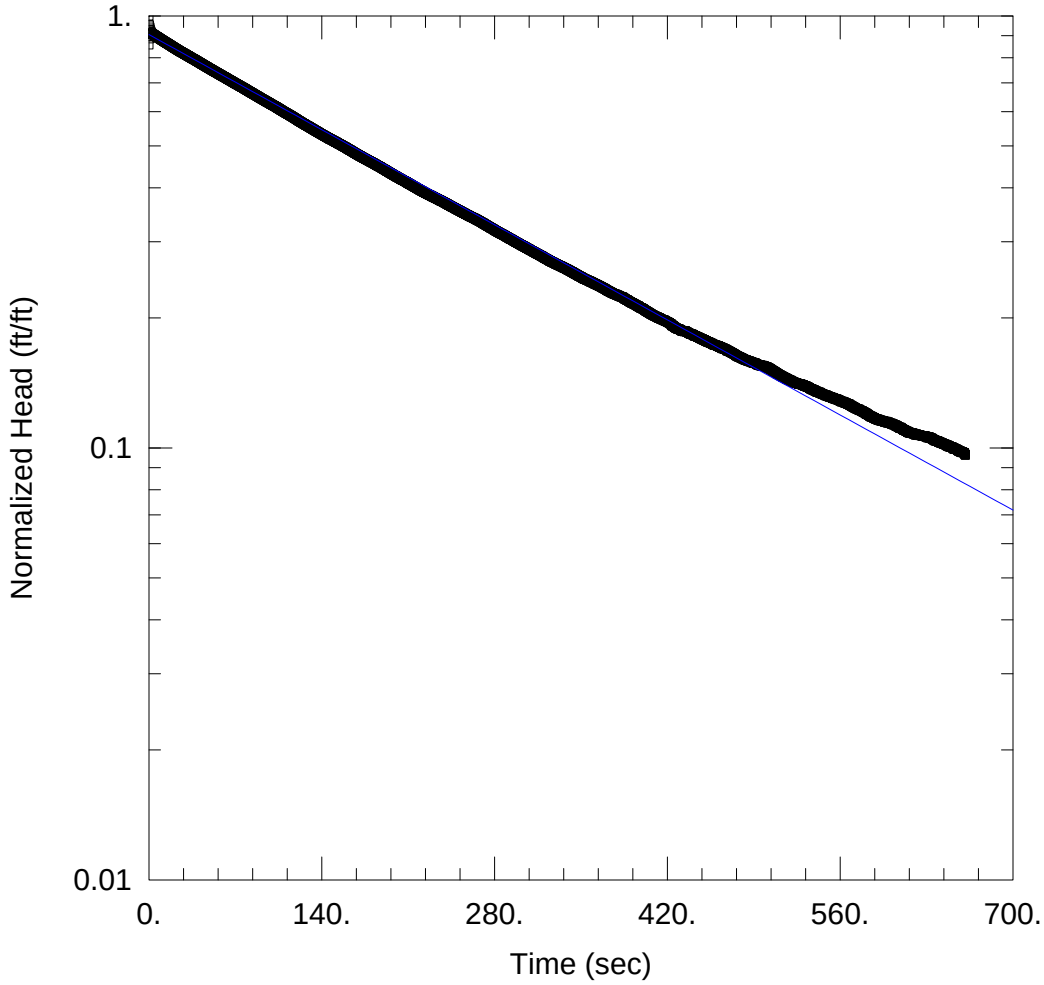
WELL DATA (CFMW-028)

Initial Displacement: -1.959 ft Static Water Column Height: 24.19 ft
Total Well Penetration Depth: 24.19 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.5399 ft/day y0 = -1.827 ft



CFMW-028 - 2 FOOT DISPLACEMENT - TEST 2

Data Set: S:\...\CFMW-028 cut2 MW028-22 FINAL.aqt
Date: 11/10/17 Time: 17:53:34

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-028
Test Date: NA

AQUIFER DATA

Saturated Thickness: 85.51 ft Anisotropy Ratio (Kz/Kr): 0.1

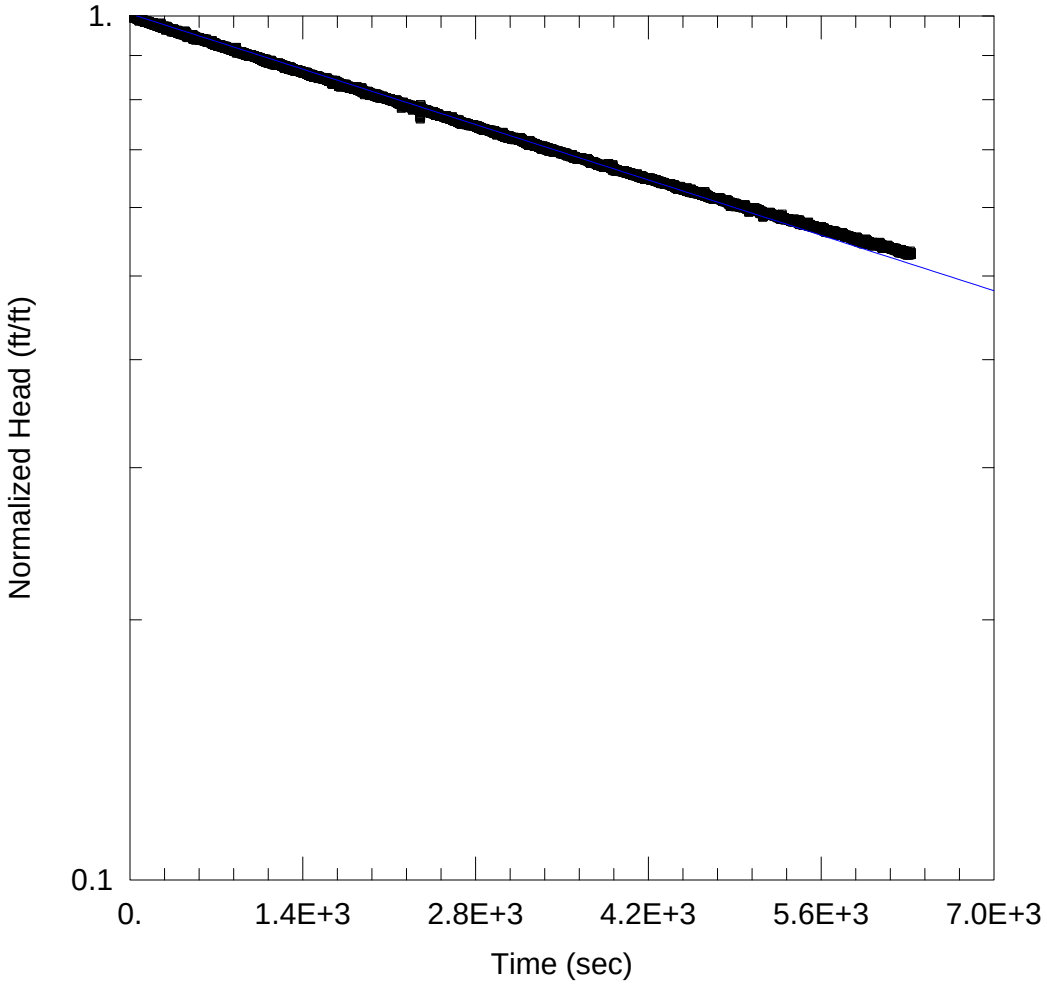
WELL DATA (CFMW-028)

Initial Displacement: -2.149 ft Static Water Column Height: 24.19 ft
Total Well Penetration Depth: 24.19 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.511 ft/day y0 = -1.945 ft



CFMW-032A - 1 FOOT DISPLACEMENT - TEST 1

Data Set: S:\...\CFMW-032a MW32a-12 FINAL.aqt
Date: 11/10/17 Time: 17:56:06

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-032a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 346.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

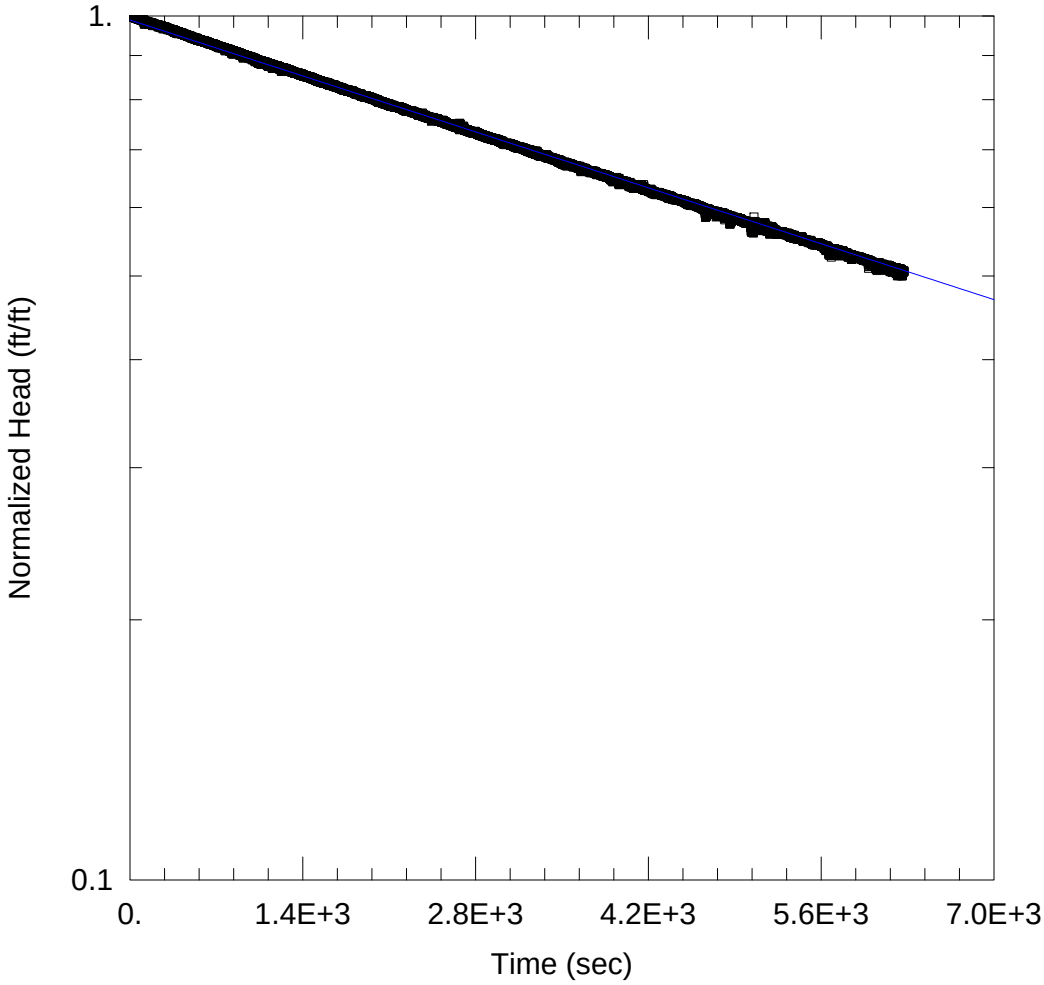
WELL DATA (CFMW-032a)

Initial Displacement: -1.106 ft
Static Water Column Height: 108. ft
Total Well Penetration Depth: 98.54 ft
Screen Length: 10. ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.01713 ft/day
y0 = -1.112 ft



CFMW-032A - 1 FOOT DISPLACEMENT - TEST 2

Data Set: S:\...\CFMW-032a MW32a-13 final.aqt
Date: 11/10/17 Time: 17:57:08

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-032a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 346.8 ft Anisotropy Ratio (Kz/Kr): 0.1

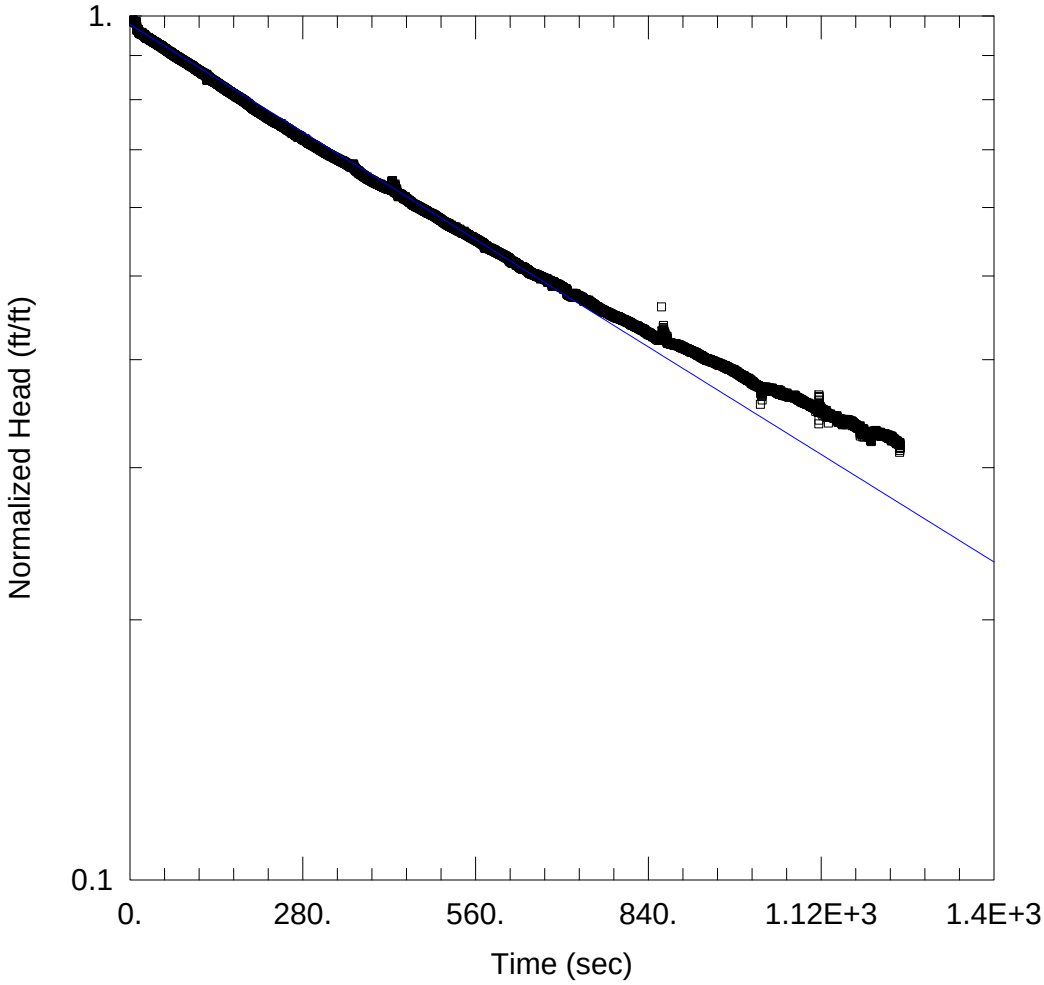
WELL DATA (CFMW-032a)

Initial Displacement: -1.117 ft Static Water Column Height: 108. ft
Total Well Penetration Depth: 98.54 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01729 ft/day y0 = -1.105 ft



CFMW-045A - 1 FOOT DISPLACEMENT - TEST 1

Data Set: S:\...\CFMW-045a -11.aqt
Date: 11/13/17 Time: 11:14:17

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-045a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 78.9 ft Anisotropy Ratio (Kz/Kr): 0.1

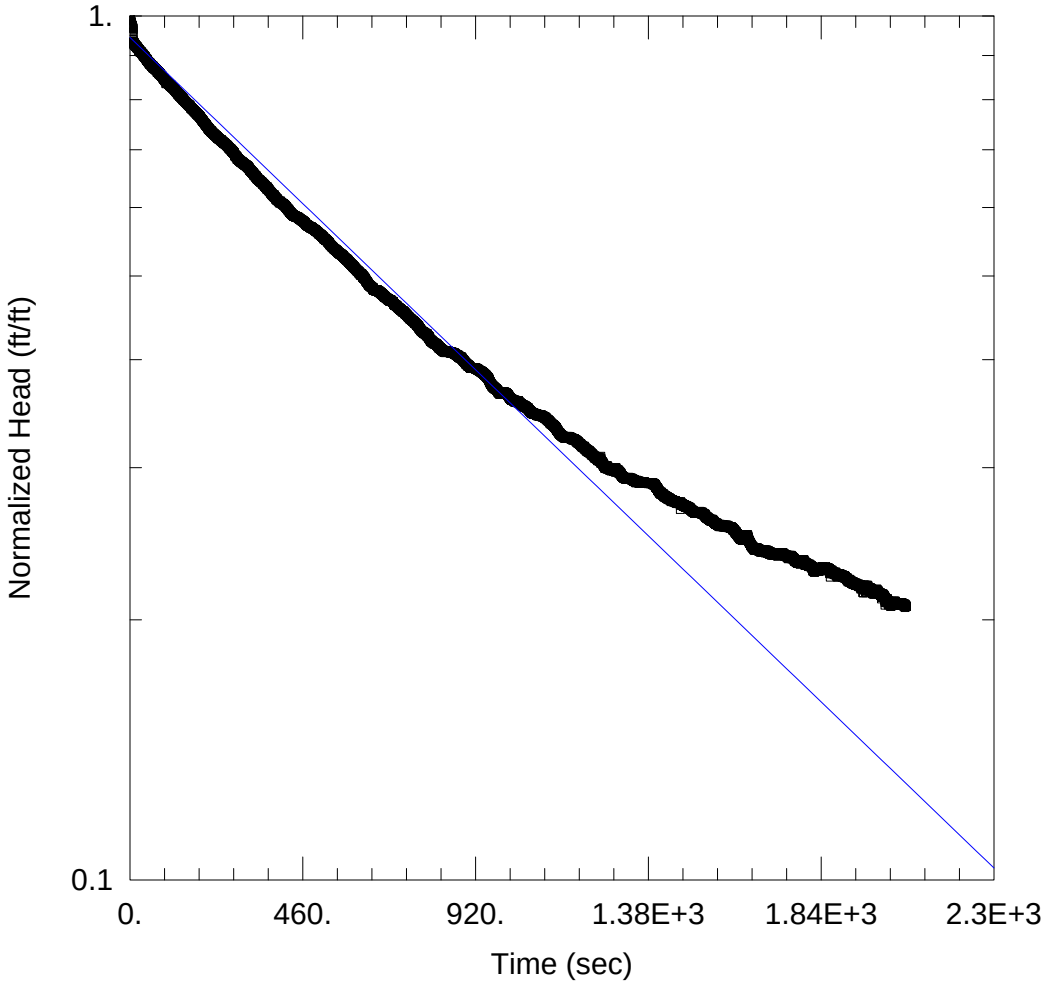
WELL DATA (CFMW-045a)

Initial Displacement: -1.049 ft Static Water Column Height: 76.09 ft
Total Well Penetration Depth: 76.09 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.1681 ft/day y0 = -1.026 ft



CFMW-045A - 1 FOOT DISPLACEMENT - TEST 2

Data Set: S:\...\CFMW-045a -12.aqt
Date: 11/13/17 Time: 11:15:23

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-045a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 78.9 ft Anisotropy Ratio (Kz/Kr): 0.1

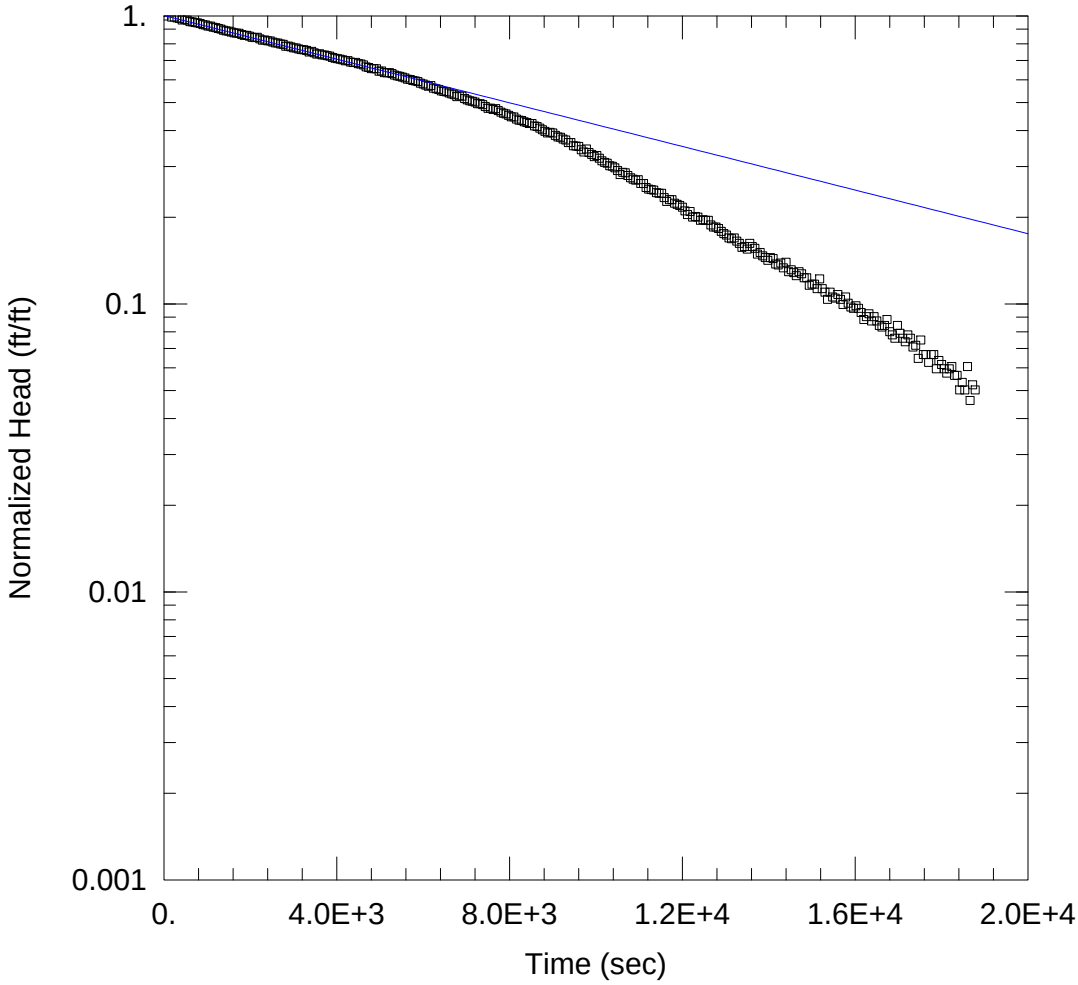
WELL DATA (CFMW-045a)

Initial Displacement: -1.228 ft Static Water Column Height: 76.09 ft
Total Well Penetration Depth: 76.09 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.158 ft/day y0 = -1.159 ft



CFMW-053A - 2 FOOT DISPLACEMENT - TEST 1

Data Set: S:\...\CFMW-053a - 22.aqt
Date: 11/13/17 Time: 11:19:24

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-053a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 516.6 ft Anisotropy Ratio (Kz/Kr): 0.1

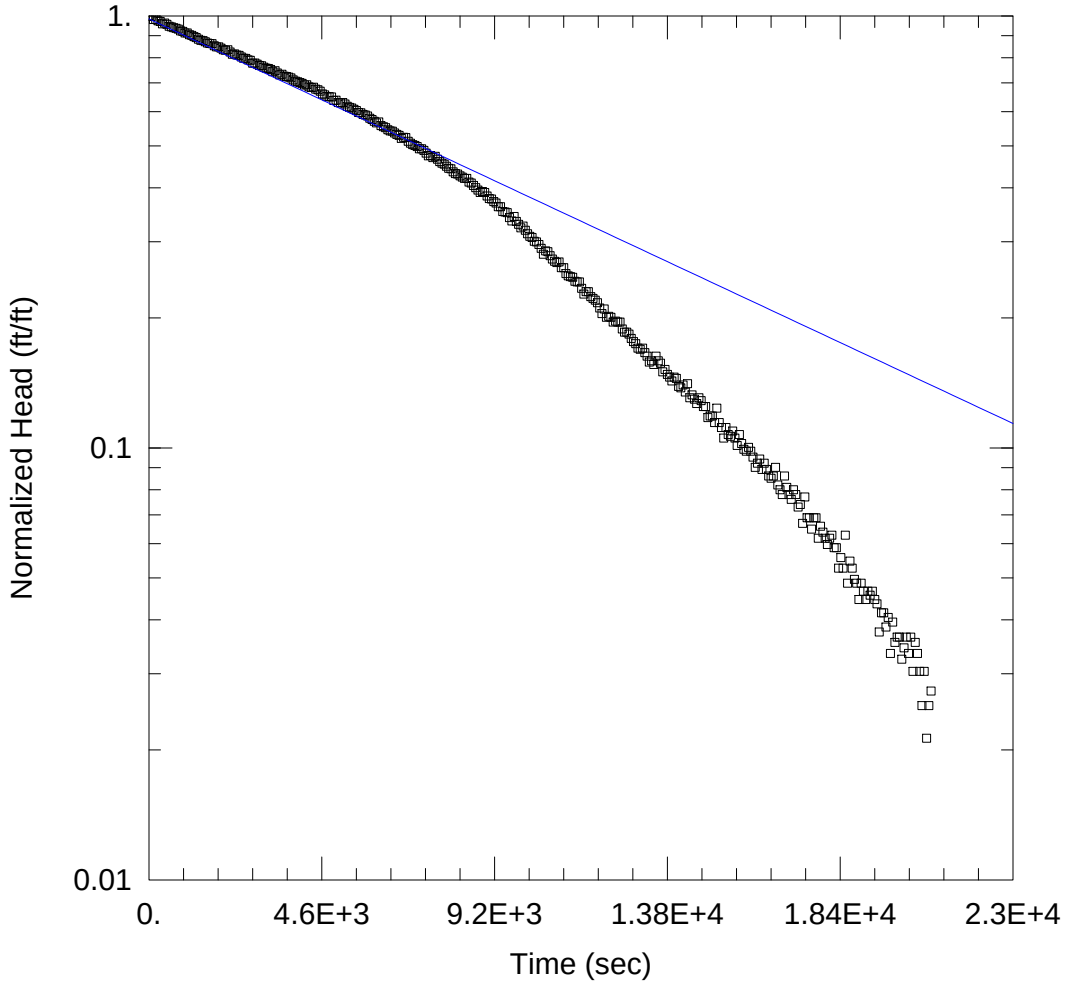
WELL DATA (CFMW-053a)

Initial Displacement: 0.974 ft Static Water Column Height: 85.81 ft
Total Well Penetration Depth: 76.74 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01385 ft/day y0 = 0.9767 ft



CFMW-053A - 2 FOOT DISPLACEMENT - TEST 2

Data Set: S:\...\CFMW-053a - 23.aqt
Date: 11/13/17 Time: 11:21:00

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-053a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 516.6 ft Anisotropy Ratio (Kz/Kr): 0.1

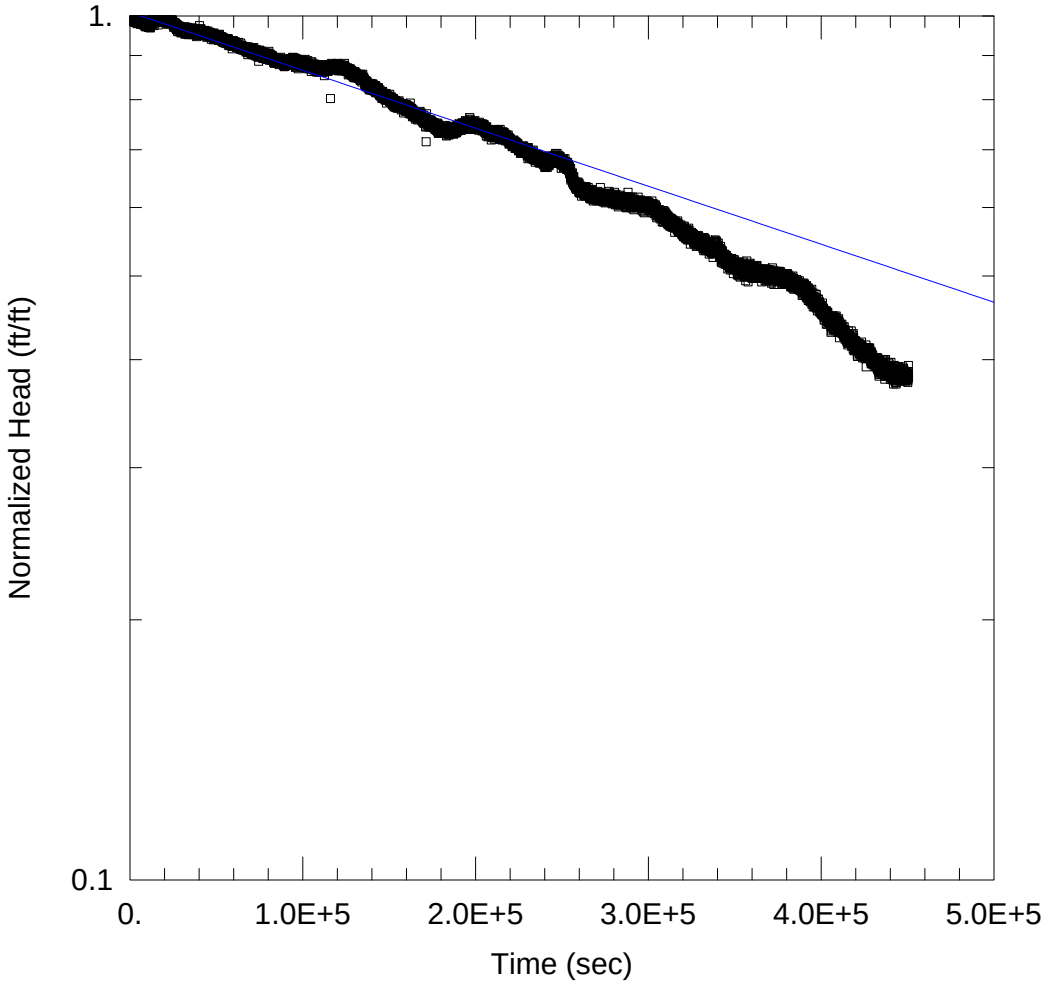
WELL DATA (CFMW-053a)

Initial Displacement: 0.987 ft Static Water Column Height: 85.81 ft
Total Well Penetration Depth: 76.74 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01489 ft/day y0 = 0.9713 ft



CFMW-057A - 1 FOOT DISPLACEMENT - TEST 2

Data Set: S:\...\CFMW-057a - test2.aqt
Date: 11/13/17 Time: 11:24:39

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-057a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 584.1 ft Anisotropy Ratio (Kz/Kr): 0.1

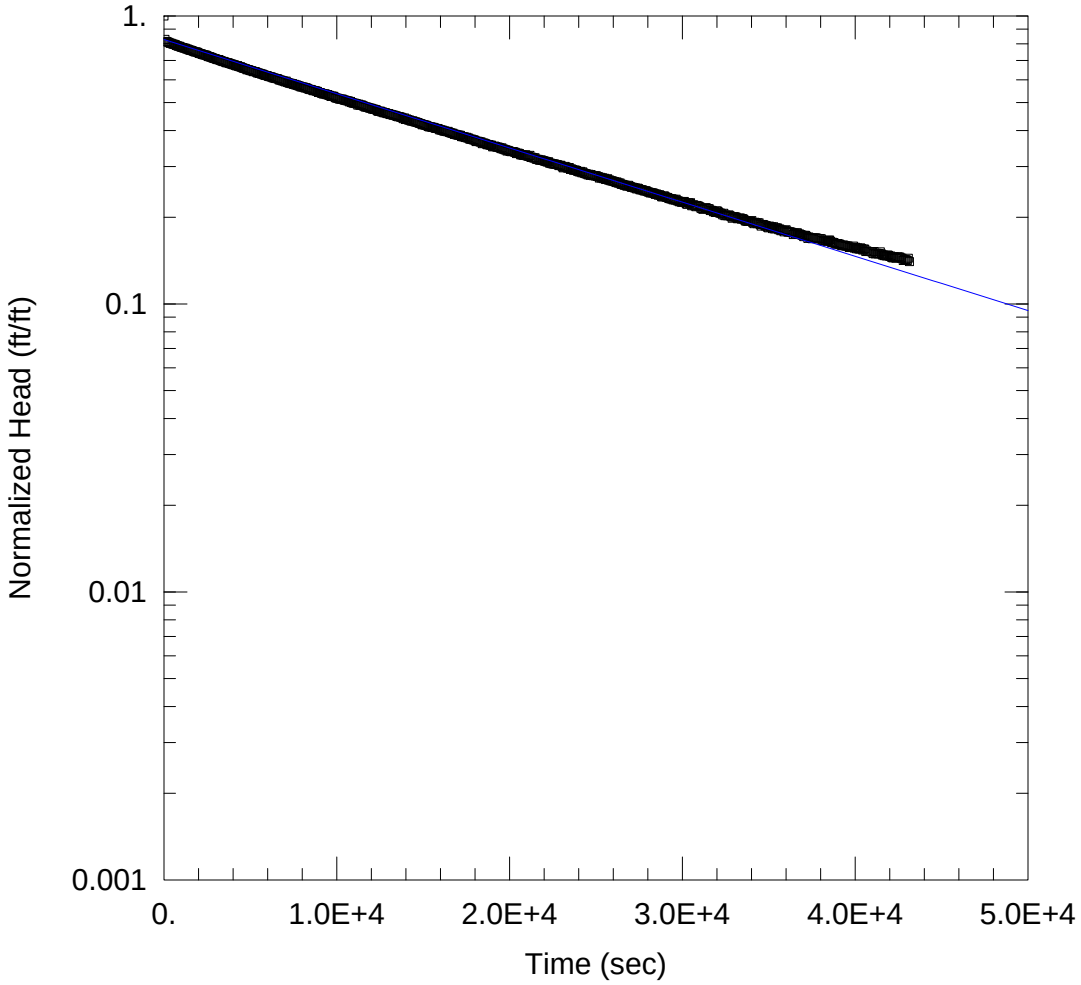
WELL DATA (CFMW-057a)

Initial Displacement: -0.632 ft Static Water Column Height: 71.66 ft
Total Well Penetration Depth: 71.66 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0002439 ft/day y0 = -0.6382 ft



CFMW-057A - 1 FOOT DISPLACEMENT - TEST 1

Data Set: S:\...\CFMW-057a.cut.aqt
Date: 11/13/17 Time: 11:23:24

PROJECT INFORMATION

Company: Roux Associates, Inc.
Client: CFAC
Project: 2476.0001Y004
Location: Columbia Falls, MT
Test Well: CFMW-057a
Test Date: NA

AQUIFER DATA

Saturated Thickness: 584.1 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (CFMW-057a)

Initial Displacement: 2.394 ft Static Water Column Height: 71.66 ft
Total Well Penetration Depth: 71.66 ft Screen Length: 10. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.006837 ft/day y0 = 1.981 ft

APPENDIX K

Monitoring Well Construction Logs

ROUX ASSOCIATES, INC.
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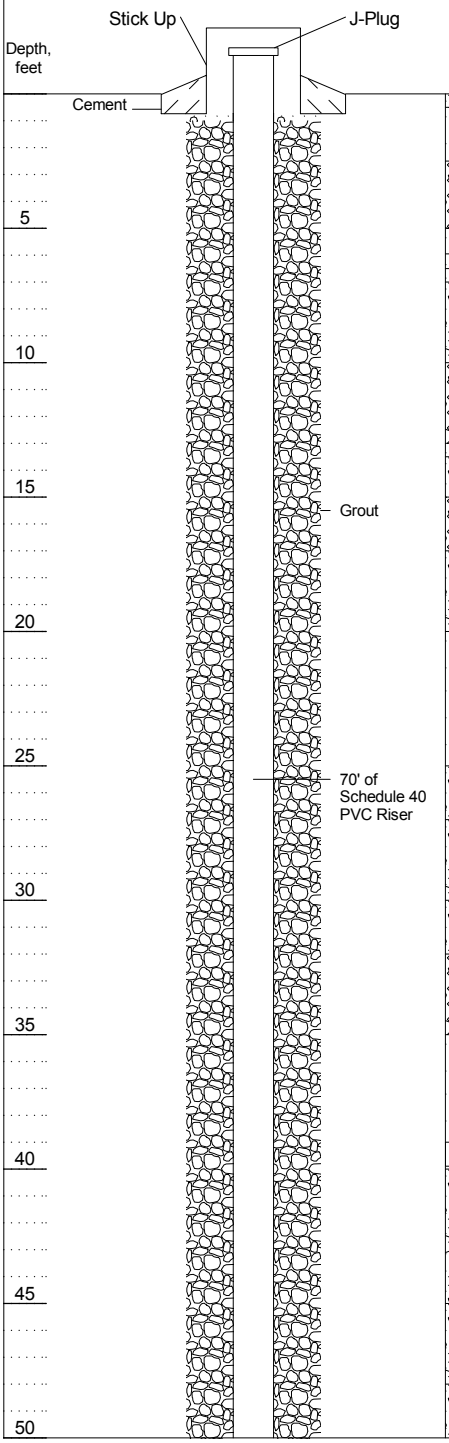
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-002	**48.399234**	**-114.141019**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Drum Storage Area**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/13/16-6/14/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to medium SAND, some Cobble, little medium Gravel and Silt; moist.		0.0	5 ft recovery
	Brown to orange, fine SAND, little Silt and fine to coarse Gravel, trace cobble; moist.		0.0	Sample CFMW-002-SO-0-0.5 collected
	Brown, fine to coarse SAND, little Cobble, Silt and fine to coarse Gravel; moist.		0.0	Sample CFMW-002-SO-0.5-2 collected
5	Brown, fine to coarse SAND, some medium to coarse Gravel, little Cobble and Silt; moist.		0.0	5 ft recovery
	Brown, fine SAND, trace gravel; moist.		0.0	Orange staining
10	Brown, fine to medium SAND, some fine to medium Gravel, little Crushed rock, trace cobble; moist.		0.1	5 ft recovery
	Brown, fine to coarse SAND, some medium to coarse Gravel, little Silt, trace cobble; moist.		0.0	Sample CFMW-002-SO-10-12 collected
	Brown, fine SAND, trace silt; moist.		0.1	
15	Gray, fine to medium SAND, some Gravel, little Crushed rock, trace boulder; moist.		0.0	5 ft recovery
	Brown, fine to coarse SAND, little coarse Gravel and Silt, trace cobble; moist.		0.0	
	Brown to gray, fine to medium SAND, some medium to coarse Gravel, little Crushed rock and Silt, trace cobble; moist.		0.0	
20	Brown, medium to coarse SAND, little Silt and Crushed rock, trace cobble and fine gravel; moist.		0.4	5 ft recovery
25	Brown, fine SAND, little Gravel and Silt; moist.		0.1	2.5 ft recovery
	Brown, fine to medium SAND, some fine to medium Gravel, trace cobble; moist to wet.		0.2	
30	Brown, fine to medium SAND, little medium Gravel, trace cobble; wet.		0.3	5 ft recovery
	Gray, fine to coarse SAND, some fine to coarse Gravel, little Silt and Crushed rock, trace cobble; dry.		0.5	
35	Bronw, fine to medium SAND, little Silt and fine to medium Gravel, trace crushed rock and cobble; dry to moist.		0.0	2 ft recovery
40	Brown, coarse GRAVEL, trace silt and sand; wet.		0.0	1.25 ft recovery
	Gray, fine SAND, some medium to coarse GRAVEL, little Cobble and Crushed rock, trace silt; dry.		0.4	
45	Brown, fine to medium SAND, some fine to coarse Gravel, little Cobble and Crushed rock, trace silt; moist.		0.4	5 ft recovery
50			0.4	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-002	**48.399234**	**-114.141019**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Gray, fine to medium SAND, little medium to coarse Gravel and Crushed rock, little Silt, trace cobble; dry. *(continued)*		0.2	5 ft recovery
	Brown, medium to coarse SAND, some fine to medium Gravel, little Cobble, trace silt; moist to wet.		0.2	
55	Gray, fine to medium SAND and medium to coarse GRAVEL, some Crushed rock; dry.		0.2	No recovery, rock in rods
	Brown, fine to medium SAND and medium to coarse GRAVEL, little Cobble, trace silt; moist to wet.			
60	No Recovery.			
	Brown, medium to coarse SAND and GRAVEL, some Cobble, little Silt, wet.		0.2	2.5 ft recovery
65	Bentonite Plug			
	Brown, fine to medium SAND, some medium to coarse Gravel and Cobble, trace silt; wet.		0.3	2.5 ft recovery
70	#2 Sand		0.1	3.75 ft recovery
	Brown, medium SAND, some fine to medium Gravel, little Cobble; wet.		0.5	
75	10' of 20-Slot Schedule 40 PVC Screen			
	Brown, medium to coarse GRAVEL, some fine to medium Sand, little Cobble, trace silt; wet.		0.1	5 ft recovery
80	Well Plug		0.0	Boring completed at 80 ft bls
	Brown, fine SAND, little Cobble, trace gravel; wet.			

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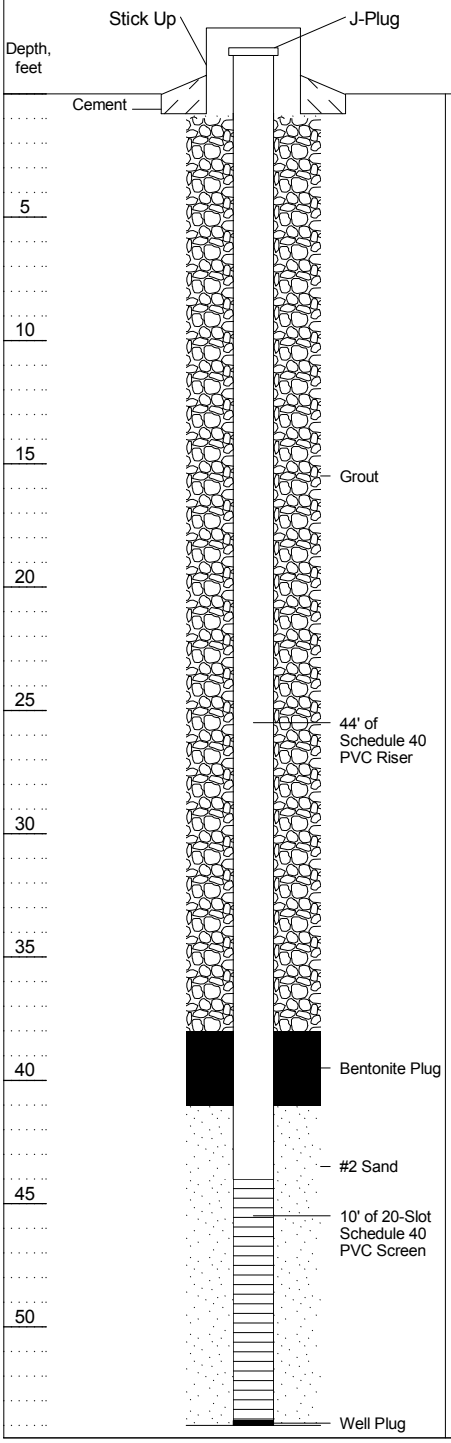
WELL CONSTRUCTION LOG

WELL NO. **CFMW-003**	LATITUDE **48.403315**	LONGITUDE **-114.142993**		
PROJECT NO./NAME **2476.0001Y002 / CFAC RI/FS Phase 1**		LOCATION **2000 Aluminum Drive Columbia Falls, Montana**		
APPROVED BY **A. Muscietta**	LOGGED BY **A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER **Cascade Drilling / Carlos Anguiano**		GEOGRAPHIC AREA **Industrial Landfill**		
DRILL BIT DIAMETER/TYPE **6-in. / Sonic Bit**	BOREHOLE DIAMETER **6-inches**	DRILLING EQUIPMENT/METHOD **Truck Mounted / Rotosonic**	SAMPLING METHOD **Continuous Core**	START-FINISH DATE **6/2/16-6/2/16**
CASING MAT./DIA. **SCH 40 PVC / 2-inch**	SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**			



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Refer to geologic log for adjacent deep monitoring well CFMW-003a for lithology.			
5					5
10					10
15					15
20					20
25					25
30					30
35					35
40					40
45					45
50					50

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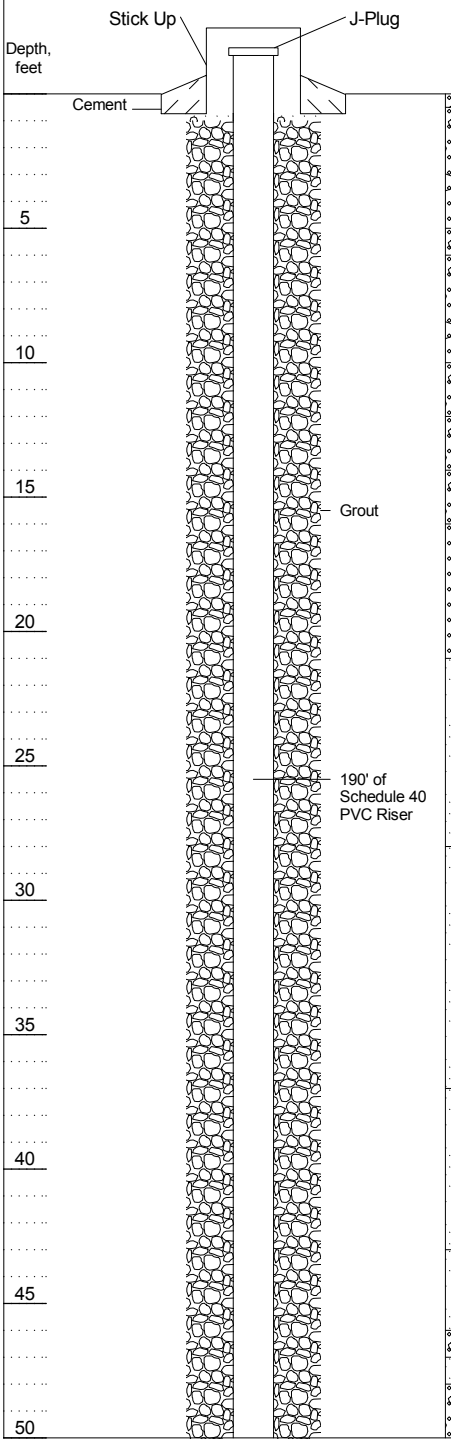
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-003a	**48.40334**	**-114.142965**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Industrial Landfill**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**5/31/16-6/3/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, some Gravel, trace silt; moist.		0.0	6 ft recovery
	Brown, fine to coarse SAND, some Gravel, trace silt and cobble; moist.		0.3	Sample CFMW-003a-SO-0-0.5 collected
5				Sample CFMW-003a-SO-0.5-2 collected
	Brown, fine to coarse SAND, little Gravel, trace silt and dark brown organics; moist.			10 ft recovery
	Brown, fine to coarse SAND, some Cobble and Silt, little fine Gravel; moist (medium dense).		0.3	
10				
	Brown, fine to coarse SAND, some Gravel, trace silt; dry (medium dense).		2.3	
	Brown, fine to coarse SAND, some Gravel and Silt; moist (medium dense).		2.5	Sample CFMW-003a-SO-10-12 collected
15	Brown, fine to coarse SAND, some Silt, trace gravel; moist (medium dense).		1.6	
	Brown, fine to coarse SAND, some Silt and Gravel, little Cobble; wet (medium dense).		0.0	12 ft recovery
20				
	Brown, fine SAND and SILT, trace fine gravel; wet (loose).		0.0	
25				
	Brown, fine SAND and SILT; wet (medium dense).		0.0	Sample CFMW-003a-SO-23-28 collected; 8 ft recovery
30				
			0.0	
35				
	Brown, fine SAND and SILT, some Gravel; wet (medium dense).		0.0	10 ft recovery
40			0.0	
	Brown-gray, fine SAND and SILT, some Gravel, trace cobble; moist (medium dense).		0.0	
45				
	Brown, fine to coarse SAND, little Gravel, trace silt; wet (loose).		0.0	8 ft recovery
	Brown, fine SAND; wet (loose).		0.0	
50	Brown, fine to coarse SAND, little Gravel; wet (loose).			

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-003a	**48.40334**	**-114.142965**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, little Gravel; wet (loose). *(continued)*		0.0	
	Brown-gray, fine to coarse SAND, some Gravel, trace silt; moist (medium dense).		0.0	
55	Brown-gray, fine to coarse SAND, some Gravel and Silt; moist (dense).		0.0	11 ft recovery
	Brown-gray, fine to coarse SAND, some Gravel and Silt; dry (very dense).		0.0	
60	Brown-orange, fine to coarse SAND and SILT, some fine Gravel, trace clay; dry (very dense).		0.0	
65	Brown-orange, SILT and low plasticity CLAY, trace fine sand; dry (very stiff).		0.0	9 ft recovery
70	Red-brown, SILT and low plasticity CLAY, trace fine sand; (very stiff).		0.0	7" Conductor casing set to 70 ft bls
75	Brown-orange-gray, SILT and low plasticity CLAY, trace fine sand; dry (very stiff).		0.0	7 ft recovery
80	Brown-orange, SILT and low plasticity CLAY, trace fine sand; dry (very stiff). Brown, SILT and low plasticity CLAY, trace fine sand; moist (very stiff).		0.1	15 ft recovery
85	Brown-orange, SILT and low plasticity CLAY; moist (very stiff).		0.0	
	Brown-orange, SILT and low plasticity CLAY, little fine Gravel, trace fine to coarse sand; moist (stiff).		0.3 0.4	
90	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, trace clay and medium to coarse gravel; moist to wet (dense).		0.0	
95	Brown-orange, fine to coarse SAND, some fine Gravel and Silt, trace medium to coarse gravel and clay; wet (medium dense).		0.8	10 ft recovery
100				
105	Brown-orange, fine to coarse SAND, some fine Gravel and Silt, little medium to coarse Gravel and clay; wet (medium dense).		0.5	10 ft recovery

Grout

190' of Schedule 40 PVC Riser

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-003a	**48.40334**	**-114.142965**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown-orange-tan, SILT and low plasticity CLAY, little fine Sand; moist (very stiff). *(continued)*		0.2	
110				110
	Brown-orange, fine to coarse SAND, some fine Gravel and Silt, trace medium to coarse gravel and clay; wet (dense).		0.0	
115				115
	Red-brown, SILT and low plasticity CLAY, trace fine sand; moist to dry (very stiff).		0.0	10 ft recovery
120				120
	Tan-red-brown, SILT and low plasticity CLAY, some fine Gravel; dry (very stiff).		0.0	
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel; wet (dense).		0.0	
125				125
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, little Clay; wet (dense).		0.1	10 ft recovery
130				130
	Tan-brown-orange, SILT and low plasticity CLAY, trace fine sand; wet (stiff).			
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, little low plasticity Clay, trace medium to coarse gravel; wet (dense).		0.0	
135				135
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, trace low plastcitiy clay; wet (medium dense).		0.0 0.1	10 ft recovery
	Red-brown, SILT and low plasticity CLAY, trace fine sand; wet (dense).		0.0	
140	Red-brown, fine SAND and SILT, little Clay; wet (loose).		0.0	140
	Red-brown-tan, SILT and low plasticity CLAY, trace fine sand; wet (stiff).			
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, trace clay and medium to coarse gravel; wet (medium dense).		0.0	
145				145
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel; wet (medium dense).		0.1	10 ft recovery
150				150
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, trace clay; wet (medium dense).		0.1	
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, trace medium to coarse gravel; wet (medium dense).		0.1	
155				155
	Brown-orange to tan-red-brown, SILT and low plasticity CLAY, trace fine sand; moist (very stiff).		0.0	
	Brown-orange, fine to coarse SAND, some Silt and fine Gravel; wet (medium dense).			10 ft recovery
160	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, trace clay; wet (dense).		0.3	160

190' of Schedule 40 PVC Riser

Grout

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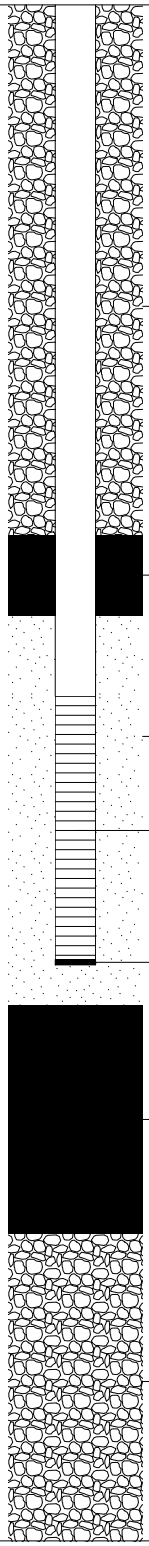
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-003a	**48.40334**	**-114.142965**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**



Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Brown-orange, fine to coarse SAND, some Silt and fine Gravel, trace clay; wet (dense). *(continued)*			10 ft recovery
170			0.0	
175	Red-brown, fine to coarse SAND, some Silt and Gravel; wet (dense).			10 ft recovery
180			0.0	
185	Brown, fine to coarse SAND, some Silt and Gravel; wet (medium dense).		0.1	10 ft recovery
190	Brown, fine to coarse SAND, some Silt and Gravel; wet (dense).		0.0	
195	Brown, fine to coarse SAND, some Silt and Gravel, trace clay; wet (dense).			10 ft recovery
200			0.0	
205	Brown, fine to coarse SAND, some Silt and Gravel, trace clay; wet (medium dense).			10 ft recovery
210	Brown, fine to coarse SAND, some Silt and Gravel, trace clay; wet (dense).		0.2	
215			0.0	
220	Brown, fine to coarse SAND, some Silt, little Gravel, trace clay; wet (dense).		0.2	8.5 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-003a	**48.40334**	**-114.142965**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, some Silt, little Gravel, trace clay; wet (dense). *(continued)*			
225	Brown, SILT and low plasticity CLAY, little fine Sand; wet (very stiff).		0.0	12 ft recovery
	Brown, fine to coarse SAND, some Silt and Gravel; wet (medium dense).			
230			0.0	
	Brown, fine to coarse SAND, some Silt and Gravel; wet (dense).		0.0	
235	Brown, fine to coarse SAND, some Silt and Gravel; wet (medium dense).		0.0	
	Brown, fine to coarse SAND, some Silt and Gravel, trace clay; moist (very dense).		0.0	4 ft recovery
	Tan, SILT and low plasticity CLAY, some fine Gravel (angular), trace fine sand; dry (very dense).		0.0	
240			0.0	
	Brown, fine to coarse SAND, some Silt and Gravel, trace clay; moist (very dense).			5.5 ft recovery
	BOULDER (pulverized); dry.		0.0	
	Brown, fine to coarse SAND, some Silt and Gravel, little Cobble (crushed), trace clay; dry (dense).		0.0	
245	BOULDER (pulverized); dry.			End of boring at 245.5 ft bls
	Brown, SILT and low plasticity CLAY, little Gravel, trace fine sand; dry (very dense).			

Grout

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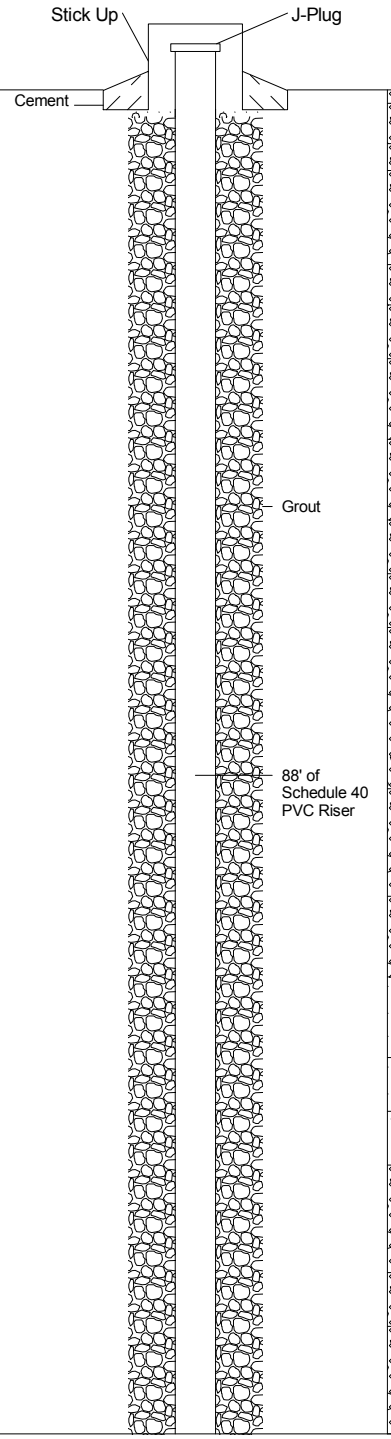
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE		
CFMW-008a	**48.400915**	**-114.132865**		
PROJECT NO./NAME		LOCATION		
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**		
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**		
A. Muscietta	**A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Cascade Drilling / Carlos Anguiano		**Sanitary Landfill**		
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**6/13/16-6/17/16**
CASING MAT./DIA.	SCREEN:			
SCH 40 PVC / 2-inch	TYPE **Slotted**	MAT. **SCH 40 PVC**	TOTAL LENGTH **10.0**ft	DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, little fine to coarse Gravel; dry.		0.1	6.5 ft recovery
	Dark brown, fine to coarse SAND, some medium Gravel, little Cobble (concrete) and fine to coarse Gravel; dry.		1.3	Sample CFMW-008a-SO-0-0.5 and CFMW-008a-SO-0-0.5-Pb collected
5	Brown, fine to coarse SAND, some fine to medium Gravel, trace silt; dry.		0.3	Sample CFMW-008a-SO-0.5-2 collected
	Brown, fine to coarse SAND, some medium to coarse Gravel, little Silt; moist.		0.1	9.5 ft recovery
	Brown, fine to coarse SAND, some Gravel and Cobble, little Silt, trace boulder; wet.			
10	Brown, fine to coarse SAND, some fine to coarse Gravel, little Cobble; dry.		0.5	
	Brown, fine to coarse Sand, some fine to coarse Gravel, trace cobble; moist.		0.1	
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Cobble, trace silt; wet.		0.1	Sample CFMW-008a-SO-10-12 collected
15				
	Brown, fine to coarse SAND, some fine to medium Gravel, trace silt; dry.		0.2	10 ft recovery
20	Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace cobble; wet.		0.3	
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Cobble and Silt; moist (dense).		0.0	
25				
	Brown, fine to coarse SAND and Gravel, trace cobble and silt; moist (loose).		1.6	10 ft recovery
30				
	Brown, fine to coarse SAND, some fine to coarse Gravel, trace cobble and silt; moist.		1.1	
	Brown, fine to medium SAND; moist.		0.3	
35				
	Brown, fine to medium SAND; moist (dense).		0.0	2 ft recovery
	Boulder, broken cobble; dry.		0.0	8 ft recovery; hard drilling
40				
	Brown, fine to coarse SAND, some Gravel (angular) and broken Cobble; dry.		0.0	
			0.1	
45	Brown, fine to coarse SAND, some Gravel (angular) and broken Cobble, little Silt; dry (dense).		0.0	
	Brown, fine to coarse SAND, some Gravel (angular) and Cobble and Boulder; dry.		0.0	4 ft recovery; hard drilling
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-008a	**48.400915**	**-114.132865**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, some Cobble, Boulder and fine Gravel (angular), trace silt; dry.		0.0	3 ft recovery; hard drilling
55	Brown, fine to coarse SAND, some Cobble, Boulder and Gravel (angular), trace silt; dry.		0.1	6 ft recovery; hard drilling
60	Brown, fine to coarse SAND, some Gravel, little Silt, trace cobble; moist.		0.0	
	Brown, fine to coarse SAND, some Gravel, broken Cobble and Boulder, trace silt; dry.		0.0	5 ft recovery; hard drilling
65				
	Gray, fine to coarse SAND, some Gravel, little broken Cobble and Boulder, trace silt; dry.		0.0	7 ft recovery; hard drilling
70			0.0	
	Brown, fine to coarse SAND, some Gravel, little Silt, trace cobble; moist (dense).		0.0	5 ft recovery; hard drilling
75				
	Brown, fine to coarse SAND, some fine Gravel and Silt, little medium to coarse Gravel; moist (medium dense).		0.0	10 ft recovery
80				
	Brown, fine to coarse SAND, some fine Gravel and Silt, little medium to coarse Gravel; wet (medium dense).		0.0	
85				
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace cobble; wet (medium dense).		0.0	10 ft recovery
90				
	Red-brown, fine to coarse SAND, some Silt and fine Gravel, trace clay; moist (stiff).		0.0	Sample CFMW-008a-SO-88-93 collected
95				
			0.0	8 ft recovery
100				
	Red-brown to orange-brown, fine to coarse SAND, some Silt, little Gravel and Clay; moist to dry (stiff).		0.0	
105				
				8 ft recovery

Grout
88' of Schedule 40 PVC Riser
Bentonite Plug
#2 Sand
10' of 20-Slot Schedule 40 PVC Screen
Well Plug
Bentonite

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-008a	**48.400915**	**-114.132865**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Bentonite			
110	Red-brown, to orange-brown, fine to coarse SAND, some Silt, little fine Gravel and Clay; dry (stiff).		0.0 0.0	
115	Tan, low plasticity SILTY CLAY, little fine Sand and Fine Gravel; dry (stiff).		0.0	7" Conductor casing set to 114 ft 11 ft recovery; hard drilling
120	Tan, fine SAND, some Silt, trace fine gravel and medium to coarse sand; moist (medium stiff). Tan, low plasticity SILTY CLAY, trace fine sand and fine gravel; dry (very stiff).		0.0	
125	Tan to orange-brown, low plasticity SILTY CLAY, some fine Sand, trace fine gravel and medium to coarse sand; dry (very stiff). Tan, fine to coarse SAND, some Silt and fine Gravel; moist (very dense).		0.0 0.0	9 ft recovery; hard drilling
130	Gray, fine SAND and SILT, some low plasticity Clay and fine Gravel; dry (very stiff). Purple to gray, low plasticity SILTY CLAY, trace fine sand ; dry (very stiff, weathered bedrock).		0.0 0.0 0.0	
135	Light gray to white, low plasticity SILTY CLAY, trace fine sand; dry (very stiff, weathered bedrock). Purple, low plasticity SILTY CLAY; dry (very stiff, weathered bedrock).		0.0	10 ft recovery; hard drilling
140	Light gray with purple, low plasticity SILTY CLAY, trace fine sand; dry (very stiff, weathered bedrock).		0.0	
145	Purple to tan, low plasticity SILTY CLAY, little fine Gravel; moist (very stiff, weathered bedrock). Light gray to purple, low plasticity SILTY CLAY, trace fine sand; dry (very stiff, weathered bedrock).		0.0 0.0	4 ft recovery; hard drilling
	Grout			
150	No Recovery.			No recovery
155	Light gray to purple, low plasticity SILTY CLAY, trace fine sand and fine gravel; dry (very stiff, weathered bedrock).		0.0	3 ft recovery; hard drilling
160	Purple, low plasticity SILTY CLAY, some fine to coarse Sand, trace fine gravel; dry (very stiff, weathered bedrock). Purple, fine to coarse SAND, some Silt and Clay, little fine to medium Gravel; moist		0.0 0.0	7 ft recovery; hard drilling

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-008a	**48.400915**	**-114.132865**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	(dense, weathered bedrock).		0.0	
	Purple and light gray, fine to coarse SAND, some Silt and Clay and fine to coarse Gravel; moist (very stiff, weathered bedrock). *(continued)*		0.0	7 ft recovery; hard drilling
	Light gray, fine to coarse SAND, some fine to coarse Gravel and Cobble, little Silt and Clay; moist (loose, weathered bedrock).		0.0	
170	Purple, low plasticity SILTY CLAY, trace fine sand and fine gravel; dry (very stiff, weathered bedrock).		0.0	
	Light gray to purple, low plasticity SILTY CLAY, trace fine sand and fine gravel; dry (very stiff, weathered bedrock).			6 ft recovery; hard drilling
175	Light gray, low plasticity SILTY CLAY, little fine Sand and fine Gravel, trace medium gravel; dry (very stiff, weathered bedrock).		0.0	
180	Purple, low plasticity SILTY CLAY, some fine Sand; dry (very stiff, weathered bedrock).		0.0	4 ft recovery
	Gray, fine to coarse SAND, some Silt, little Clay, trace gravel; moist (medium dense, weathered bedrock).		0.0	
185	Greenish-gray, (angular) GRAVEL, some Broken boulder; moist (loose, weathered bedrock).		0.0	6 ft recovery; hard drilling
	Light gray to white, low plasticity SILTY CLAY, trace fine sand and fine gravel; dry (very stiff, weathered bedrock).		0.0	
190	Greenish-light gray, medium GRAVEL, some Silt and fine Sand, trace slay; moist (dense, weathered bedrock).		0.0	
	Light gray, low plasticity SILTY CLAY, some fine Sand, little fine Gravel; moist (stiff, weathered bedrock).		0.0	4 ft recovery; hard drilling
195	Purple, SILT, little Clay and fine Sand, trace gravel; moist (stiff, weathered bedrock).		0.0	
	COBBLE and coarse GRAVEL; moist (weathered bedrock).			
200	Purple, fine to coarse SAND, some Gravel, little Silt and low plasticity Clay; moist (dense, weathered bedrock).		0.0	
	Purple, fine to coarse SAND, some Silt and fine Gravel, little Clay; moist to dry (dense, weathered bedrock).			
205	Purple to gray, fine to coarse SAND, some Silt, little fine Gravel and Clay; moist (dense, weathered bedrock).		0.0	7 ft recovery; hard drilling
210	Light gray, low plasticity SILTY CLAY, trace fine sand and fine gravel; dry (very stiff, weathered bedrock).		0.0	
	Purple to gray, fine to coarse SAND, some Silt and fine to coarse Gravel, little Clay; moist (dense, weathered bedrock).		0.0	
215	Purple to whiteish green, fine to coarse GRAVEL and COBBLE, trace coarse sand; moist (loose, weathered bedrock).			
	No Recovery.			
220	Gray, low plasticity SILTY CLAY, trace fine sand and fine gravel; dry (very stiff, weathered bedrock).			5 ft recovery; hard drilling

Grout

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-008a	**48.400915**	**-114.132865**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Gray, low plasticity SILTY CLAY, some fine Sand, trace fine gravel; dry to moist (stiff, weathered bedrock).			5 ft recovery; hard drilling
		Purple and gray, low plasticity SILTY CLAY, trace fine sand and fine gravel; moist (stiff, weathered bedrock).			
230		Purple, fine to coarse SAND, some Silt and Clay, little fine Gravel; moist (dense, weathered bedrock).			4 ft recovery; hard drilling
		Purple, GRAVEL, some fine to coarse SAND, little Silt and Clay; moist (dense, weathered bedrock).			
	Grout	Gray, fine to coarse SAND, some Silt and Clay, trace fine gravel; moist (dense, weathered bedrock).			
235		COBBLE and fine to coarse GRAVEL; moist.			4 ft recovery; hard drilling
240					
245		Green, broken COBBLE, BOULDER or BEDROCK; moist.			5 ft recovery; hard drilling with water
250				0.0	
255		Green, broken COBBLE, BOULDER or BEDROCK, some Silt and Clay; moist.			3 ft recovery; hard drilling with water
260				0.0	
265		Gray, broken COBBLE, BOULDER or BEDROCK.		0.0	3 ft recovery; hard drilling with water
270		Purple, broken COBBLE, BOULDER or BEDROCK.		0.0	
275		Purple, broken COBBLE, BOULDER or BEDROCK, some Silt and Clay.			5 ft recovery; hard drilling with water

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-008a	**48.400915**	**-114.132865**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280			Purple, broken COBBLE, BOULDER or BEDROCK, some Silt and Clay. *(continued)*			280
285	Grout					285
			Purple, broken COBBLE, BOULDER or BEDROCK.			5 ft recovery; hard drilling with water
290						290
295						295
300						End of boring at 300 ft bls 300

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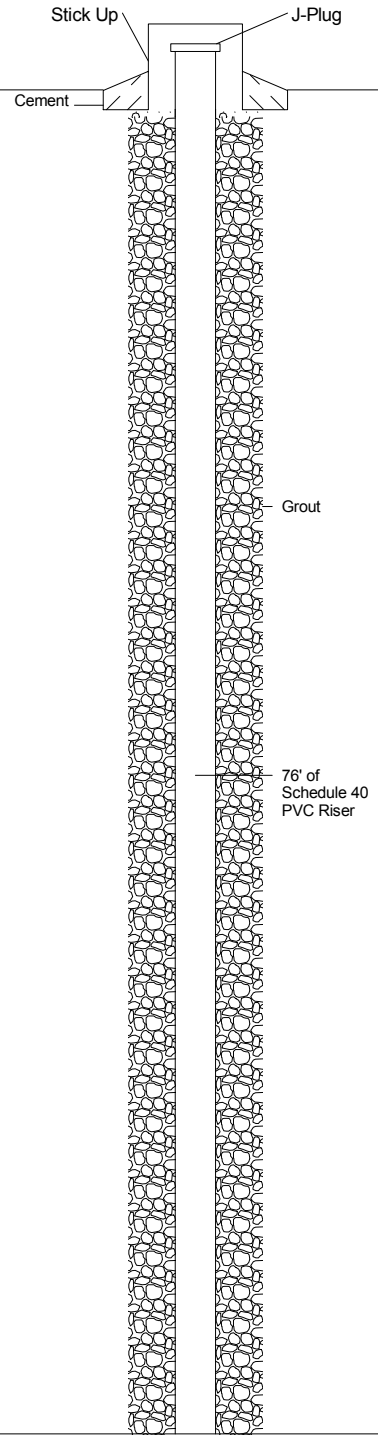
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-010	**48.399485**	**-114.137099**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Drum Storage Area**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**5/18/16-5/20/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch** SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Dark brown, fine to medium SAND, some coarse Sand, little coarse Gravel; dry.		1.3	6 ft recovery Samples CFMW-010-SO-0-0.5 and CFMW-010-SO-0-0.5-Pb collected
		Brown, fine to coarse SAND, some coarse Gravel, trace silt; dry.		1.1	
5				2.0	Sample CFMW-010-SO-0.5-2 collected
		Brown, medium to coarse SAND, some fine to coarse Gravel, trace cobble; dry.		0.8	9 ft recovery
10				1.7	
15				0.8	Sample CFMW-010-SO-10-12 collected
		Brown, medium to coarse SAND, some fine to coarse Gravel; dry.		1.7	9 ft recovery
20		Brown, fine to coarse SAND, little fine to medium Gravel, trace cobble; dry.		0.8	
25		Brown, fine to coarse SAND, some fine to medium Gravel; moist.		0.4	
		Brown, fine to coarse SAND, some fine to coarse Gravel; moist.		1.0	9 ft recovery
30		Brown, fine to medium SAND, little fine to medium Gravel; moist		2.6	
35				0.5	
				0.1	
		Brown, fine to medium SAND, some coarse Sand, little fine to medium Gravel, trace cobble; moist.		0.8	9 ft recovery
40		Brown to light gray, fine to coarse SAND, some fine to coarse Gravel (angular) and Crushed rock, trace fine silt; dry.		1.7	
45				0.3	
		Brown to light gray, fine to coarse SAND, some fine to coarse Gravel (angular), trace silt; dry.		0.3	9 ft recovery
				0.1	
50				0.1	

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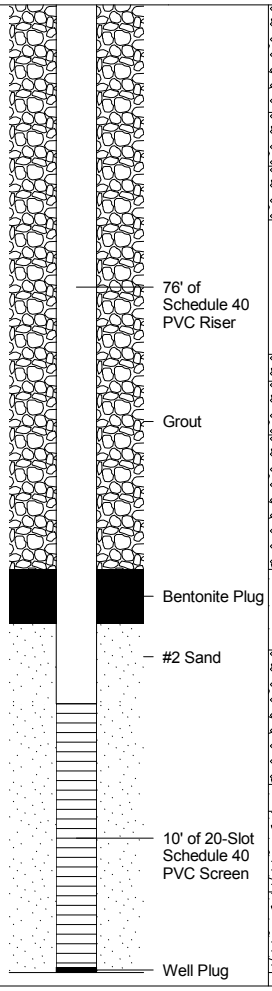
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-010	**48.399485**	**-114.137099**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown to light gray, fine to coarse SAND, some fine to coarse angular Gravel, trace silt and cobble; dry.		0.3	
55	Brown to light gray, fine to coarse SAND, little fine to coarse Gravel, trace silt; dry.		0.1	
	Light gray, fine to coarse SAND, some fine to coarse Gravel, trace silt; dry.		0.3	8 ft recovery
	No Recovery; (pink boulder).			
60				
	Brown to light gray, fine to coarse SAND, some fine to coarse Gravel; moist.		0.0	
65	Light gray, fine to coarse SAND, some fine to coarse Gravel (angular); dry.		0.0	
	Brown, fine to coarse SAND and GRAVEL; wet.		0.0	10 ft recovery
70			0.0	
	Brown, fine SAND; wet.		0.0	
75	Brown, fine to coarse SAND and GRAVEL; wet.		0.0	
			0.3	4 ft recovery
80	Brown, fine SAND; wet.		0.0	
	Brown, medium SAND and GRAVEL, trace silt; wet.		0.0	6 ft recovery
	Brown, medium SAND, some Gravel, little Silt; wet.			
85			0.0	End of boring at 86 ft bls

Graphic Log:



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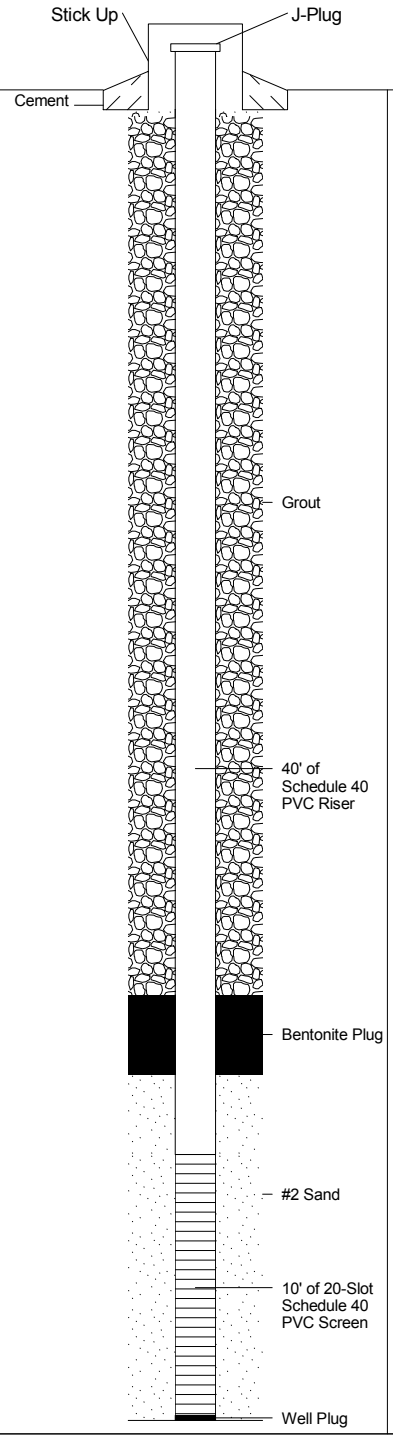
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE		
CFMW-011	**48.399057**	**-114.139221**		
PROJECT NO./NAME		LOCATION		
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**		
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**		
A. Muscietta	**A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Cascade Drilling / Carlos Anguiano		**Drum Storage Area**		
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**6/28/16-6/29/16**
CASING MAT./DIA.	SCREEN:			
SCH 40 PVC / 2-inch	TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**			



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Refer to geologic log for adjacent deep monitoring well CFMW-011a for lithology.			
5					
10					
15					
20					
25					
30					
35					Sample CFMW-011a-SO-31-36 collected
40					
45					
50					

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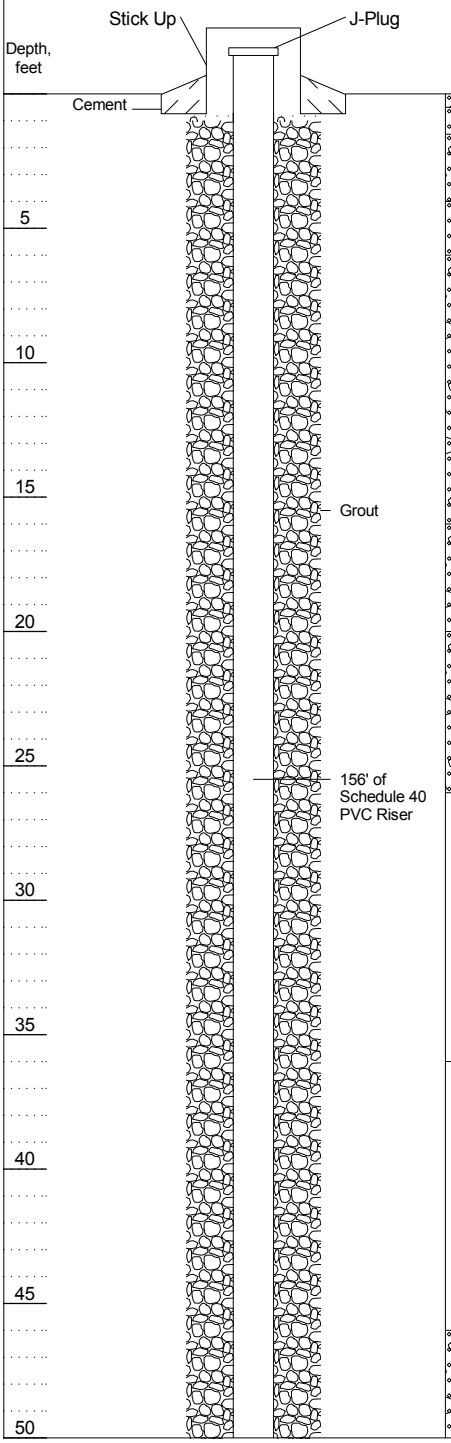
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-011a	**48.399056**	**-114.139253**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **North-West Percolation Pond**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**6/25/16-6/29/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to coarse SAND, some fine to coarse Gravel and Silt; wet (medium dense).		0.0	6 ft recovery
		Brown, fine to coarse SAND, some Silt; wet (medium dense).		0.0	Sample CFMW-011a-SO-0-0.5 and CFMW-011a-SO-0-0.5-Pb collected
5		Brown, fine to coarse SAND, some fine to coarse Gravel and Silt; wet (medium dense).		0.0	Sample CFMW-011a-SO-0.5-2 collected
		Brown, fine to coarse SAND; moist (loose).		0.0	8 ft recovery
		Brown, fine to coarse SAND and fine to coarse GRAVEL, some Cobble; dry (loose).			
10				0.0	
15					Sample CFMW-011a-SO-10-12 collected
		Brown, fine to coarse SAND, some fine to coarse Gravel; moist.		0.0	6 ft recovery
20					
		Brown, fine to coarse SAND, some fine to coarse Gravel; moist (loose).			
25				0.0	
		No Recovery.			No recovery
30					
35					Sample CFMW-011a-SO-31-36 collected
		No Recovery.			No recovery
40					
45					
		Brown, fine to coarse SAND, little fine to coarse Gravel; wet (loose).			7 ft recovery
50					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-011a	**48.399056**	**-114.139253**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to coarse SAND, little fine to coarse Gravel; wet (loose). *(continued)*		0.0	
55					55
		Brown, fine to coarse SAND, some fine to coarse Gravel, trace cobble; wet (loose).		0.0	7 ft recovery
60					60
65					65
		Brown, fine to coarse SAND, little medium Gravel; wet (loose).		0.0	8 ft recovery
70					70
		Brown, fine to medium SAND; wet (loose).		0.0	
75					75
				0.0	6 ft recovery
80					80
		Brown, fine to medium SAND, little medium to coarse Gravel; wet (loose).		0.0	
85					85
		Brown, fine to medium SAND; wet (loose).		0.0	2 ft recovery
90					90
95					95
		Light gray, fine to coarse SAND, some Silt, trace fine to medium gravel; very wet (very loose).		0.0	8 ft recovery
100		Light gray, fine to coarse SAND, some Silt, little fine to coarse Gravel, trace cobble; wet (dense).		0.0	100
105					105

Grout

156' of Schedule 40 PVC Riser

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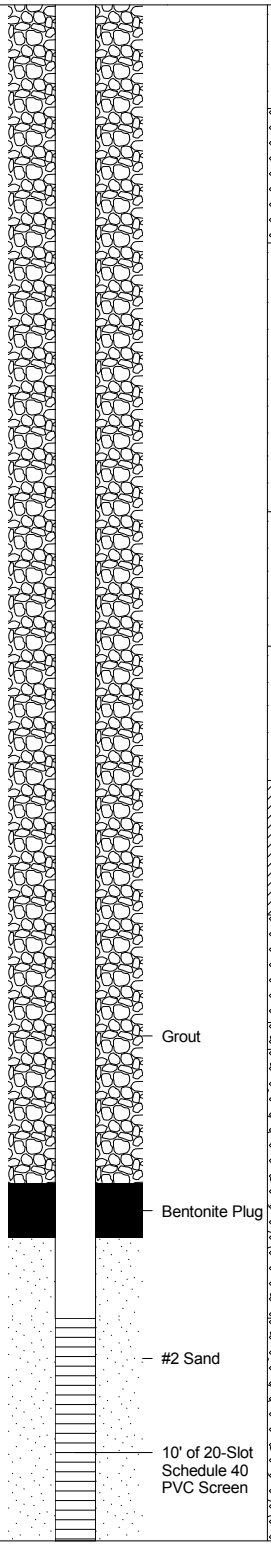
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-011a	**48.399056**	**-114.139253**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110	Orange-brown, fine SAND and SILT, some fine to medium Gravel; wet (stiff). *(continued)*		0.0	8 ft recovery
115	Orange-brown, fine to coarse SAND and SILT, some fine Gravel; wet (medium stiff).		0.0	
120	Orange-brown, fine SAND and SILT, some low plasticity Clay and fine to medium Gravel; wet (very stiff).		0.0	2 ft recovery 7" Conductor casing set to 120 ft bls
125				
130	Orange-brown, fine SAND and SILT, some low plasticity Clay; moist to wet (stiff).		0.0	10 ft recovery
135	Orange-brown, fine SAND and SILT, some low plasticity Clay; moist (stiff).		0.0	
140	Orange-brown to tan, low plasticity SILTY CLAY, little fine Sand; moist (very stiff).		0.0	5 ft recovery
145	Brown, fine to coarse SAND, some Silt and fine to coarse Gravel; moist to wet (medium stiff).		0.0	5 ft recovery
150	Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt; wet (loose). Brown, fine to coarse SAND, some fine to coarse Gravel and Silt; moist to wet (dense).		0.0 0.0	10 ft recovery
155				
160	Orange-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt; wet (medium dense).		0.0	10 ft recovery

Graphic Log



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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-011a	**48.399056**	**-114.139253**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Well Plug; Bentonite; Grout	Orange-brown, fine to coarse SAND, some fine to coarse Gravel, little Silt; wet (medium dense). *(continued)*			10 ft recovery
170				0.0	
175		Orange-brown, fine to coarse SAND, little fine Gravel and Silt; wet (medium dense).			10 ft recovery
180				0.0	
		Orange-brown, fine to coarse SAND, little fine to medium Gravel, trace silt; wet (loose).		0.0	
185		Orange-brown, fine to coarse SAND, little fine to coarse Gravel and Silt; wet (medium dense).		0.0	10 ft recovery
		Dark orange-brown to reddish brown, fine to coarse SAND, some fine to medium Gravel and Silt, trace clay; moist (dense).			
190				0.0	
195		Dark orange-brown, fine to coarse SAND, some fine to medium Gravel and Silt; moist (dense).			15 ft recovery
200				0.0	
205					
210					15 ft recovery
215					
220				0.0	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-011a	**48.399056**	**-114.139253**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Dark orange-brown, fine to coarse SAND, some fine to medium Gravel and Silt; moist (dense). *(continued)*			15 ft recovery
230				0.0	
235	Grout				
240		Dark orange-brown, fine to coarse SAND, some Silt and fine to coarse Gravel, little Clay; moist (stiff).			11 ft recovery
245					
250		Dark orange-brown, fine to coarse SAND and SILT, some fine to medium Gravel, little Clay; dry (stiff).		0.0	
255		Dark orange-brown, fine to coarse SAND, some fine to coarse Gravel and Silt, trace clay; moist to wet (dense).			13 ft recovery
260					
265		Dark orange-brown, fine to coarse SAND, some fine to coarse Gravel and Silt, trace clay and cobble; moist (dense).		0.0	
		BOULDER; dry.		0.0	10 ft recovery
				0.0	
270		Dark orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, trace clay and cobble; moist (stiff).			
275		Dark orage-brown, fine to coarse SAND, some Silt and fine to coarse Gravel; moist (stiff).		0.0	
		Brown to tan, fine to coarse SAND and SILT, some fine to coarse Gravel and Clay; moist (stiff).			10 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-011a	**48.399056**	**-114.139253**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280			Brown to tan, fine to coarse SAND and SILT, some fine to coarse Gravel and Clay; moist (stiff). *(continued)*		0.0	
			Brown to tan, low plasticity SILTY CLAY, some fine to coarse Sand and fine to coarse Gravel; moist (stiff).		0.0	
285			Brown to tan, low plasticity SILTY CLAY, some fine to coarse Sand and fine to coarse Gravel; dry (stiff).		0.0	
	Grout		Dark orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, trace clay and cobble; moist (stiff).			9 ft recovery
290					0.0	
295						6 ft recovery
					0.0	
			BOULDER; dry.			
300						End of boring at 300 ft bls

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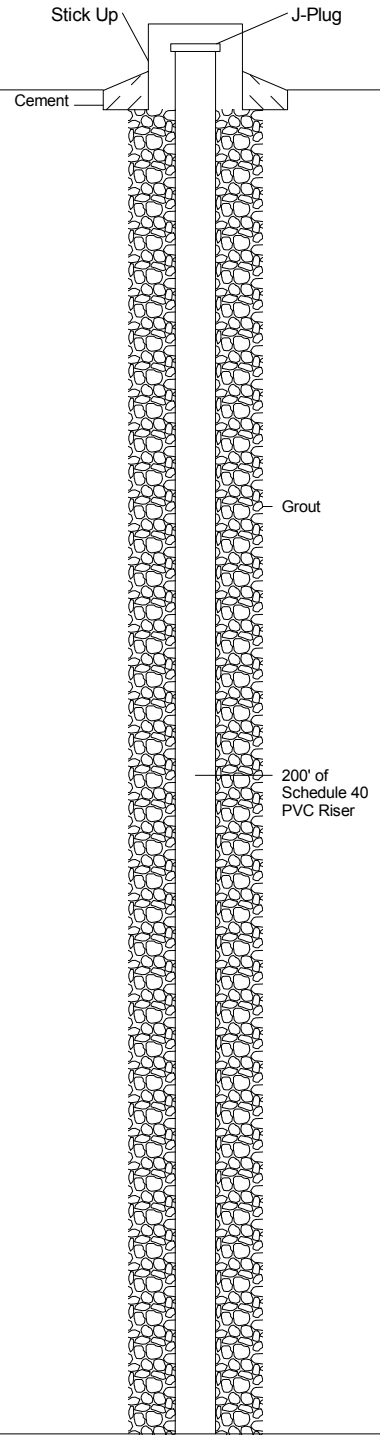
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE		
CFMW-012a	**48.399131**	**-114.136552**		
PROJECT NO./NAME		LOCATION		
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**		
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**		
A. Muscietta	**A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Cascade Drilling / Carlos Anguiano		**Wet Scrubber Sludge Pond**		
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**5/20/16-5/24/16**
CASING MAT./DIA.	SCREEN:			
SCH 40 PVC / 2-inch	TYPE **Slotted**	MAT. **SCH 40 PVC**	TOTAL LENGTH **10.0**ft	DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Dark brown, fine to coarse SAND; dry (topsoil).	0.7	6 ft recovery Sample CFMW-012a-SO-0-0.5 and CFMW-012a-SO-0-0.5-Pb collected
	Reddish brown, fine to coarse SAND, trace silt and gravel; dry.		
	Brown, fine to medium SAND, some coarse Sand and Gravel, little Silt; dry.	0.0	Sample CFMW-012a-SO-0.5-2 collected
5	Brown, medium to coarse SAND and fine to coarse GRAVEL, trace boulder; dry.	0.0	10 ft recovery
	Brown, fine SAND and coarse GRAVEL, some Cobble; moist.	0.1	
	Brown, coarse SAND, some fine to coarse Gravel, little Cobble, trace fine to medium sand; moist.		
10		0.0	
		0.0	Sample CFMW-012a-SO-10-12 collected
15		2.8	
	Brown, fine to coarse SAND, little fine Gravel; moist.		9 ft recovery
		0.7	
20			
	Brown, GRAVEL, trace coarse sand; dry.	0.0	
	Brown, fine to coarse SAND, some fine to coarse Gravel; moist.		
		0.8	
25			
	Brown, medium to coarse SAND, some fine to medium Gravel, trace cobble; moist.		10 ft recovery
		0.6	
30			
		0.2	
35		0.0	
	Brown, medium to coarse SAND and fine GRAVEL, trace silt and cobble; moist.		8 ft recovery
		2.1	
40		1.5	
		0.4	
	Brown to light gray, fine to coarse SAND and GRAVEL (angular), some broken Cobble, trace broken boulder; dry.		
45		1.4	
	Brown to light gray, fine to coarse SAND and fine GRAVEL, some medium to coarse Gravel, trace boulder (angular); dry.		10 ft recovery
50			

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-012a	**48.399131**	**-114.136552**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown to light gray, fine to coarse SAND and fine GRAVEL, some medium to coarse Gravel, trace boulder (angular); dry. *(continued)*		0.0	
55		Gray, GRAVEL (angular and broken), some fine to coarse Sand, trace cobble; dry.		0.0	10 ft recovery
		Gray, GRAVEL and Crushed rock; dry.		0.0	
60		Brown, fine to medium SAND, trace gravel; dry.		0.1	
		Brown, coarse SAND and fine GRAVEL, some coarse Gravel and Cobble, trace silt; moist to wet.		0.1	
65		Brown, coarse SAND and coarse GRAVEL, little fine to medium Sand, trace silt; wet.		0.1	
		Gray, fine to coarse SAND, some Gravel, little Silt; wet (dense).			5 ft recovery
70	200' of Schedule 40 PVC Riser			0.0	
		Brown, fine SAND, some Silt; wet.		0.0	
		Brown, fine SAND and SILT; wet.			13 ft recovery Sample CFMW-012a-SO-68-73 collected
75				0.0	
80	Grout	Brown, GRAVEL, some fine to coarse Sand; wet.		0.0	
		Brown, fine to coarse SAND, some fine to coarse Gravel; wet.		0.0	
85					
		Brown, fine to coarse SAND, some Gravel, little Silt; wet.		0.0	10 ft recovery
90		Brown to gray, fine SAND, some Silt, little Gravel, trace boulder; moist (stiff).		0.0	
		Brown, SILT, some fine Sand, little Gravel and Clay; moist (stiff).		0.0	
95					
		Brown, fine to coarse SAND, some medium Gravel and Silt; wet.		0.0	10 ft recovery
100		Brown, fine SAND and SILT, little medium to coarse Sand and Gravel; wet.		0.0	
105					
				0.0	5 ft recovery, rock in casing

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WELL NO.	LATITUDE	LONGITUDE
CFMW-012a	**48.399131**	**-114.136552**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Gray-brown, fine GRAVEL, trace coarse sand; wet. *(continued)*		0.0	
110					110
		Gray-brown, fine to coarse GRAVEL (graded); wet.		0.0	
		Gray-brown, coarse GRAVEL, trace silt; wet.			
115				0.0	115
		Brown, fine to medium SAND; wet.		0.0	10 ft recovery
		Gray, fine to coarse SAND, some Gravel and Silt; wet (dense).			
120				0.0	120
125				0.0	125
	200' of Schedule 40 PVC Riser				
		Brown, fine to coarse SAND, some Gravel; wet (loose).		0.0	7 ft recovery
		Brown to orange, CLAY, some fine Sand and Silt, little Gravel; dry (stiff).			
130				0.0	130 7" Conductor casing set to 130 ft bls
		Brown to orange, CLAY, some Silt, Gravel and fine Sand; dry (stiff).			10 ft recovery
135	Grout				135
140				0.0	140
					13 ft recovery
145					145
150				0.0	150
155					155
					10 ft recovery
160				0.0	160

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WELL NO.	LATITUDE	LONGITUDE
CFMW-012a	**48.399131**	**-114.136552**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Brown to orange, CLAY, some Silt, Gravel and fine Sand; dry (stiff). *(continued)*			165
				5 ft recovery
			0.0	
170				170
	Brown to orange, CLAY, some Silt and fine Sand, little Gravel; dry (stiff).			5 ft recovery
			0.0	
175				175
	Brown to red, CLAY, some Silt; dry (stiff).			10 ft recovery
180				180
			0.0	
185				185
			0.0	Recovery not noted
	COBBLE/ROCK.		0.0	Large rock/cobble
	Brown to red, CLAY, some Silt; dry (stiff).		0.0	
190				190
	Brown, CLAY, some Silt, trace fine sand; moist.		0.0	
	Brown to red, CLAY, some Silt; dry (stiff).			
195				195
			0.0	Recovery not noted
200	COBBLE/ROCK.		0.0	200
	Brown, fine to medium SAND; moist.		0.0	
	Brown, fine to coarse SAND, some Gravel and Silt, trace cobble; wet.		0.0	
			0.0	
205	Brown, GRAVEL, some coarse Sand, trace silt; wet (loose).			205
	Brown, GRAVEL, some coarse Sand and Silt, trace cobble; wet.		0.0	Recovery not noted
	Brown, SILT, some Gravel and Clay, little fine Sand; moist.		0.0	
210				210
	Brown, SILT, some Gravel and Clay, little fine to coarse Sand; moist.		0.0	
215				215
	Brown, GRAVEL and coarse SAND, little Silt; wet.		0.0	10 ft recovery
	Brown, SILT, some Gravel, little Clay, trace fine to coarse sand; moist (hard).		0.0	
220			0.0	220

Grout
Bentonite Plug
#2 Sand
10' of 20-Slot Schedule 40 PVC Screen
Well Plug
Bentonite

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-012a	**48.399131**	**-114.136552**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Brown, SILT, some Gravel, little Clay, trace fine to coarse sand; moist (hard). *(continued)*		0.0 0.0	
230		Brown, coarse SAND, some Gravel, some Silt, little fine to medium Sand, trace clay; wet (loose).		0.0 0.0 0.0	10 ft recovery
235	Grout	Brown, coarse SAND and fine GRAVEL, some Silt, trace clay; wet (loose).		0.0	
		Brown, fine to coarse SAND and GRAVEL, some Silt, trace clay; moist (dense).		0.0	8 ft recovery
240		Brown, fine to coarse SAND and fine GRAVEL, some Silt, trace clay; wet (loose).		0.0	
		Tan, CLAY, some Silt; dry to moist (stiff).		0.0	
245		Tan, CLAY, some Silt; dry (stiff).		0.0	10 ft recovery
250		Reddish tan, CLAY, some Silt; dry (stiff).		0.0 0.0	
255		Tan, CLAY, some Silt and Gravel; dry (stiff).		0.0	End of boring at 254 ft bls

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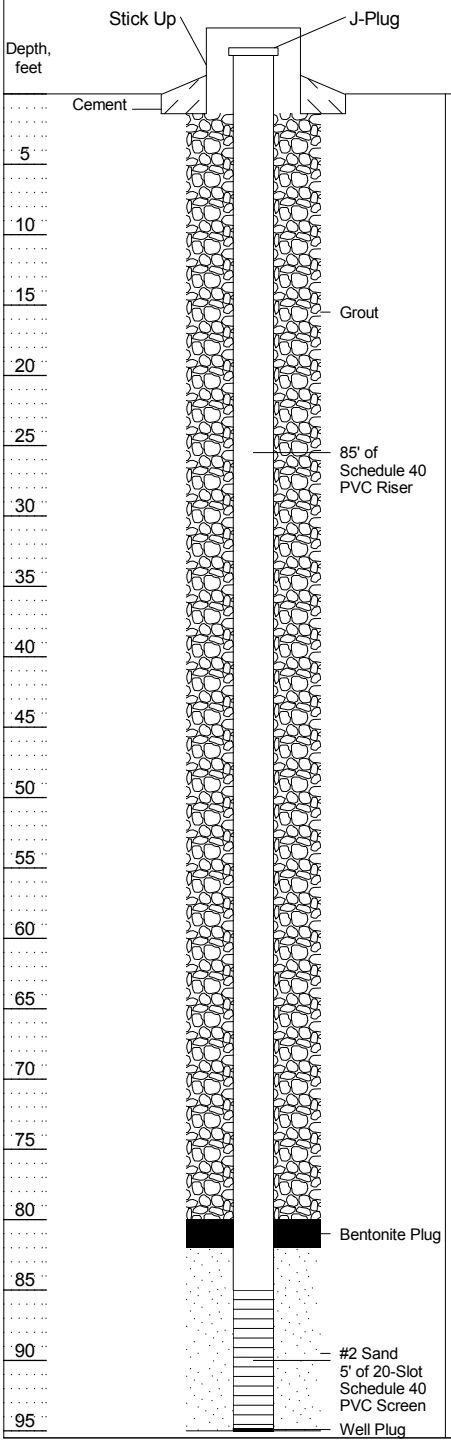
WELL CONSTRUCTION LOG

WELL NO. **CFMW-016**	LATITUDE **48.39891**	LONGITUDE **-114.13305**		
PROJECT NO./NAME **2476.0001Y002 / CFAC RI/FS Phase 1**		LOCATION **2000 Aluminum Drive Columbia Falls, Montana**		
APPROVED BY **A. Muscietta**	LOGGED BY **A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER **Cascade Drilling / Carlos Anguiano**		GEOGRAPHIC AREA **Center Landfill**		
DRILL BIT DIAMETER/TYPE **6-in. / Sonic Bit**	BOREHOLE DIAMETER **6-inches**	DRILLING EQUIPMENT/METHOD **Truck Mounted / Rotosonic**	SAMPLING METHOD **Continuous Core**	START-FINISH DATE **6/24/16-6/24/16**
CASING MAT./DIA. **SCH 40 PVC / 2-inch**	SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**			



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Refer to geologic log for adjacent deep monitoring well CFMW-016a for lithology.			
5					5
10					10
15					15
20					20
25					25
30					30
35					35
40					40
45					45
50					50
55					55
60					60
65					65
70					70
75					75
80					80
85					85
90					90
95					95

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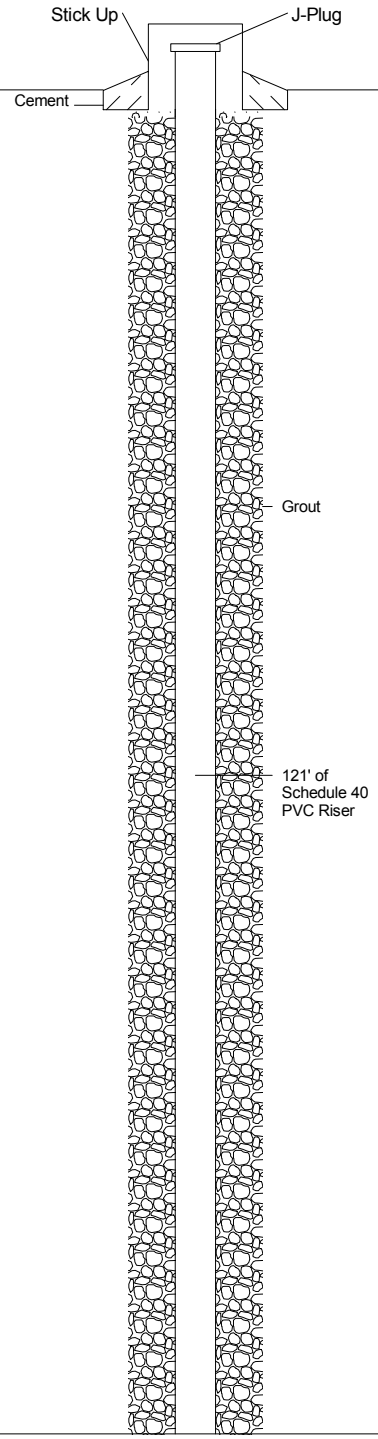
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-016a	**48.398934**	**-114.133053**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Center Landfill**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**6/21/16-6/25/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch** SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **5.0** ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to coarse SAND, some fine to medium Gravel, trace silt; moist.		0.0	6 ft recovery
	Brown, fine to coarse SAND, some fine to coarse Gravel, trace silt; moist.		0.6	Sample CFMW-016a-SO-0-0.5 and CFMW-016a-SO-0-0.5-Pb collected
5	Gray, fine to coarse SAND, some Silt, little fine to medium Gravel; wet (loose).		0.8	Sample CFMW-016a-SO-0.5-2 collected
	Tan-brown, coarse SAND, some fine to medium Gravel, little fine to medium Sand, trace silt; wet.		0.1	8 ft recovery
10	Dark gray, fine to medium SAND, some Silt and fine to coarse Gravel, trace cobble; wet (loose).			
			0.5	Sample CFMW-016a-SO-10-12 collected
15				
			0.2	9 ft recovery
20	Light gray, fine to coarse SAND, some fine to coarse Gravel, little Cobble and Silt; wet.			
			0.2	
25	Light gray, fine to coarse SAND, some fine to coarse Gravel; wet.		0.1	
	Dark brown, PEAT with Organics, some light gray fine Sand and Silt.		0.0	9 ft recovery
	Brown, fine to coarse SAND, some fine to coarse Grave, trace silt; wet (loose).			
30	Brown, fine SAND, little fine to medium Gravel; wet.		0.0	
35	Brown, fine to coarse SAND, little fine to medium Gravel; moist to dry.		0.0	
	Dark gray, fine to coarse SAND, little Silt and fine to medium Gravel; wet (loose).		0.0	9 ft recovery
40	Brown, fine to coarse SAND, little fine to coarse Gravel, trace medium to coarse sand and silt; moist.		0.0	
45				
	Brown, fine to coarse SAND, some fine to coarse Gravel; trace silt; moist to dry.		0.0	2 ft recovery; hard drilling
	Brown to red, fine to coarse SAND, some fine to coarse Gravel and broken Boulder, trace silt; dry (dense).		0.0	6 ft recovery; hard drilling
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-016a	**48.398934**	**-114.133053**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to coarse SAND and fine to coarse Gravel, trace silt; dry (loose). *(continued)*		0.0	
		Brown, fine to coarse SAND and fine to coarse GRAVEL (pulverized), trace silt; dry (loose).		0.0	
55					10 ft recovery
		Brown, fine to coarse SAND, some Boulder and Cobble (pulverized), little fine to coarse Gravel; dry (loose).			
60				0.0	
65		Dark gray, fine to coarse SAND, some Cobble and fine to coarse Gravel, trace silt; wet (loose).			10 ft recovery; hard drilling
	Grout			0.0	
70					
		Brown, fine to coarse SAND, some Boulder and Cobble (pulverized); dry.		0.0	
		Brown, coarse SAND, some fine to coarse Gravel, trace cobble; moist.		0.0	
		Brown, fine to coarse SAND, some fine to coarse Gravel and Cobble (pulverized), little silt; dry (dense).		0.0	
75	121' of Schedule 40 PVC Riser			0.0	8 ft recovery
		Brown, coarse SAND, some fine to medium Gravel, trace fine to medium sand; wet (loose).			
80				0.0	
					Sample CFMW-016a-SO-79-84 collected
85					
		No Recovery.			No Recovery
90					
95					
		No Recovery.			No Recovery
100				0.0	
		Brown, fine to coarse SAND, some fine to coarse Gravel and Cobble, trace silt; wet (medium dense).			
105				0.0	
					8 ft recovery

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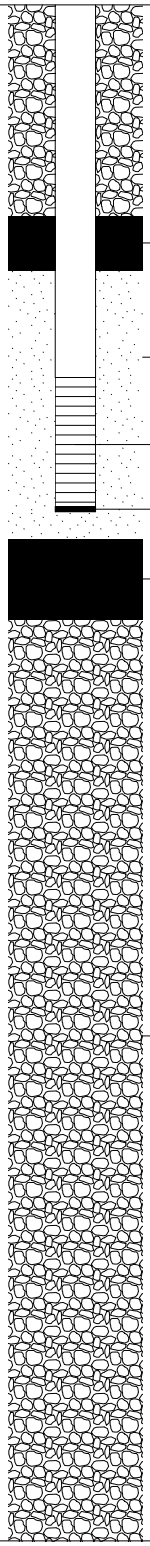
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-016a	**48.398934**	**-114.133053**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110		Brown, fine to coarse SAND, trace cobble; wet (loose). *(continued)*		0.0	
115		Brown, fine to coarse SAND, some fine to coarse Gravel; wet (loose).		0.0	
		Brown, fine to coarse SAND; wet (loose).		0.0	10 ft recovery
120		Brown, fine to coarse SAND, little Silt, Cobble and fine to coarse Gravel; moist (medium dense).		0.0	
125		Brown, fine to coarse SAND, little Silt and fine to coarse Gravel; dry (medium dense).		0.0	
		Brown, fine to coarse SAND, some Silt and fine to coarse Gravel; dry (loose).		0.0	3 ft recovery
		Orange brown, fine to coarse SAND, some Silt, little fine Gravel and Clay; moist (dense).		0.0	
130		Orange brown, fine to coarse SAND and SILT, some fine Gravel and Clay; moist (stiff).			10 ft recovery
135				0.0	7" Conductor casing set to 135 ft bls
140					12 ft recovery
145				0.0	
150					
155					15 ft recovery
160				0.0	



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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-016a	**48.398934**	**-114.133053**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165		Orange brown, fine to coarse SAND and SILT, some fine Gravel and Clay; moist (stiff). *(continued)*			165
					15 ft recovery
170					170
				0.0	
175	Grout				175
180					180
					15 ft recovery
185					185
				0.0	
190					190
195					195
					15 ft recovery
200					200
				0.0	
205					205
210					210
					15 ft recovery
215					215
				0.0	
220					220

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WELL NO.	LATITUDE	LONGITUDE
CFMW-016a	**48.398934**	**-114.133053**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Orange brown, fine to coarse SAND and SILT, some fine Gravel and Clay; moist (stiff). *(continued)*			15 ft recovery
230					
235	Grout			0.0	
240					15 ft recovery
245					
250				0.0	
255					15 ft recovery
260		Reddish brown, fine to coarse SAND and SILT, some fine Gravel and Clay; moist (stiff).		0.0	
265				0.0	
270		Orange brown, fine to coarse SAND and SILT, some fine Gravel and Clay; moist (stiff).		0.0	15 ft recovery
275					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-016a	**48.398934**	**-114.133053**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS	
280			Orange brown, fine to coarse SAND and SILT, some fine Gravel and Clay; moist (stiff). *(continued)*		0.0		280
285	Grout						285
						7 ft recovery	
290					0.0		290
						7 ft recovery	
295							295
					0.0		
300						End of boring at 300 ft bls	300

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WELL CONSTRUCTION LOG

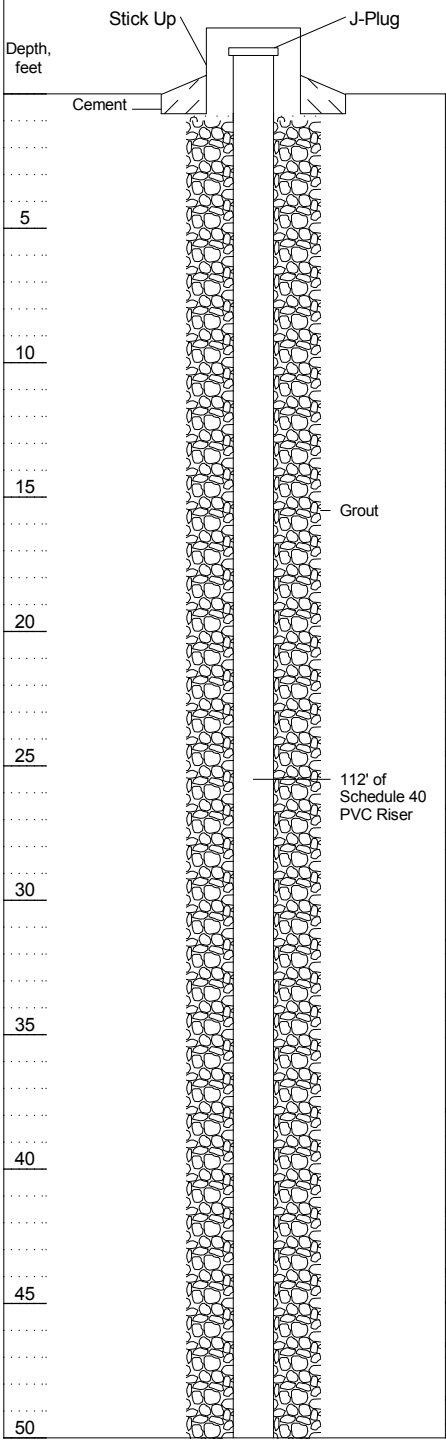
WELL NO.	LATITUDE	LONGITUDE
CFMW-018	**48.398746**	**-114.130431**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **East Landfill**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**5/19/16-5/28/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**

SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, SILT, some fine Sand, little Gravel, trace cobble; dry.		1.7	5 ft recovery Sample CFMW-018-SO-0-0.5 and CFMW-018-SO-0-0.5-Pb collected
	Gray, COBBLE, some Crushed rock and fine Sand; dry.		0.7	Sample CFMW-018-SO-0.5-2 collected
5	Brown-gray, COBBLE, some Crushed rock; dry.		0.7	5 ft recovery
	Brown, fine SAND and GRAVEL, trace silt; dry.		2.8	
10			0.4	
	Gray, COBBLE, some Crushed rock; dry (loose).		2.4	5 ft recovery
	Brown, fine to medium SAND, little Gravel; moist.			Sample CFMW-018a-SO-10-12 collected
15	Gray, fine to medium SAND, some Crushed rock, little Gravel, trace cobble; moist (loose).		0.7	5 ft recovery
			1.8	
20	Gray, fine to meidum SAND, some Gravel, little Crushed rock, trace cobble; dry (loose).			
	Brown, fine to medium SAND, little Gravel, trace crushed rock and cobble; dry.		0.5	3 ft recovery
25	Brown, medium to coarse SAND, little Gravel, trace cobble; moist.		1	
	Gray, fine to coarse SAND, some Gravel, trace cobble; moist.		0.6	2.5 ft recovery
30				
	Gray, fine to coarse SAND, some Gravel, some Crushed rock, trace cobble; dry.		0.1	5 ft recovery
	Gray, fine to coarse SAND, some Gravel, little Crushed rock, trace cobble and silt; dry (loose).		0.1	
35	Gray, fine to coarse SAND, some Gravel, little Crushed rock, trace cobble; dry (loose).			2.5 ft recovery
			0.7	
40				
	Gray, fine to coarse SAND, some Gravel, trace cobble and crushed rock; dry (loose).		0.4	5 ft recovery
	Brown, medium to coarse SAND, some Gravel, trace cobble; moist (loose).		0.6	
45	Gray, fine to coarse SAND, some Gravel and Crushed rock, trace cobble; dry.			
	Gray, GRAVEL and SAND, trace cobble and crushed rock; dry.		0.4	5 ft recovery
	Brown, fine to coarse SAND, some Gravel, trace cobble and crushed rock; dry.		0.1	
50	Gray, fine to coarse SAND and GRAVEL, little Silt, trace Cobble and crushed rock;			

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-018	**48.398746**	**-114.130431**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		dry.			5 ft recovery
		Gray, fine to coarse SAND, some Gravel and Crushed rock, little Cobble; dry.			
55					55
				0.0	5 ft recovery
		Gray, fine SAND, some Crushed rock, trace cobble and gravel; dry.		0.0	
		Gray, fine to coarse SAND, some Gravel, little Crushed rock, trace cobble; dry.		0.0	
60					60
		Gray, medium to coarse SAND, some Gravel, trace cobble and silt; dry.			5 ft recovery
				0.0	
65					65
	Grout				5 ft recovery
				0.0	
		Gray, fine to medium SAND, some coarse Gravel and Crushed rock, trace cobble; dry.		0.0	
70					70
					2.5 ft recovery
				0.0	
75					75
	112' of Schedule 40 PVC Riser	Gray to red, fine to medium SAND, some Gravel and Crushed rock, trace cobble; dry.			4 ft recovery
80					80
				0.0	4 ft recovery
85					85
		Gray, fine to coarse SAND, little Gravel, trace cobble; dry.		0.0	5 ft recovery
		Gray, fine SAND, some Crushed rock, trace cobble and gravel; moist.		0.0	
90		Brown, fine to medium SAND, little Gravel, trace cobble; moist.			90
					5 ft recovery
95					95
					5 ft recovery
				0.0	
100		Brown to gray, fine to medium SAND and coarse Gravel, trace cobble; moist to wet.		0.0	Orange staining 100
					5 ft recovery
		Gray to purple, coarse GRAVEL and medium to coarse SAND, little Silt, few Cobble; wet.		0.0	
105					105
	Bentonite Plug	Gray to purple, fine to medium SAND, some coarse Gravel, little Silt, trace cobble;		0.0	5 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-018	**48.398746**	**-114.130431**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Bentonite Plug	wet.			
		Gray to purple, medium GRAVEL, few Cobble, little medium to coarse SAND; wet. *(continued)*		0.0	
110		Brown, medium to coarse SAND, some medium to coarse Gravel, trace silt and cobble; moist to wet.			5 ft recovery
	#2 Sand			0.0	
115		Gray to purple, medium to coarse GRAVEL and fine to coarse SAND, some Cobble, little Silt; wet.		0.0	5 ft recovery
	10' of 20-Slot Schedule 40 PVC Screen				
120		Gray, medium to coarse SAND, some medium Gravel, little Silt, trace cobble; wet.		0.0	5 ft recovery
	Well Plug	Red to brown, SAND and SILT, some Cobble, little Gravel; moisture not noted.			Blue staining
125		Brown, fine to medium SAND and SILT, little Gravel; moist to wet.		0.0	End of boring at 125 ft bls

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WELL CONSTRUCTION LOG

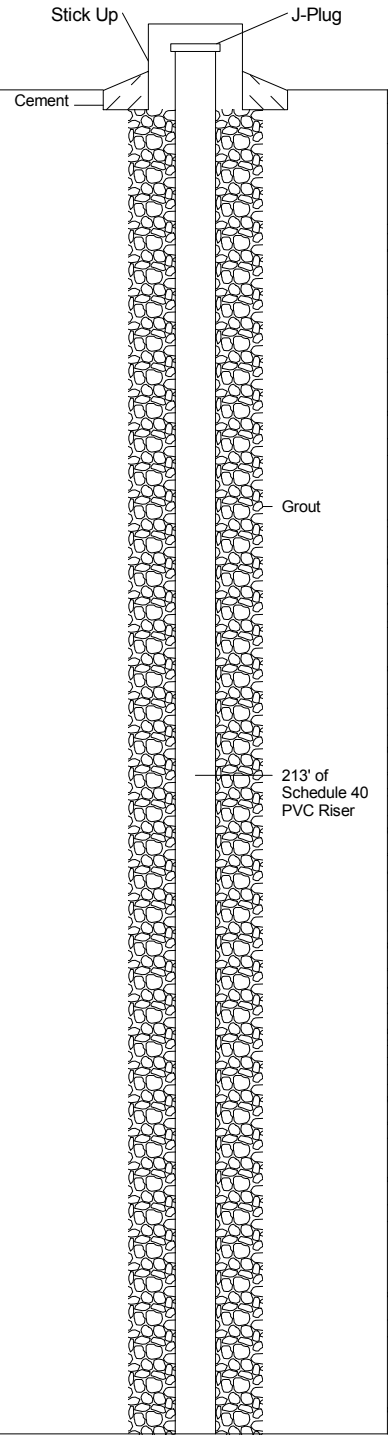
WELL NO.	LATITUDE	LONGITUDE
CFMW-019a	**48.398029**	**-114.13571**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Wet Scrubber Sludge Pond**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**5/25/16-5/28/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**

SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to coarse SAND, little Gravel, trace silt; moist.		0.1	6 ft recovery
	Tan, fine to coarse SAND, some Silt, little Gravel; moist.		0.3	Sample CFMW-019a-SO-0-0.5 collected
	Tan, fine to coarse SAND, some Silt, trace gravel; moist.		0.0	Sample CFMW-019a-SO-0.5-2 collected
5				5
	Brown, GRAVEL, some fine to coarse Sand; moist.		0.1	6 ft recovery
	Brown, fine to coarse SAND, some Gravel and Cobble; moist.		2.0	
10				10
	BOULDER.			
	Brown, fine to coarse SAND, some Gravel and Cobble; moist.			Sample CFMW-019a-SO-10-12 collected
15				15
			2.9	
	Brown, course SAND and fine GRAVEL, some fine to medium Sand, trace cobble; moist.		2.2	9 ft recovery
20				20
	Brown, fine to coarse SAND and fine GRAVEL, trace cobble; dry.		0.5	
	Brown, coarse SAND and fine GRAVEL; little fine Sand; trace cobble; dry.		2.1	
25				25
	Brown, coarse SAND and fine GRAVEL, little fine to medium Sand; dry.			5 ft recovery
30				30
			0.6	
35	Brown, GRAVEL, some coarse Sand, trace fine to medium sand and cobble; dry.			35
			0.0	
	Brown, coarse SAND and fine GRAVEL, trace fine to medium sand and cobble; moist.		0.9	10 ft recovery
40	Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt; dry.			40
			1.2	
45			1.3	45
			5.4	9 ft recovery
50				50

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-019a	**48.398029**	**-114.13571**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt; dry. *(continued)*		1.6	
		Brown, fine to coarse SAND, some fine Gravel and Silt; dry.		2.5	
55		BOULDER (broken), some Crushed rock; dry.			6 ft recovery
		Tan to gray, fine to coarse SAND, little fine Gravel and Silt; dry.			
60				3.8	
65				3.5	
		No Recovery.			No recovery
70				0.0	
75					
					No recovery
80				0.0	
85					
					No recovery
90					
95					
		Brown, fine to coarse SAND, some Gravel, trace cobble; wet.			10 ft recovery
				0.0	
100		Brown, fine to coarse SAND, little Gravel; wet.		0.0	
		Brown, fine to coarse SAND, some Gravel, trace cobble; wet.			
105				0.0	
					9 ft recovery

213' of Schedule 40 PVC Riser

Grout

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-019a	**48.398029**	**-114.13571**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, some Gravel; wet. *(continued)*		4.1	
110	Brown, fine to medium SAND, trace gravel; wet.		1.7	
	Brown to gray-brown, fine SAND and SILT, little fine Gravel; wet (stiff).		1.7	
115				
	Brown, fine to coarse SAND, some Silt, little Gravel; wet.		0.4	8 ft recovery
	Brown, fine to coarse SAND, little Gravel, trace silt; wet.		0.3	
120				
	Brown, fine to coarse SAND, little Gravel and Silt; wet.		0.1	
	Brownish gray, fine to coarse SAND, little Gravel and Silt; dry (loose).		0.2	
125	Brownish gray, fine to coarse SAND and SILT, some Gravel; dry (soft).		4.2	4 ft recovery
	213' of Schedule 40 PVC Riser			
	Brown, fine SAND and SILT, some medium to coarse Sand, little Gravel; dry (soft).		7.8	
	Brownish gray, fine to coarse SAND, some Gravel and Silt; dry (loose).		0.0	6 ft recovery
130	Brownish gray, fine to coarse SAND, some Gravel and Silt; wet (loose).		0.3	
	Brownish gray, fine to coarse SAND, some Gravel and Silt; wet (medium dense).		0.2	
	Gray, fine to coarse SAND, some Gravel and Silt; dry (loose).		0.1	
135	Brownish orange, fine to coarse SAND and SILT, some fine Gravel, little medium Gravel; moist to dry (medium soft).			12 ft recovery
	Grout		0.3	
	Brownish orange, SILT, some Clay, little fine to medium Gravel; moist (very stiff).			
140	Brownish orange, SILT, some Clay and fine Gravel; moist (very stiff).		0.2	
	Brownish orange, SILT, some Clay, little fine to coarse Gravel; moist (stiff).		1.1	
	Brownish orange, SILT, some Clay, little fine to coarse Gravel; moist (very stiff).			
145			0.4	
	Brownish orange, SILT, some Clay, trace gravel; moist (very stiff).			10 ft recovery
			0.2	
150			0.1	7" Conductor casing set to 150 ft bls
155				
	Brownish orange, SILT and CLAY, little fine Gravel; moist (very stiff).		0.0	10 ft recovery
160			0.0	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-019a	**48.398029**	**-114.13571**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Brownish orange, SILT and CLAY, trace fine gravel; moist (very stiff). *(continued)*		0.0	
	Brownish orange, SILT and CLAY, some fine Gravel, little fine to coarse Sand; moist (stiff).		0.0	2 ft recovery
	Tan, SILT and low plasticity CLAY, trace fine sand; moist (very stiff).		0.0	14 ft recovery
170			0.0	
175	Reddish brown, SILT and low plasticity CLAY, trace fine sand; moist (very stiff).		0.0	
			0.0	
180	Reddish brown and tan, SILT and low plasticity CLAY, trace fine sand; dry (very stiff).			
	Reddish brown, SILT and low plasticity CLAY, trace fine sand; moist (very stiff).			12 ft recovery
185			0.0	
	Reddish brown, SILT and low plasticity CLAY, trace fine sand; dry (very stiff).			
190			0.0	
	Reddish brown, SILT, some low plasticity Clay, little fine Sand; moist (stiff).		0.0	
	Reddish brown and tan, SILT and low plasticity CLAY, trace fine sand; dry (very stiff).		0.0	
195	Reddish brown, SILT, some Clay, trace fine sand; moist (stiff).		0.0	12 ft recovery
	Reddish brown and tan, SILT and CLAY, trace fine sand; dry (very stiff).		0.0	
	Brown, fine to coarse SAND, some medium to fine Gravel (angular); dry (loose).		0.0	
200			0.0	
	Brown, fine to coarse SAND, some fine to coarse Gravel, interbedded with 6" Silt every 1'; wet (medium dense).			
205				
	Brown, fine to coarse SAND, some fine to medium Gravel, little Silt; moist (loose).		0.0	7 ft recovery
210			0.0	
	Brown, fine to coarse SAND, some Gravel (angular), little broken Cobble; dry.		0.0	
	Brown, fine to coarse SAND, some Gravel, little Silt; wet (loose).		0.0	13 ft recovery
215	Brown, fine to coarse SAND, some Gravel, little Silt; wet (medium dense).		0.0	
220	Brown, fine to coarse SAND, some Silt, little Gravel; wet (medium dense).			

Grout
#2 Sand
Bentonite Plug
10' of 20-Slot Schedule 40 PVC Screen
Well Plug

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-019a	**48.398029**	**-114.13571**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to coarse SAND, some Silt, little Gravel; wet (medium dense). *(continued)*		0.0	
225		Brown, fine to coarse SAND, some Silt and Gravel, trace clay; moist (dense).		0.0	225
		Brown, fine to coarse SAND, little Silt and Gravel; wet (medium dense).			9 ft recovery
				0.0	
230	Bentonite			0.0	230
235		Brown, fine to coarse GRAVEL, little fine to coarse Sand and Silt; wet (loose).		0.0	235
		Brown, fine to coarse SAND, some fine Gravel, little Silt; wet (medium dense).		0.0	11 ft recovery
240		Brownish orange, fine to coarse SAND, some Silt, little Gravel, trace clay; moist (dense).		0.0	240
245		Brownish orange, SILT and CLAY, trace fine sand; moist (very stiff).		0.0	245
		Reddish brown, SILT and CLAY, trace fine sand; moist (very stiff).		0.0	10 ft recovery
250				0.0	250
255	Grout	Reddish brown, SILT and CLAY, some Gravel, trace fine sand; dry (very stiff).		0.0	255
		Brown to tan, fine to coarse SAND, some Gravel and Silt; wet (medium dense).			10 ft recovery
260				0.0	260
265					265
		Brown, fine to coarse SAND, some Silt and Gravel, trace cobble; dry (dense).		0.0	7 ft recovery
270		Brown, fine to coarse SAND, some Silt and Gravel; wet (medium dense).		0.0	270
		Brown, fine to coarse SAND, some Silt and Gravel, trace cobble; dry (dense).		0.0	
		Brown, fine to coarse SAND, some Gravel and Silt; wet (medium dense).		0.0	4 ft recovery
275		Brown, fine to coarse SAND, some Gravel and Silt, little cobble; dry (loose).		0.0	275
					7 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-019a	**48.398029**	**-114.13571**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS	
280			Brown, fine to coarse SAND, some Silt and fine to coarse Gravel, little broken cobble; dry (dense). *(continued)*		0.0		280
285			Brown, fine to coarse SAND, some Gravel and Silt, little Cobble and broken Boulder; dry (dense).		0.0	3 ft recovery	285
			Brown, fine to coarse SAND, some Gravel and Silt, trace cobble; dry (dense).			6.5 ft recovery	
290	Grout		Brown, fine to coarse SAND, some Silt, little Gravel; moist (medium dense).				290
			Brown, fine to coarse SAND, some Gravel and Silt, little Cobble, trace boulder; dry (dense).				
295			No Recovery.			No recovery	295
			Brown to tan, fine to coarse SAND, some Gravel and Silt, trace clay; wet (medium dense).		0.0	3 ft recovery	
300						End of boring at 300 ft bls	300

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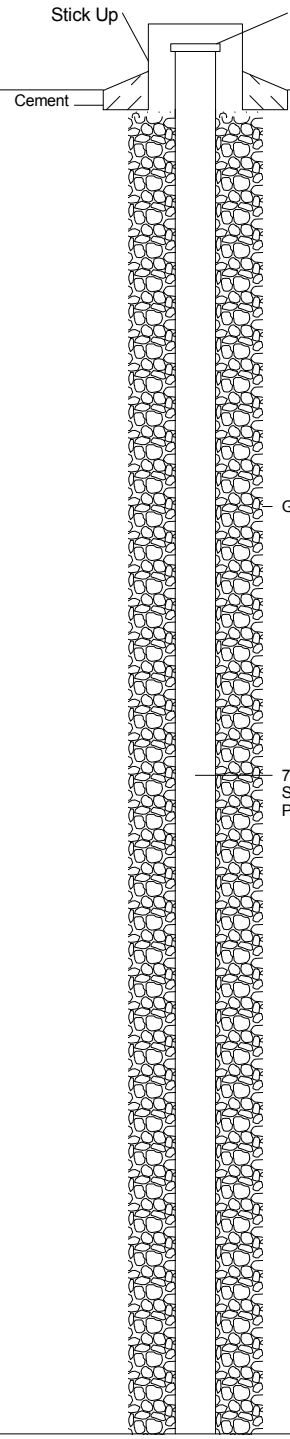
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE		
CFMW-022	**48.397448**	**-114.132975**		
PROJECT NO./NAME		LOCATION		
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**		
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**		
A. Muscietta	**S. Ward**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Cascade Drilling / Jeremiah Charlton		**East Landfill**		
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/2/16-6/3/16**
CASING MAT./DIA.	SCREEN:			
SCH 40 PVC / 2-inch	TYPE **Slotted**	MAT. **SCH 40 PVC**	TOTAL LENGTH **10.0**ft	DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, some Gravel, little Cobble; moist.		0.0	5 ft recovery Sample CFMW-022-SO-0-0.5 and CFMW-022-SO-0-0.5-Pb collected
	Brown to gray, fine to coarse SAND, some fine to coarse Gravel and Cobble, little crushed Rock, trace silt; dry to moist.		0.1	
	Brown, fine to coarse SAND, some fine to medium Gravel, little Silt and Cobble; moist.		0.0	Sample CFMW-022-SO-0.5-2 collected
5				5
	Brown, medium to coarse SAND, some medium to coarse Gravel, trace cobble and silt; moist to wet.		0.0	3.5 ft recovery Black staining
	Brown-orange, fine to medium SAND, some Gravel, little silt and cobble; moist to wet.		0.0	
10				10
	Brown, fine to coarse SAND, some fine to coarse Gravel and Cobble, trace silt; moist.		0.0	4.5 ft recovery
	Brown to dark gray, fine to medium SAND, some coarse Gravel, crushed Rock and Silt, little Cobble; moist.		0.0	Sample CFMW-022-SO-10-12 collected
15				15
	Brown, fine to medium SAND and GRAVEL, some Silt, little Cobble and crushed Rock, trace silt; moist.		0.0	5 ft recovery
20				20
	Brown, fine to coarse GRAVEL, some fine to coarse Sand and Cobble, little Silt and crushed Rock; moist.		0.0	5 ft recovery
25				25
	Brown, fine to coarse GRAVEL, some Cobble, little fine to coarse Sand, Silt and crushed Rock; moist.		0.0	
	Brown, coarse SAND, some medium to coarse Gravel and Cobble, little crushed Rock; moist.		0.0	3.5 ft recovery
30				30
	Brown to gray, fine to medium SAND, some coarse Gravel, little cobble, trace silt; moist.		0.0	5 ft recovery
35				35
	Brown, fine to medium SAND, trace cobble and silt; moist.		0.0	4 ft recovery
40				40
	Brown, fine to medium SAND, some coarse GraveL and crushed Rock, little Silt; dry.		0.0	5 ft recovery
45				45
	Brown, fine to medium SAND; moist to wet.		0.0	5 ft recovery
50				50

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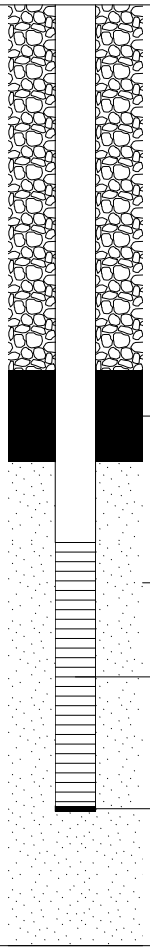
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-022	**48.397448**	**-114.132975**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	



Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to medium SAND; moist to wet. *(continued)*			5 ft recovery
	Brown, fine SAND; wet.		0.0	
55	Brown, SILT, little Clay, trace sand; moist to wet (soft).		0.0	55
	Brown, fine SAND, trace silt; wet (loose).		0.0	5 ft recovery
	Brown, fine SAND and SILT, little Gravel, trace cobble; moist to wet.		0.0	
60				60
	Brown, coarse GRAVEL, some fine to medium Sand and Cobbles; wet.			2.5 ft recovery
			0.0	
65				65
	Brown, fine to coarse SAND and Gravel, little Silt and Cobble; wet (dense).		0.0	5 ft recovery
	Brown, medium to coarse GRAVEL, some fine to medium Sand, little Cobble, trace silt; wet.			
70				70
			0.0	4 ft recovery
	Brown, medium to coarse GRAVEL, some fine to medium Sand and Silt, little Cobble; wet (dense).		0.0	
75			0.0	75
	Brown, medium to coarse GRAVEL, some fine to medium Sand and Cobble, trace silt; wet (loose).		0.0	5 ft recovery
	Brown, medium to coarse GRAVEL, some fine Sand, little Cobble and Silt; wet (dense).			
80				80
	Brown, medium to coarse GRAVEL, some fine to medium Sand, little Cobble, trace silt; wet (loose to dense).		0.0	
	Brown, medium to coarse GRAVEL and SAND, little Cobble and Silt; wet (dense).		0.0	End of boring at 85 ft bls
85				85

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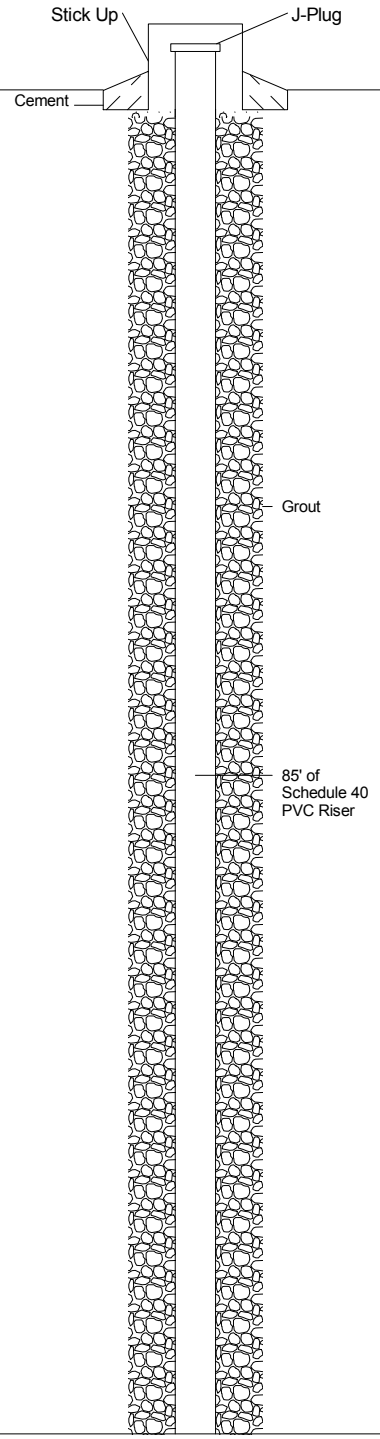
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-025a	**48.396692**	**-114.145394**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **North-West Percolation Pond**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**7/13/16-7/15/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch** SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to coarse SAND, little Gravel and Organics, trace silt; moist.		0.1	6 ft recovery
	Brown, fine to coarse SAND, some fine to medium Gravel, trace silt; dry.		0.1	Sample CFMW-025a-SO-0-0.5 and CFMW-025a-SO-0-0.5-Pb collected
	Brown, fine to coarse SAND and fine GRAVEL, trace medium to coarse gravel; dry.		0.2	
5			0.0	Sample CFMW-025a-SO-0.5-2 collected
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Cobble; dry.		0.0	10 ft recovery
	Brown, fine to coarse SAND, some fine to medium Gravel, trace cobble; moist.			
10	Brown, fine to coarse SAND and fine to medium GRAVEL, some Cobble; moist.		0.0	
15				Sample CFMW-025a-SO-10-12 collected
	Brown, fine to coarse SAND, some fine to medium Gravel, trace cobble; moist.		0.1	8 ft recovery
20	Brown, fine to coarse SAND, little fine to medium Gravel; moist		0.2	
	Brown, fine to coarse SAND, some fine to coarse Gravel, trace cobble; moist.		0.1	
25			0.2	
	Brown, fine to coarse SAND, little fine to medium Gravel; moist.		0.2	7 ft recovery
	Brown, fine to coarse SAND, some fine to coarse Gravel, trace cobble; moist.		0.1	
30	Brown, fine to medium SAND; moist to wet.			
35			0.1	
	Gray to brown, SILT, some fine Sand, little Clay and Gravel; wet (medium stiff).			Sample CFMW-025a-SO-35-40 collected 8 ft recovery
40			0.0	
	Gray to brown, fine to coarse SAND and SILT, little Clay and fine to medium Gravel, trace cobble; moist (stiff).		0.0	
45				
	Gray to brown, SILT, some fine to medium Sand and Clay, little fine to medium Gravel; dry (very stiff).			5 ft recovery
50			0.0	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-025a	**48.396692**	**-114.145394**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
					7" Conductor casing set to 50 ft bls
		Gray to brown, SILT, some low plasticity Clay, little fine to coarse Sand and dine to medium Gravel, trace boulder and cobble; moist (stiff).			5 ft recovery
55				0.0	
		Gray to brown, SILT, some low plasticity Clay and fine to coarse Sand, little fine to medium Gravel, trace boudler and cobble; dry (stiff).			9 ft recovery
60				0.0	
65					
	Grout				7 ft recovery
70				0.0	
					5 ft recovery
75	85' of Schedule 40 PVC Riser			0.0	
		Brown, SILT, some low plasticity Clay and fine to coarse Sand, little fine to medium Gravel; moist (stiff).		0.0	14 ft recovery
80	Bentonite Plug	Orange-brown to tan, fine to coarse SAND and SILT, some fine to medium Gravel, trace clay; wet (medium stiff).			
85	#2 Sand				
90	10' of 20-Slot Schedule 40 PVC Screen			0.0	
		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, trace clay; wet (medium dense).		0.0	4 ft recovery
95	Well Plug				16 ft recovery
100				0.0	
105	Bentonite				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-025a	**48.396692**	**-114.145394**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110	Bentonite	Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, trace clay; wet (medium dense). *(continued)*			
					15 ft recovery
115					
120				0.0	
125					
		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, little low plasticity Clay; wet (dense).			11 ft recovery
130				0.0	
135					
					15 ft recovery
140					
145	Grout			0.0	
150					
					14 ft recovery
155				0.0	
160					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-025a	**48.396692**	**-114.145394**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165					165
		Orange-brown to tan, fine to coarse SAND, some Silt and fine to medium Gravel, little low plasticity Clay; wet (medium dense).			15 ft recovery
170					170
175	Grout				175
180				0.0	180
					15 ft recovery
185					185
190				0.0	190
195					195
				0.0	12 ft recovery
200		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, some Boulder, little low plasticity Clay; moist (dense).		0.0	200
205		Brown to dark orange, fine to coarse SAND and SILT, some fine to coarse Gravel and Cobble, little low plasticity Clay; moist (stiff).		0.0	205
		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, trace cobble; moist to wet (medium dense).			16 ft recovery
210					210
215					215
220				0.0	220

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-025a	**48.396692**	**-114.145394**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, trace cobble; moist to wet (medium dense). *(continued)*			
225		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, little low plasticity Clay; moist to wet (dense).			17 ft recovery
230					
235	Grout			0.0	
240					
245					14 ft recovery
250				0.0	
255					
		Purple, BOULDER.			4 ft recovery
		Brown-tan to dark orange, SAND and SILT, some low plasticity Clay and fine Gravel; dry (very stiff).		0.0	
260					11 ft recovery
				0.0	
265		Gray to brown, SAND and SILT, some low plasticity Clay and fine to coarse Gravel, trace cobble; moist (stiff).			
				0.0	
270					
		Brown to dark orange, fine to coarse SAND and SILT, some fine to coarse Gravel and low plasticity Clay; moist (stiff).			11 ft recovery
275				0.0	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-025a	**48.396692**	**-114.145394**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280			Brown to dark orange, fine to coarse SAND and SILT, some fine to coarse Gravel and low plasticity Clay; moist (stiff). *(continued)*			280
			Brown to dark orange, SAND and SILT, some low plasticity Clay and fine to coarse Gravel, trace cobble; dry (very stiff).			7.5 ft recovery
285	Grout				0.0	285
						5 ft recovery
290					0.0	290
295						295
300						End of boring at 300 ft bls 300

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WELL CONSTRUCTION LOG

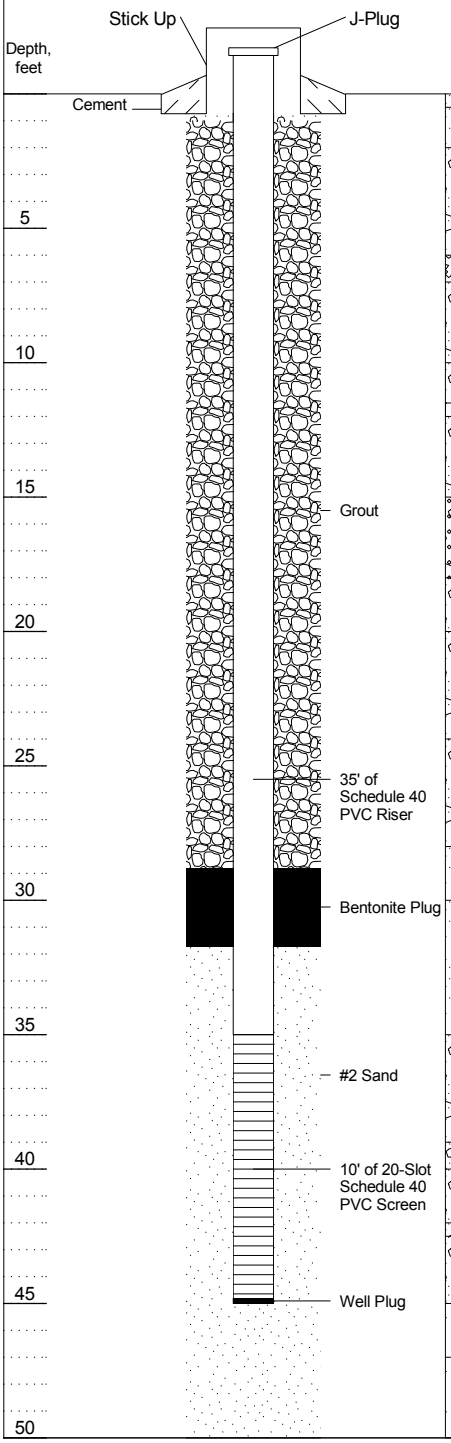
WELL NO.	LATITUDE	LONGITUDE
CFMW-026	**48.396692**	**-114.144125**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **North-West Percolation Pond**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/14/16-6/15/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**

SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine SAND, some Organics and Silt, trace gravel; moist.		0.1	4 ft recovery
	Dark brown, SAND, some Silt, little Gravel; moist (loose).		0.1	Sample CFMW-026-SO-0-0.5 collected
	Brown, fine to medium SAND, some medium to coarse Gravel, little Cobble, trace silt; moist.		0.1	Sample CFMW-026-SO-0.5-2 collected
5			0.2	5 ft recovery
	Brown, fine to coarse GRAVEL and non-plastic CLAY, little Sand and Cobble; moist.		0.1	
	Brown, medium to coarse SAND, some coarse Gravel and Cobble, trace silt; moist.		0.7	
10				
	Brown, medium SAND and medium GRAVEL, little Cobble; moist.		0.3	5 ft recovery
	Brown to gray, coarse GRAVEL, some Cobble, little medium Sand; moist.		0.3	Sample CFMW-026-SO-10-12 collected
	Brown to gray, fine to medium SAND, some medium to coarse Gravel, few Cobble, little Crushed rock, trace silt; moist.		0.5	
15				
	Brown, medium to coarse SAND, little Gravel and Cobble, trace silt; moist.		0.7	5 ft recovery
	Brown to gray, fine to medium SAND, little Gravel, few Cobble, trace silt; moist.		0.9	
20				
	Brown, fine to medium SAND, some coarse Gravel; moist.		0.3	5 ft recovery
25	Gray, fine SAND, little Gravel and Silt, trace cobble; dry.		0.7	
			0.3	5 ft recovery
	Brown, medium SAND, trace gravel and cobble; moist to wet.		0.4	
30				
	Brown, medium SAND, trace gravel and cobble; wet.		0.9	1.5 ft recovery
35				
	Brown, fine to medium SAND, some Gravel, little Cobble, trace silt; wet.		0.2	5 ft recovery
40	Brown, fine to medium GRAVEL, some medium Sand, trace silt; wet.		0.9	
	Brown, medium SAND, little Gravel and Silt; wet.		0.3	5 ft recovery
	Brown, fine SAND, little Gravel and Silt; wet.		0.3	
	Brown, medium SAND, little Gravel, trace cobble and silt; wet (loose).		0.5	
45				
	Brown, SILT, some fine to medium Sand and Gravel, trace cobble; moist (soft).		0.3	5 ft recovery
	Brown, SAND and SILT, some medium to coarse Gravel, little Crushed rock and Clay, trace cobble; dry (stiff).		0.7	
50				End of boring at 50 ft bls

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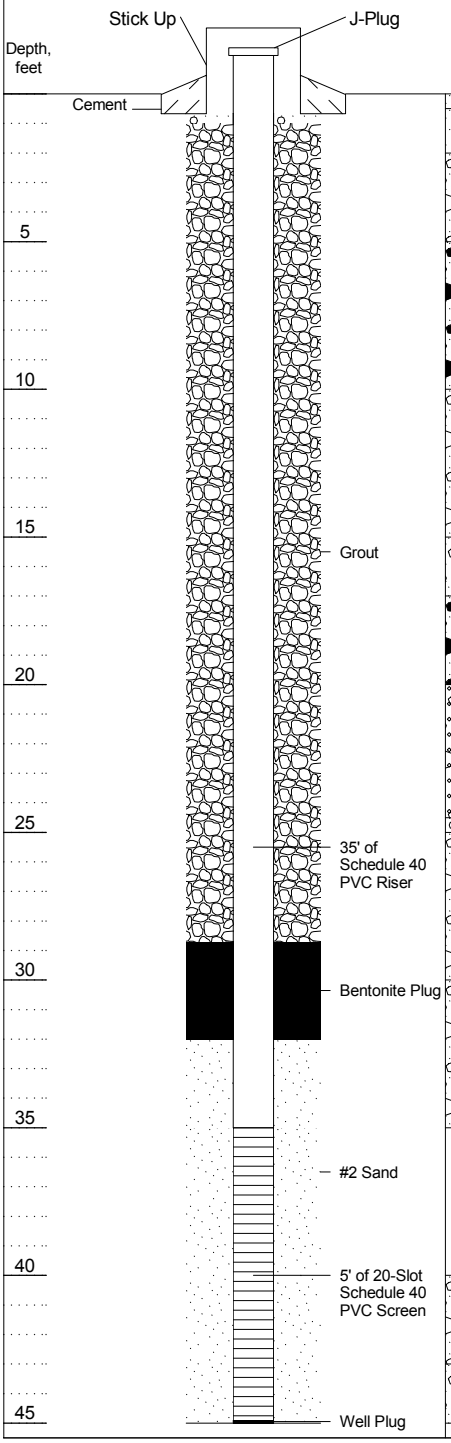
WELL CONSTRUCTION LOG

WELL NO. **CFMW-027**	LATITUDE **48.396987**	LONGITUDE **-114.14026**		
PROJECT NO./NAME **2476.0001Y002 / CFAC RI/FS Phase 1**		LOCATION **2000 Aluminum Drive Columbia Falls, Montana**		
APPROVED BY **A. Muscietta**	LOGGED BY **S. Ward**			
DRILLING CONTRACTOR/DRILLER **Cascade Drilling / Jeremiah Charlton**		GEOGRAPHIC AREA **Overflow Ditch**		
DRILL BIT DIAMETER/TYPE **6-in. / Sonic Bit**	BOREHOLE DIAMETER **6-inches**	DRILLING EQUIPMENT/METHOD **Track Mounted / Rotosonic**	SAMPLING METHOD **Continuous Core**	START-FINISH DATE **6/30/16-7/1/16**
CASING MAT./DIA. **SCH 40 PVC / 2-inch**	SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**			



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Black, coarse SAND, some Silt, trace gravel; dry to moist (loose).	2.1	5 ft recovery
	Black to dark brown, fine SAND, some Silt, trace gravel and roots; moist (loose).	1.8	Sample CFMW-027-SO-0-0.5 and CFMW-027-SO-0-0.5-Pb collected
	Light brown to gray, medium to coarse GRAVEL, some fine to medium Sand, trace cobble and crushed rock; moist.	0.2	Sample CFMW-027-SO-0.5-2 collected
5			5
	Brown to light gray, fine to coarse GRAVEL, some fine to medium Sand, little Crushed rock, trace silt and cobble; moist.	0.8	5 ft recovery
10			10
	Light brown, medium GRAVEL, some fine Sand, little Clay and Cobble; moist (dense).	0.5	5 ft recovery
		0.5	Sample CFMW-027-SO-10-12 collected
15			15
	Brown to dark gray, fine SAND, some fine to coarse Gravel, trace silt and cobble; dry to moist (loose).	0.5	5 ft recovery
	Light brown, fine to coarse GRAVEL, some fine to coarse Sand, little Clay; moist to wet (dense).	0.9	
20			20
	Brown to dark gray, fine to coarse SAND, some medium to coarse Gravel, trace silt and cobble; moist.	1.0	5 ft recovery
25			25
	Light brown, COBBLE, some fine to medium Gravel, little fine Sand; wet.	0.1	1.5 ft recovery
	Light brown, medium to coarse GRAVEL, some fine to medium Sand and Cobble, trace silt; wet.	0.0	
30			30
	Light brown, fine to medium GRAVEL, little fine Sand and Cobble, trace silt; wet (loose).	0.4	4 ft recovery
35			35
	No recovery.		No recovery
40			40
	Light brown, medium to coarse GRAVEL, some fine to coarse Sand, little Cobble; wet (medium dense).	0.4	5 ft recovery
	Brown to gray, medium to coarse SAND, little fine Gravel, trace silt; wet (loose).	0.2	End of boring at 45 ft bls
45			45

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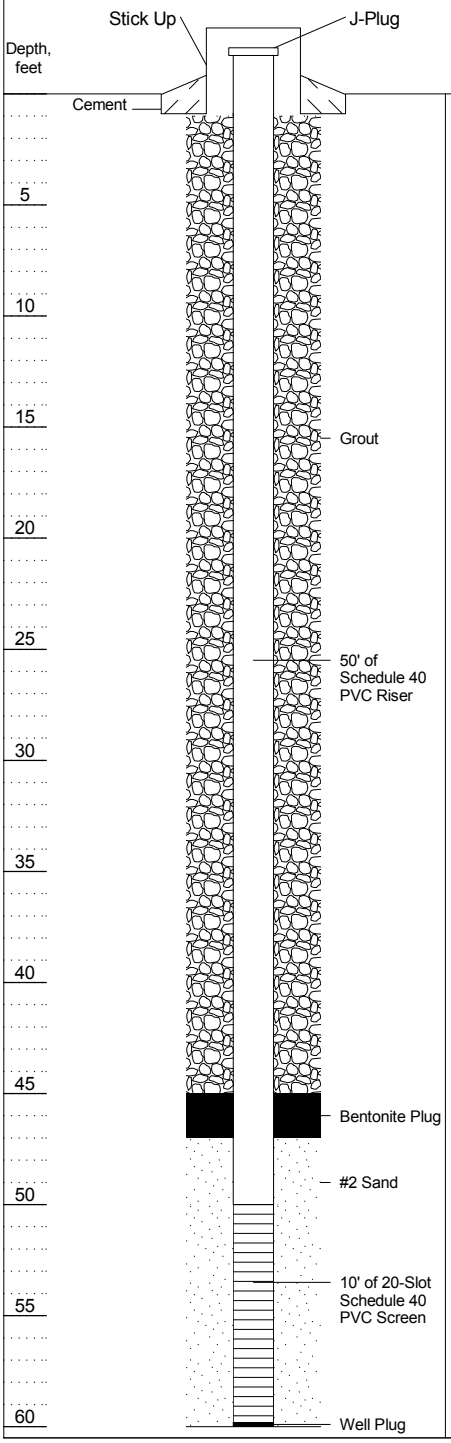
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE		
CFMW-028	**48.396361**	**-114.136594**		
PROJECT NO./NAME		LOCATION		
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**		
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**		
A. Muscietta	**A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Cascade Drilling / Carlos Anguiano		**North-East Percolation Pond**		
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**7/11/16-7/11/16**
CASING MAT./DIA.	SCREEN:			
SCH 40 PVC / 2-inch	TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**			



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Refer to geologic log for adjacent deep monitoring well CFMW-028a for lithology.			
5					5
10					10
15					15
20					20
25					25
30					30
35					35
40					40
45					45
50					50
55					55
60					60

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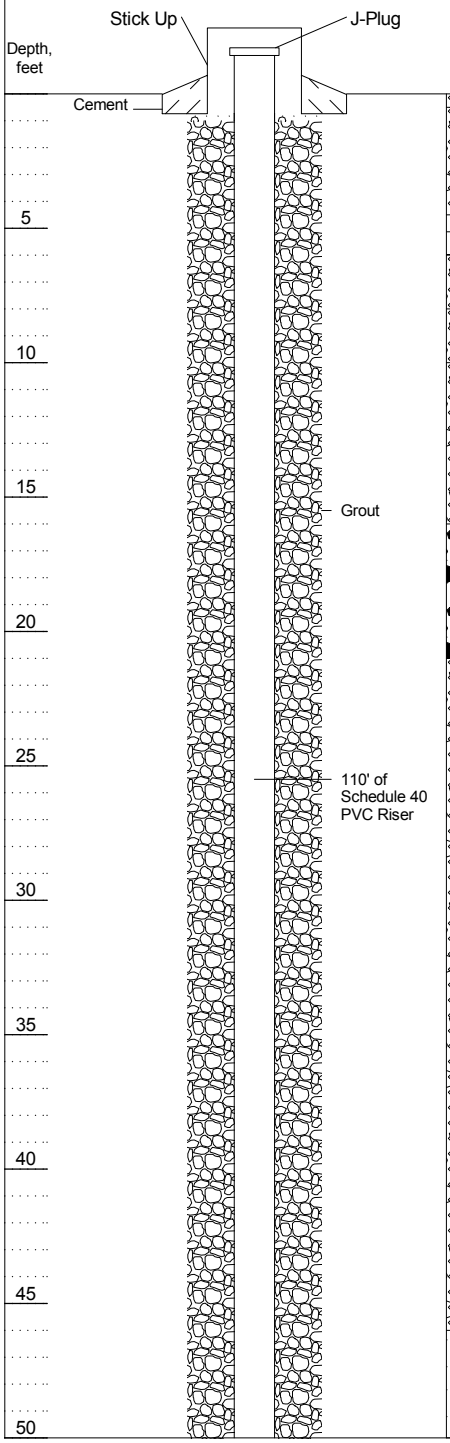
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-028a	**48.39636**	**-114.13656**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **North-East Percolation Pond**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**6/30/16-7/12/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, some Cobble, little Silt; moist.	0.0	6 ft recovery
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Cobble; moist.	0.0	Sample CFMW-028a-SO-0-0.5 and CFMW-028a-SO-0-0.5-Pb collected
5	Black, SILT; moist.	0.0	Sample CFMW-028a-SO-0.5-2 collected
	Dark brown, fine to coarse SAND, some fine to coarse Gravel, trace cobble; moist.	0.0	8 ft recovery
10	Brown, fine to coarse SAND, some fine to coarse Gravel, trace cobble; moist.	0.0	
	Brown, fine to coarse SAND and fine to coarse GRAVEL, trace cobble; moist.	0.0	Sample CFMW-028a-SO-10-12 collected
15			
	Brown, fine to coarse GRAVEL, some fine to coarse SAND, trace silt and cobble; moist (loose).	0.0	8 ft recovery
20			
	Brown, fine to coarse SAND, some fine to coarse Gravel, trace cobble; moist.	0.0	
25			
			7 ft recovery
30		0.0	
35			
			8 ft recovery
40		0.0	
45			
	Brown, fine to medium SAND; wet (loose).	0.0	10 ft recovery
50			

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-028a	**48.39636**	**-114.13656**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, some fine to medium Gravel; wet (loose).		0.0	
	Brown, fine SAND; wet (loose).		0.0	Sample CFMW-028a-SO-48-53 collected
55				
	Brown, fine to medium SAND, trace silt; wet (loose).			8 ft recovery
60			0.0	
65				
				8 ft recovery
			0.0	
70				
	Brown, fine SAND, some Silt; wet (loose).		0.0	
75	Brown, fine to coarse SAND, some Silt, little fine Gravel; wet (medium dense).		0.0	
	Brown, fine to medium SAND; wet (loose).			10 ft recovery
80			0.0	
	Brown, fine SAND, some Silt; wet (medium dense).			
85			0.0	
	Brown, fine to medium SAND; wet (loose).			14 ft recovery
90			0.0	
	Brown, fine SAND, some Silt; wet (medium dense).			
95				
			0.0	
100				
	Brown to gray, fine SAND, some Silt; wet (medium dense).			15 ft recovery
105				

Grout

110' of Schedule 40 PVC Riser

Bentonite Plug

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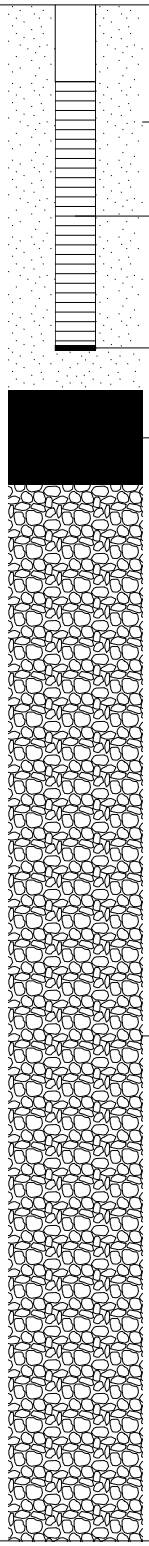
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-028a	**48.39636**	**-114.13656**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown to gray, fine SAND, some Silt; wet (medium dense). *(continued)*			
110			0.0	
115				15 ft recovery
			0.0	
120				
	Gray-brown, fine to medium SAND, some Silt, little fine to medium Gravel; wet (medium dense).		0.0	
	Orange-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (stiff).			
125				
			0.0	
130				15 ft recovery
			0.0	
135	Purple to gray, fine SAND and SILT, some Clay and fine to medium Gravel; dry (very dense).		0.0	7" Conductor casing set to 135 ft bls
	Tan, SILT and low plasticity CLAY, trace fine sand; moist to dry (very stiff).			
140			0.0	
145				14 ft recovery
150			0.0	
155				
160				15 ft recovery

Graphic Log



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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-028a	**48.39636**	**-114.13656**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165			Tan, SILT and low plasticity CLAY, trace fine sand; moist to dry (very stiff). *(continued)*		0.0	165
170			Orange-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (stiff).		0.0	170
			Brown-dark orange, fine to coarse SAND, some fine to coarse Gravel and Silt; wet (loose to medium dense).		0.0	
175	Grout		Olive brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; dry to moist (stiff).			175 7 ft recovery
180					0.0	180
			Gray-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble; wet (loose to medium dense).		0.0	
185			Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (stiff).		0.0	185 3 ft recovery
190			Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; wet-moist (stiff).			190 15 ft recovery
195			Yellow-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace clay; wet (medium dense).			195
200			Yellow-brown, medium to coarse SAND, some Gravel and Silt; wet (loose).		0.0	200 15 ft recovery
205			Olive brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (stiff).			205
210					0.0	210
215						215
220			Brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist-wet (stiff).			220 15 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-028a	**48.39636**	**-114.13656**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist-wet (stiff). *(continued)*			
230				0.0	
235	Grout				
240		Brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (stiff).		0.0	15 ft recovery
		BOULDER.			
245		Brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (stiff).			
250				0.0	7 ft recovery
255		Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (very stiff).			7 ft recovery
260				0.0	
265		Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist-wet (very stiff).			10 ft recovery
270				0.0	
275		Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (very stiff).			14 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-028a	**48.39636**	**-114.13656**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280		Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (very stiff). *(continued)*		0.0	
285	Grout				
		Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist-wet (very stiff).			8 ft recovery
290				0.0	
295		Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; moist (very stiff).		0.0	6 ft recovery
300		Olive-brown, fine to coarse SAND and SILT, some fine to medium Gravel, trace cobble and clay; wet (very stiff).			End of boring at 300 ft bls

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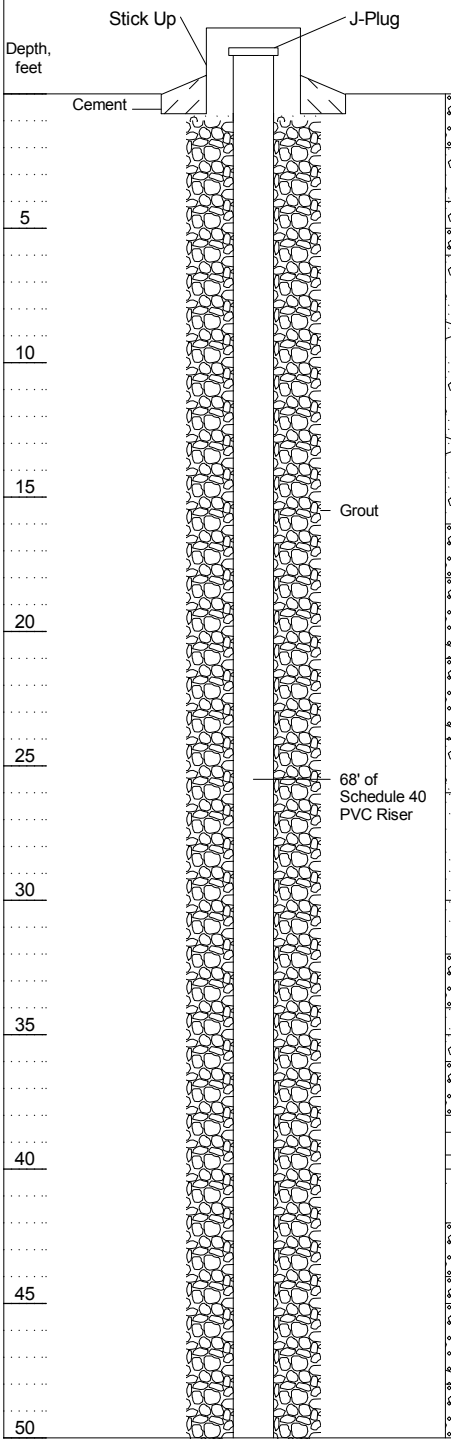
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-029	**48.396805**	**-114.134893**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **North-East Percolation Pond**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**5/18/16-5/19/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND, some coarse Gravel; dry.		0.3	6 ft recovery Sample CFMW-029-SO-0-0.5 collected
	Brown, medium to coarse SAND, some coarse Gravel; moist.		0.7	Sample CFMW-029-SO-0.5-2 collected
5	Brown, coarse SAND, some fine to medium Sand and Gravel; moist.		1.8	
	Brown to light gray, fine to coarse SAND, some Gravel (angular), trace silt; dry.		1.7	10 ft recovery
	Brown, medium to coarse SAND, some fine to coarse Gravel, trace silt; dry.		1.2	
10			0.8	
			1.2	Sample CFMW-029-SO-10-12 collected
15			1.4	
	Brown, fine to coarse SAND, little Gravel; dry to moist.		1.3	10 ft recovery
20	Dark brown, fine to coarse SAND and GRAVEL; moist.		0.9	
	Tan-brown, fine to coarse SAND and GRAVEL, trace silt; wet.		1.5	
25	Brown, medium SAND, little coarse Gravel; moist.		1.3	
	Brown, fine to medium SAND; moist.		0.5	9 ft recovery
30			0.5	
	Brown, medium to coarse SAND, some fine Sand; moist		0.5	
	Brown to light gray, fine to coarse SAND, some fine to medium Gravel; dry.		0.5	
35	Brown, fine to medium SAND; moist.		0.9	
	Brown to light gray, fine to medium SAND, some fine to medium Gravel; dry.		0.9	8 ft recovery
	Brown, fine to coarse SAND, some fine Gravel; dry.		3.7	
40	Brown, SILT, trace fine sand and fine gravel; dry.		5.1	
	Brown, SILT, little fine Sand, trace cobble; dry.		7.7	
	Brown to light gray, fine to coarse SAND, some fine to coarse Gravel (angular), little Cobble (crushed); dry.		0.6	
45	Brown, fine to coarse SAND, some coarse Gravel, little cobble; dry to moist.		2.1	8 ft recovery
	Brown, fine to coarse SAND, some fine Gravel, trace silt; dry.		1.9	
50	Brown, fine to coarse SAND and GRAVEL (angular), trace cobble and silt; dry.		2.4	

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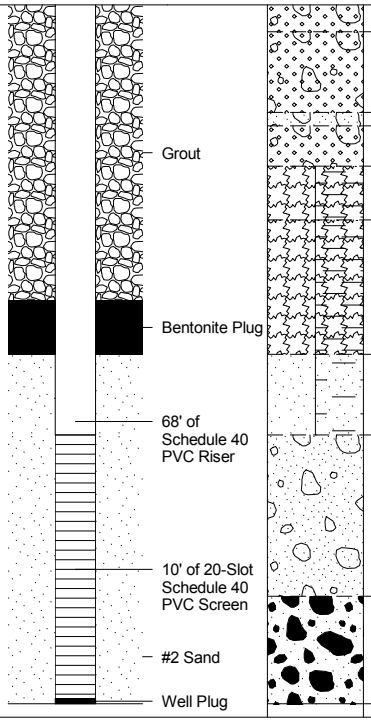
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-029	**48.396805**	**-114.134893**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine SAND and GRAVEL (angular), some Cobble (crushed), trace silt; dry.		0.5	
55	Brown, coarse SAND and GRAVEL, trace cobble; moist.		0.5	55
	Brown to light gray, fine to coarse SAND, some Gravel (angular) and Cobble (crushed), trace silt; dry.		0.3	5 ft recovery
	Brown, fine to coarse GRAVEL, some Silt, trace clay; wet.		0.1	
60	Brown, fine to coarse GRAVEL, some Silt, trace cobble; wet.		0.7	60
	Brown, fine SAND, some Silt and fine to coarse Gravel, trace cobble; wet.			4 ft recovery
65			0.7	65
	Brown, coarse SAND and GRAVEL, some Cobble, trace silt and fine sand; wet.			
70			0.3	70
	Brown, fine to coarse GRAVEL, some coarse Sand, trace silt; wet.			
75			0.0	75
				End of boring at 76 ft bls



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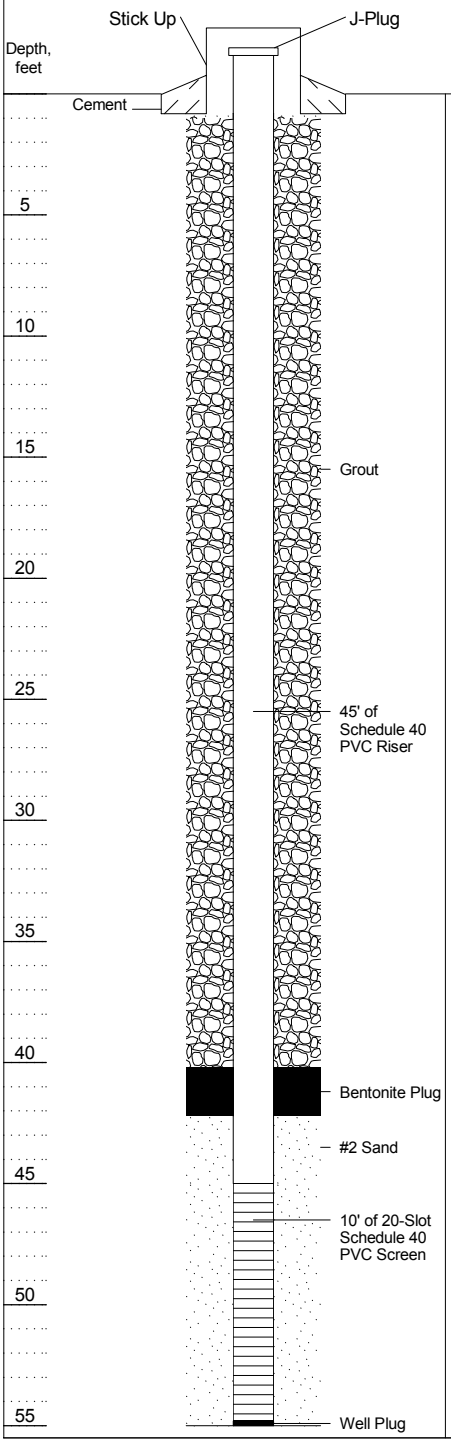
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-032	**48.395893**	**-114.132747**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Raw Materials Loading**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**8/11/16-8/11/16**

CASING MAT./DIA.	SCREEN:
SCH 40 PVC / 2-inch	TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Refer to geologic log for adjacent deep monitoring well CFMW-032a for lithology.			
5					5
10					10
15					15
20					20
25					25
30					30
35					35
40					40
45					45
50					50
55					55

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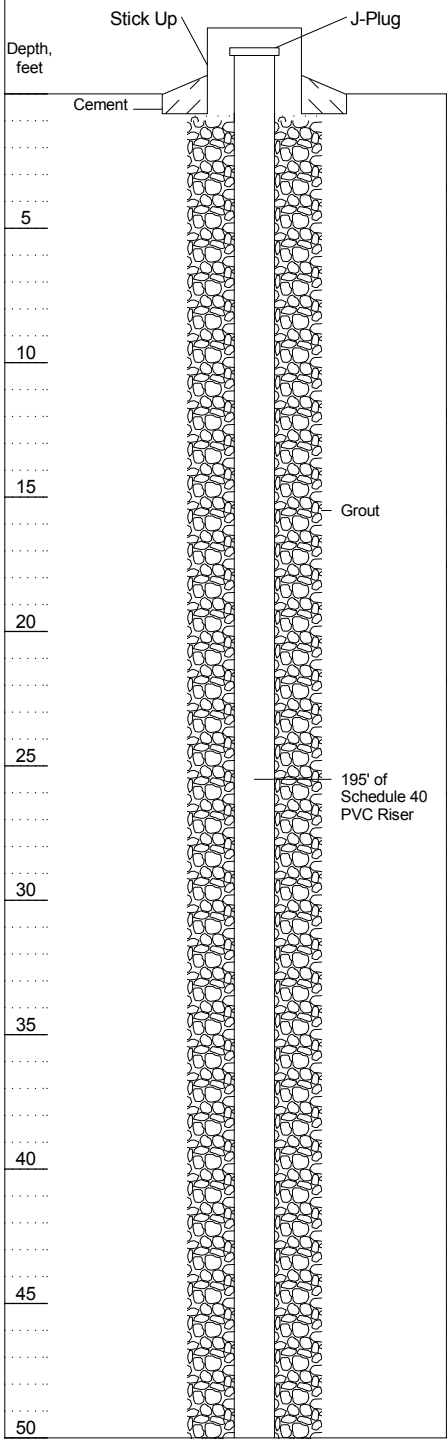
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-032a	**48.395893**	**-114.132709**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Raw Materials Loading**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**8/8/16-8/11/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to medium SAND, some Silt and Organics; dry.		0.0	6 ft recovery
	Tan, fine to medium SAND, some Silt, little fine to medium Gravel, trace coarse gravel; dry.		0.0	Sample CFMW-032a-SO-0-0.5 and CFMW-032a-SO-0-0.5-Pb collected
5	Brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt; dry.		0.0	Sample CFMW-032a-SO-0.5-2 collected
	Brown to dark orange, fine to coarse SAND, little fine to medium Gravel, trace cobble; dry.		0.2	10 ft recovery
10				
	Brown, fine to medium SAND and fine to medium GRAVEL, some Silt; moist.		0.1	
15	Light gray, fine to coarse SAND, little fine to medium Gravel; dry.		0.4	
	Brown to light gray, fine to coarse SAND and fine to coase GRAVEL, little Silt and Cobble (pulverized); dry.			10 ft recovery
20			0.0	
25				
	Brown to tan, fine SAND, some Silt; moist.			10 ft recovery
30			0.0	
	Brown to tan, fine SAND, some Silt, little fine to medium Gravel; moist.		0.0	
35	Brown to tan, fine SAND and SILT, little medium to coarse Sand, trace fine to medium gravel and clay; moist to wet (soft).		0.0	
			0.0	7 ft recovery
40	Brown to tan, fine SAND and SILT, some high plasticity Clay and medium to coarse SAND, trace fine gravel; wet.		0.0	
45				Sample CFMW-032a-SO-43-48 collected
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-032a	**48.395893**	**-114.132709**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown to tan, SILT, some high plastiticy Clay and fine Sand; wet (soft).			10 ft recovery
55			0.0	
	BOULDER.			
60			0.0	
	Brown, fine to coarse SAND; wet.			10 ft recovery
65	Grout			
			0.0	
70				
	Light brown to light gray, fine to coarse SAND and SILT, some high plasticity Clay and fine Gravel, trace medium to coarse gravel; wet (stiff).		0.0	10 ft recovery
	Dark orange to light brown-gray, SILT, some fine Sand, high plasticity Clay and fine to medium Gravel; moist (stiff).			
75	195' of Schedule 40 PVC Riser			
			0.0	
80				
	Gray, fine to coarse SAND, some fine to coarse Gravel, trace silt; moist (loose).			14 ft recovery
			0.0	
85	Orange to red-brown, SILT and low plasticity CLAY, some fine Sand, little fine Gravel, trace medium to coarse Sand and medium to coarse Gravel; moist to dry (very stiff).			
90			0.0	
95				
	Orange to red-brown, SILT and CLAY, some fine Sand and fine Gravel, little medium to coarse Sand and medium to coarse Gravel; moist (very stiff).			11 ft recovery
100			0.0	
				7" Conductor casing set to 103 ft bls
105				
				9 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-032a	**48.395893**	**-114.132709**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110		Orange to red-brown, SILT and CLAY, some fine to coarse Sand, little fine Gravel, trace medium to coarse gravel; moist (very stiff). *(continued)*		0.0	
115		Tan to orange, SILT and CLAY, some fine to coarse Sand, little fine Gravel; moist (very stiff).			11 ft recovery
120				0.0	
125					
130	195' of Schedule 40 PVC Riser	Orange-red to brown-tan, SILT and CLAY, some fine to coarse Sand, little fine Gravel; moist (very stiff).		0.0	15 ft recovery
135					
140					
145	Grout				15 ft recovery
150				0.0	
155					
160				0.0	15 ft recovery

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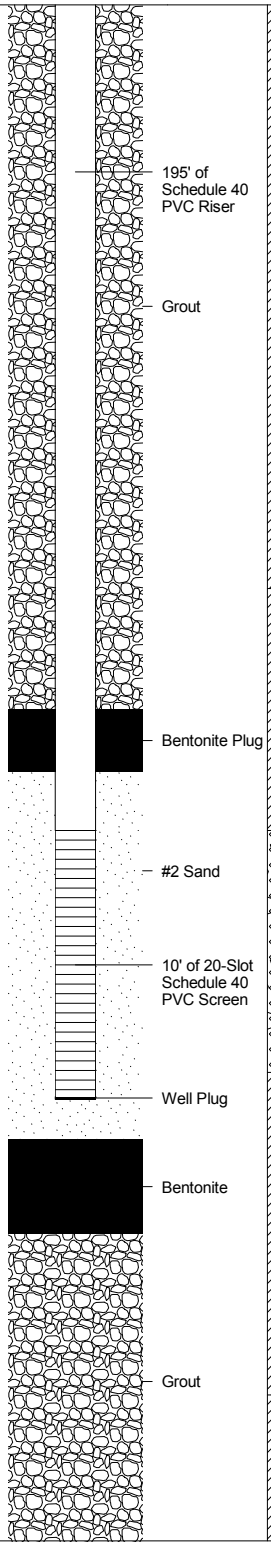
WELL NO.	LATITUDE	LONGITUDE
CFMW-032a	**48.395893**	**-114.132709**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Orange-red to brown-tan, SILT and CLAY, some fine to coarse Sand, little fine Gravel; moist (very stiff). *(continued)*			
170				15 ft recovery
175				
180			0.0	
185	Orange-red to brown, SILT and CLAY, some fine to coarse Sand and fine to coarse Gravel; moist (very stiff).			15 ft recovery
190			0.0	
195	Orange-red to brown, fine to coarse SAND, some fine to medium Gravel and Silt, trace clay; wet (medium dense).			
200			0.0	15 ft recovery
205	Orange-red to brown, SILT and CLAY, some fine to coarse Sand and fine to coarse Gravel; moist to wet (stiff).		0.0	
210			0.0	
215	Orange-red to brown, SILT and CLAY, some fine to coarse Sand and fine to coarse Gravel, trace boulder; moist (stiff).			10 ft recovery
220			0.0	



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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-032a	**48.395893**	**-114.132709**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Orange-red to brown, SILT and CLAY, some fine to coarse Sand and fine to coarse Gravel, trace boulder; moist (stiff). *(continued)*			225
230		Orange-red to brown, SILT and CLAY, some fine to coarse Sand and fine to coarse Gravel; moist (stiff).		0.0	15 ft recovery 230
235	Grout				235
240					240
245		Orange-tan, SILT and CLAY, some fine to coarse Sand, trace fine to medium gravel; moist (very stiff).		0.0	10 ft recovery 245
250		Red-purple to brown, SILT and CLAY, little fine to coarse Sand; moist (very stiff).		0.0	250
255				0.0	9 ft recovery 255
260		Orange-tan to red-brown, SILT and CLAY, some fine to coarse Sand, trace fine to medium gravel; dry (very stiff).		0.0	260
265		Brown, SILT and CLAY, some fine to coarse Sand and fine to coarse Gravel, trace cobble; moist (very stiff).		0.0	15 ft recovery 265
270					270
275		Brown, SILT and CLAY, some fine to coarse Sand and fine to coarse Gravel, trace cobble; dry (very stiff).		0.0	275
				0.0	7 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-032a	**48.395893**	**-114.132709**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280		Brown, SILTY CLAY and fine to medium GRAVEL, some fine to coarse Sand, trace cobble; dry (stiff).		0.0	8 ft recovery
285	Grout			0.0	
290					10 ft recovery
295				0.0	
300					End of boring at 300 ft bls

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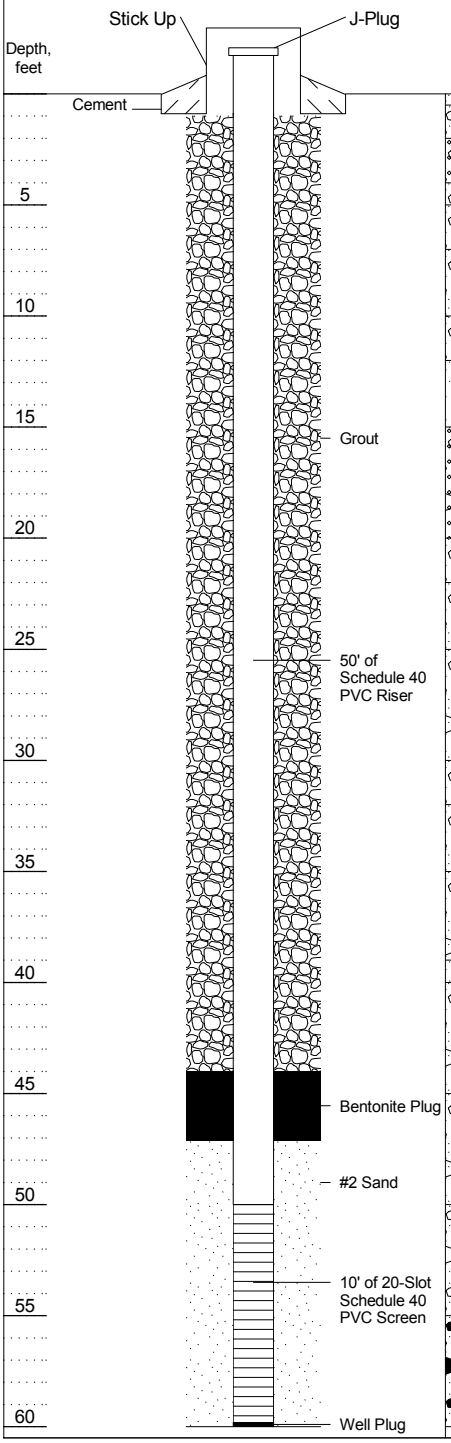
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-033	**48.395093**	**-114.139094**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Paste Plant**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**7/1/16-7/2/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Light to dark brown, fine SAND, little fine Gravel, trace silt; moist (loose).		0.1	4 ft recovery
	Dark brown to gray, fine to medium GRAVEL, some fine to medium Sand, little Silt and Cobble; moist.		0.4	Sample CFMW-033-SO-0-0.5 and CFMW-033-SO-0-0.5-Pb collected
5	Brown to gray, fine to coarse SAND, some fine to medium Gravel, little Silt and Cobble; moist.		0.1	Sample CFMW-033-SO-0.5-2 collected
	Gray to brown, fine SAND, little fine to medium Gravel and Cobble, trace silt and crushed rock; dry to moist (loose).		0.1	5 ft recovery
10	Brown to orange, fine to medium SAND, some medium to coarse Gravel, trace cobble and silt; moist (medium dense).		0.9	
	Brown to gray, fine to medium SAND, some fine to medium Gravel, little Crushed rock, trace cobble; moist (loose).		0.1	5 ft recovery
15	Brown, medium SAND, some fine to coarse Gravel, little Cobble, trace crushed rock and silt; dry to moist.		0.3	Sample CFMW-033-SO-10-12 collected
	Brown, fine SAND, trace medium gravel; moist (loose).		1	5 ft recovery
20	Brown, fine to coarse SAND, some fine to coarse Gravel, trace crushed rock and silt; moist (loose).		0.6	
	Brown to gray, fine SAND, little fine to medium Gravel, trace crushed rock and cobble; dry (loose).		0.9	5 ft recovery
25	Brown to red, fine to medium SAND, some fine to coarse Gravel, little Cobble, trace crushed rock; dry to moist (loose).		0.7	
	Brown, fine to medium SAND, some fine to coarse Gravel, little Cobble, trace crushed rock; moist (loose).		0.2	5 ft recovery
30	Brown, fine to medium SAND, some Gravel, little Cobble; moist (loose).		0.4	
	Brown to light gray, medium to coarse SAND, some fine to coarse Gravel, little Cobble, trace crushed rock and silt; moist (loose).		0.7	5 ft recovery
35	Brown, fine to medium SAND, some fine to coarse Gravel, trace cobble; moist (loose).		1.2	
	Brown to gray, fine SAND, some Silt, little Crushed rock and fine Gravel; dry to moist.		0.1	0.5 ft recovery
40	Light brown, coarse SAND, some fine Gravel, little Cobble; wet (loose).		0.3	
	Brown, medium to coarse SAND, some fine to medium Gravel, little Cobble; wet (loose).			3 ft recovery
45	Brown, fine to medium GRAVEL, some fine to coarse SAND, trace cobble and silt; wet (loose).			4 ft recovery
50	Light brown, fine to coarse GRAVEL, some fine to coarse SAND, little Cobble; wet (loose).		0.2	
55			0.8	3 ft recovery
60			0.4	
			0.2	End of boring at 60 ft bls

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WELL CONSTRUCTION LOG

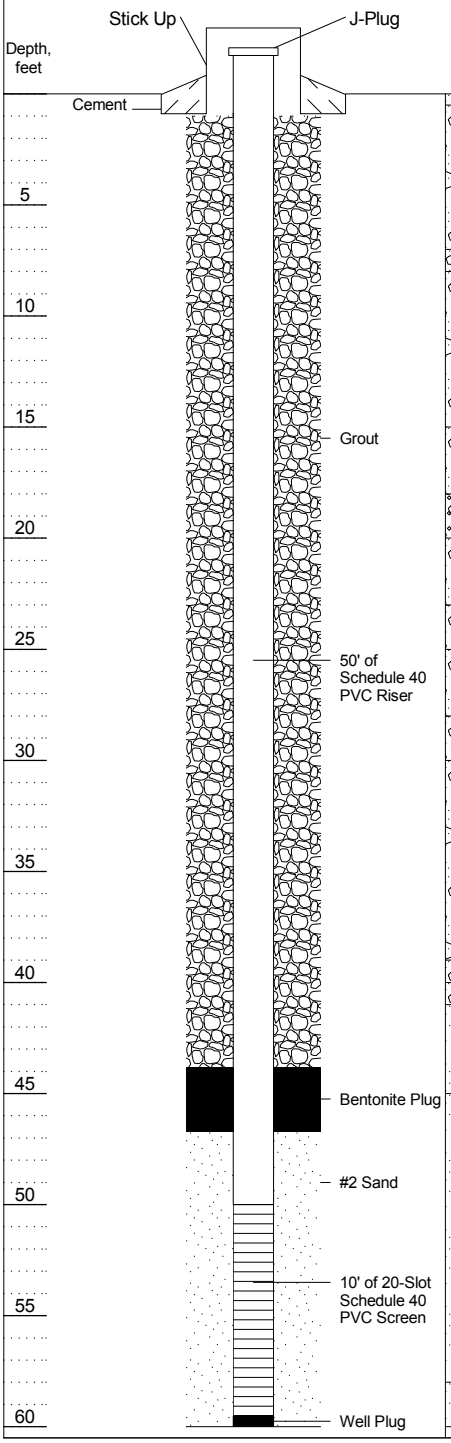
WELL NO.	LATITUDE	LONGITUDE
CFMW-034	**48.395158**	**-114.135246**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Fueling Area**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**5/31/16-6/1/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**

SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Black, fine to medium SAND, little Cobble and Silt, trace gravel; moist.		0.6	5 ft recovery Sample CFMW-034-SO-0-0.5 collected Sample CFMW-034-SO-0.5-2 collected
	Brown, fine to medium SAND, little medium Gravel, Cobble and Crushed rock; moist.			
5			0.1	5 ft recovery
	Brown, medium to coarse GRAVEL, some fine to medium Sand and Cobble, trace silt; moist to wet.		0.1	
10				
	Brown, fine SAND, little coarse Gravel, trace cobble and crushed rock; moist.		0.1	5 ft recovery Sample CFMW-034-SO-10-12 collected
15				
	Brown, medium to coarse SAND, some medium to coarse Gravel, trace silt and cobble; moist.		0.1	5 ft recovery
	Gray to brown, fine to medium SAND, some Gravel, little Crushed rock, trace cobble; dry.		0.1	
20				
	Brown, fine to medium SAND, some fine to coarse Gravel, little Cobble, trace silt; moist to wet.		0.5	5 ft recovery
	Brown, fine SAND, little Gravel, moist to wet.		0.1	
25				
	Brown, fine SAND, some medium Gravel, trace cobble; moist.		0.2	5 ft recovery
	Brown, fine to medium SAND, some fine to coarse Gravel, trace cobble and silt; moist to wet.			
30				
	Brown, fine to medium SAND, some medium to coarse Gravel, trace silt and cobble; moist.		0.1	5 ft recovery
35				
				5 ft recovery
40				
	Brown, fine SAND, little Gravel and Silt, trace cobble; moist to wet.		0.3	
	Brown, medium to coarse SAND, some fine to coarse Gravel, trace silt; moist to wet.		0.1	5 ft recovery
	Brown, fine to medium SAND; wet.		0.1	
45				
	Brown, fine to medium SAND, trace gravel; wet.		0.3	5 ft recovery
50				
			0.2	5 ft recovery
55				
			0.1	5 ft recovery
	Brown, fine SAND; wet.		0.1	
60				End of boring at 60 ft bls

BORING/FEET CFAC BORING LOGS.GPJ ROUX.GDT 11/14/16

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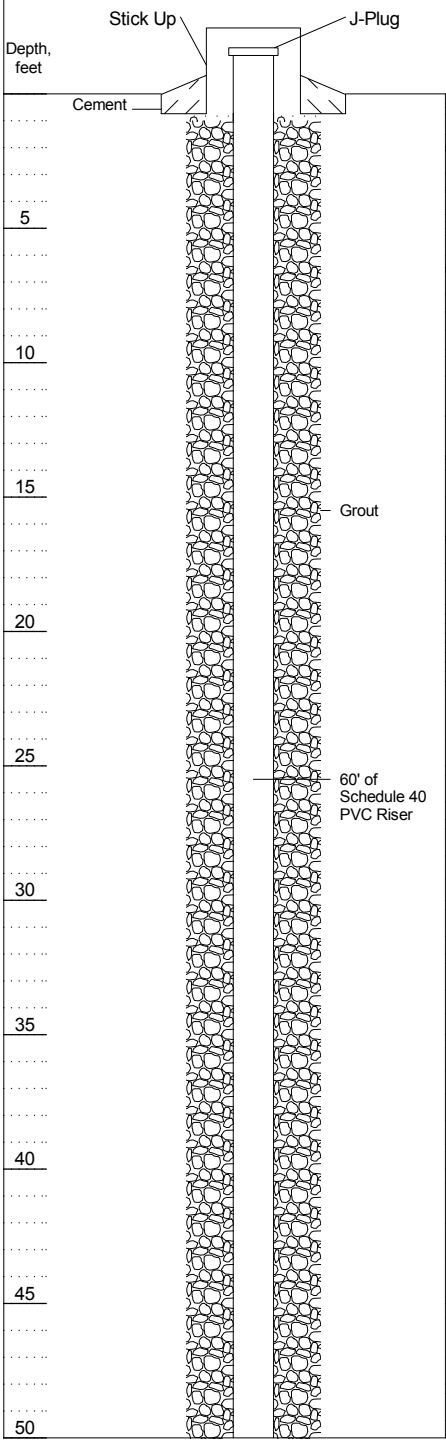
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-035	**48.395298**	**-114.130701**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Main Plant Area**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/1/16-6/2/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, medium to coarse SAND, trace gravel and silt; moist.		0.2	5 ft recovery Sample CFMW-035-SO-0-0.5 collected
	Brown, medium to coarse SAND, little fine to coarse Gravel, trace cobble; moist.		0.2	Sample CFMW-035-SO-0.5-2 collected
5	Gray, fine to coarse SAND, little medium to coarse Gravel, little crushed Rock; dry.		0.1	Orange staining 5 ft recovery
	Brown, medium to coarse SAND, little fine to medium Gravel, trace cobble and silt; moist.		0.3	
10	Gray, fine to medium SAND, some medium to coarse Gravel and crushed Rock, trace cobble; dry.		0.1	5 ft recovery
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Cobble, trace silt; moist.		0.1	Sample CFMW-035-SO-10-12 collected; orange staining
15	Brown, fine to coarse SAND and GRAVEL, trace cobble and silt; moist to wet.		0.1	5 ft recovery
	Brown to gray, fine to coarse SAND, some fine to coarse Gravel and crushed Rock, trace cobble; dry.		0.3	
20	Brown, fine to coarse SAND, some fine to medium Gravel, trace cobble and crushed rock; moist to wet.			3 ft recovery
	Light brown to gray, low plasticity CLAY, some Silt; moist to wet (soft).		0.1	
	Light brown to gray, SILT, little fine Sand and low plasticity Clay; moist to wet (soft).		0.2	
25	Light brown, SAND and SILT, some low plasticity Clay, trace gravel; moist (stiff).		0.5	2.5 ft recovery
	Light brown, fine SAND and SILT, trace clay; wet (stiff).		0.2	
30	Light brown, fine SAND and SILT, little Clay, trace gravel; wet (stiff).		0.0	4 ft recovery
	Light brown, SAND and SILT, trace clay; wet (stiff).		0.2	
35	Light brown, SAND and SILT, little Clay; wet (soft).		0.1	4 ft recovery
40	Light brown, SILT and fine SAND; wet (soft).		0.0	5 ft recovery
45	Light brown, SILT, some fine Sand, little Clay; wet (stiff).		0.0	3 ft recovery
50	Light brown, SAND and SILT; wet (soft).		0.0	

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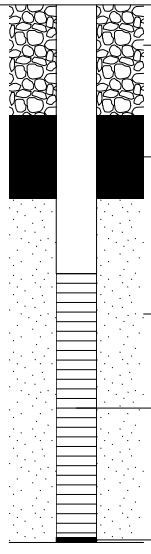
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-035	**48.395298**	**-114.130701**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Light brown, SAND and SILT; wet (soft). *(continued)*		0.0	2.5 ft recovery
55					
		Light brown, fine SAND and SILT, little Clay; wet (stiff).		0.0	2.5 ft recovery
60					
		Light brown, SAND, some Silt; wet.		0.0 0.0	2.5 ft recovery
65					
		Light brown, fine to medium SAND; wet.		0.0	2.5 ft recovery
70					End of boring at 70 ft bls



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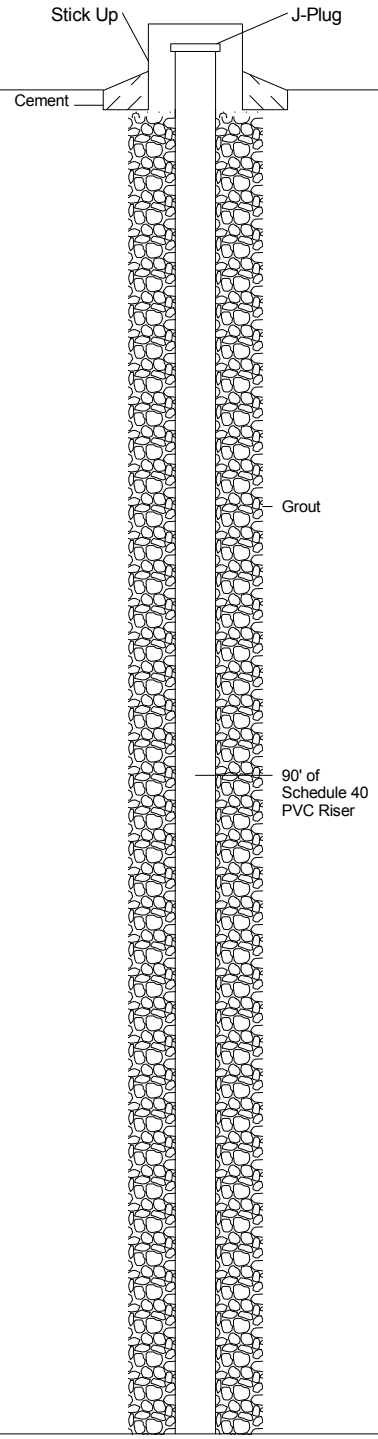
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-037	**48.391583**	**-114.130261**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Main Plant Area**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/24/16-6/25/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Dark brown to gray, medium to coarse GRAVEL, some fine to medium Sand; moist.	0.2	3.5 ft recovery
		0.2	Sample CFMW-037-SO-0-0.5 and CFMW-037-SO-0-0.5-Pb collected
	Brown, fine to medium SAND, some fine to medium Gravel, trace cobble and silt; moist.	0.2	Sample CFMW-037-SO-0.5-2 collected
5			5
	Dark brown to gray, fine to medium SAND, some fine to coarse Gravel, trace silt; most.	0.5	2.5 ft recovery
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace cobble; moist to wet.	0.2	
10			10
	Brown to dark brown, fine to medium SAND, some fine to medium Gravel, little Silt, trace cobble; moist to wet.	0.1	5 ft recovery
	Brown, medium to coarse SAND, little fine to medium Gravel, little Silt, trace cobble; moist.	0.4	Sample CFMW-037-SO-10-12 collected
15			15
	Brown, fine to medium SAND, little fine to medium Gravel, trace cobble; moist.	0.2	5 ft recovery
	Brown to gray, fine SAND, little fine to medium Gravel and Silt, trace cobble; moist to dry.	0.8	
20			20
	Brown, fine to medium SAND, some medium to coarse Gravel, trace silt; moist.	0.1	5 ft recovery
	Brown, fine to coarse SAND, some fine to medium Gravel, little Silt, trace cobble; moist.	0.1	
25			25
	Brown, fine to medium SAND, some fine to medium Gravel, trace silt; moist.	0.3	4.5 ft recovery
	Brown, fine to medium SAND, some fine to medium Gravel, little Silt, trace cobble; moist.	0.2	
30			30
	Brown, fine SAND, little fine to medium Gravel, trace silt; dry to moist.	0.4	4 ft recovery
		0.4	
	Brown, fine to medium GRAVEL, some fine Sand, trace cobble and silt; moist.	0.4	
35			35
	Brown, fine to coarse SAND, some fine to medium Gravel, little Silt, trace cobble; moist.	0.3	5 ft recovery
	Brown, fine SAND, little fine Gravel, some Silt, trace crushed rock; moist.	0.5	
40			40
	Brown, fine SAND, some fine to medium Gravel and Silt, trace cobble; dry to moist.	0.3	5 ft recovery
	Brown to gray, fine to medium GRAVEL, some fine Sand and Silt, little Crushed rock; dry.	0.6	
45			45
	Gray, fine SAND, some Crushed rock and Silt, trace cobble; dry.	0.6	5 ft recovery
	Brown, fine SAND, some medium Gravel, little Silt, trace cobble; moist.	0.6	
	Brown, fine SAND, some fine to coarse Gravel, little Silt, trace crushed rock and	0.8	
50			50

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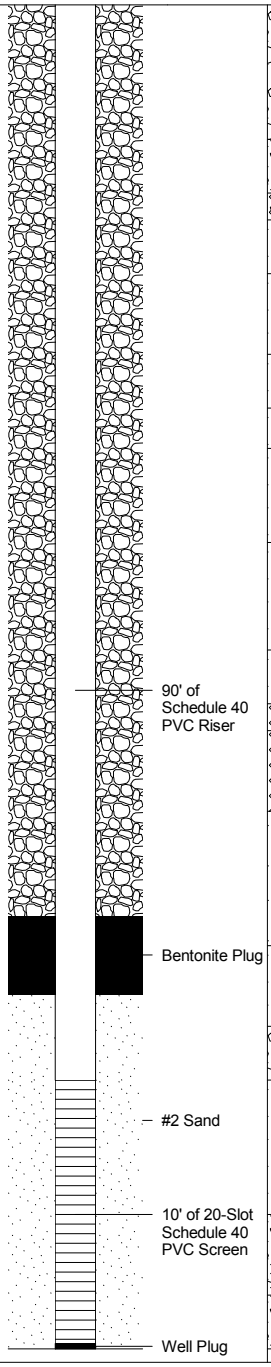
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-037	**48.391583**	**-114.130261**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	cobble; dry.			3 ft recovery
	Gray, fine GRAVEL, some fine Sand and Crushed rock, trace silt and cobble; dry (loose).		2.0	
55				55
	Medium brown, fine to medium SAND, some Gravel; moist.		0.0	5 ft recovery
	Medium brown, fine to coarse SAND and GRAVEL, little Silt, trace cobble; moist.		0.0	
60	Medium brown, fine SAND and SILT; moist (soft).		0.0	60
	Brown to red, fine SAND and SILT; moist (stiff).		0.0	5 ft recovery
65	Light brown, fine SAND and SILT; moist (medium soft).		0.0	65
	Light brown, fine SAND, some Silt; moist (loose).		0.0	5 ft recovery
70	Light brown, fine to medium SAND; dry (loose).		0.0	70
	Medium brown, fine SAND and SILT, trace gravel; moist (stiff).		0.0	5 ft recovery
75	Medium brown, fine to medium SAND, some Silt, trace gravel; moist (loose).		0.0	75
	Dark brown to brown, fine to coarse SAND and SILT; moist (soft).		0.0	5 ft recovery
80	Dark brown to brown, fine to coarse SAND and SILT, some coarse Sand and dark brown Organics; moist (soft).		0.0	80
	Light brown, fine SILT and SAND, some Clay; wet (soft).		0.0	2.5 ft recovery
85				85
	Light brown, fine to medium SAND and SILT, some Clay, trace gravel; wet (soft).		0.0	2.5 ft recovery
90	Brown, coarse GRAVEL, some fine to medium Sand and Silt; wet (loose).		0.0	90
	Light brown, fine SAND and SILT, some Clay, little Gravel; wet (stiff).			5 ft recovery
95				95
	Light brown, SAND and GRAVEL, some Clay, trace cobble; wet (dense).		0.0	5 ft recovery
100	Light brown, SAND and GRAVEL, some Clay and Crushed rock, trace cobble; wet (dense).		0.0	End of boring at 100 ft bls 100



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WELL CONSTRUCTION LOG

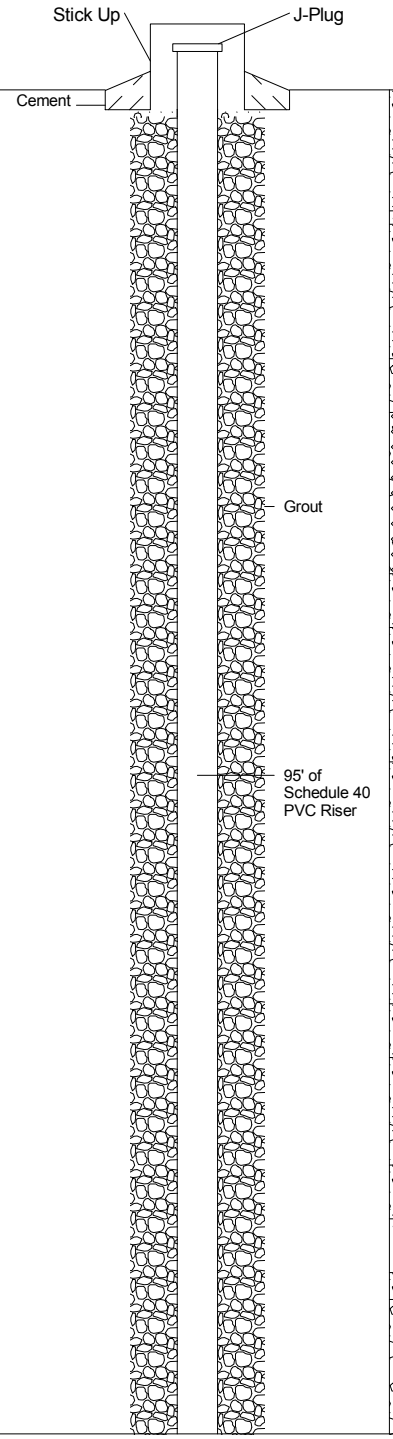
WELL NO.	LATITUDE	LONGITUDE
CFMW-038	**48.391325**	**-114.132269**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **L. Jensen**	**Columbia Falls, Montana**

DRILLING CONTRACTOR/DRILLER	GEOGRAPHIC AREA
Cascade Drilling / Jeremiah Charlton	**Rectifier Yards**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/25/16-6/27/16**

CASING MAT./DIA.	SCREEN:
SCH 40 PVC / 2-inch	TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Brown, coarse SAND and GRAVEL; moist (loose).	0.0	3 ft recovery Sample CFMW-038-SO-0-0.5 and CFMW-038-SO-0-0.5-Pb collected Sample CFMW-038-SO-0.5-2 collected
5	COBBLE (crushed).	0.0	5 ft recovery
	Brown, coarse SAND and GRAVEL, some Silt, little Cobble; moist (loose).	0.7	
10	Brown, coarse GRAVEL (angular), some Sand and Silt, little Cobble; moist (loose).	0.7	3.5 ft recovery
	Brown, fine to coarse SAND and GRAVEL, some large Cobble, little Silt, trace crushed rock; moist (loose).	0.5	Sample CFMW-038-SO-10-12 collected
15		0.0	5 ft recovery
	Brown, coarse SAND, some Gravel, little Silt, trace cobble; moist (loose).	0.1	
20	Light brown, coarse SAND, some Gravel and Cobble, trace silt; moist (loose).		5 ft recovery
25	Light brown, fine to medium SAND, some fine to coarse Gravel, little Crushed rock, trace cobble and silt; moist (loose).	0.1	4 ft recovery
30		0.1	5 ft recovery
35	Gray to light brown, fine SAND, some fine Gravel, little Crushed rock and Silt; dry.	0.0	
	Gray, fine SAND, some fine to medium Gravel and Crushed rock, little Silt, trace cobble; dry.	0.8 1.0	5 ft recovery
40	Brown, medium to coarse SAND, some medium to coarse Gravel, trace cobble, silt and crushed rock; moist.	0.1	5 ft recovery
	Brown, COBBLE, little Silt and fine Sand, trace fine to medium gravel; moist to wet.	0.1	
45	Gray, fine SAND and fine GRAVEL, little Silt and Crushed rock; dry (loose).	0.0	3 ft recovery
	Light brown to gray, coarse GRAVEL, some fine to coarse Sand, little Silt, Cobble and Crushed rock; dry (loose).	0.1	
50			

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-038	**48.391325**	**-114.132269**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**L. Jensen**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine SAND, trace silt and medium gravel; moist (loose).		0.2	5 ft recovery
			0.1	
	Brown to gray, fine SAND, some fine to medium Gravel and Silt, little Crushed rock, trace cobble; moist.		0.1	
55	Gray, fine SAND, some fine to medium Gravel, little Crushed rock and Silt; dry (loose).			5 ft recovery
60	Gray to brown, fine SAND, some Crushed rock, little fine to medium Gravel and Silt; dry.		0.4	5 ft recovery
	Brown, fine SAND, little Silt; moist.		0.4	
65	Gray, fine SAND, some Crushed rock, little fine to medium Gravel and Silt; dry (loose).		0.4	5 ft recovery
	Brown, fine SAND, little Silt, trace gravel; dry to moist (dense).		0.2	
			1.0	
70	Gray to brown, fine SAND, some fine to medium Gravel, little Silt, trace crushed rock; dry (loose).		1.9	5 ft recovery
75	Gray, fine SAND, some fine to coarse Gravel and Crushed rock, little Silt, trace cobble; dry (loose).		0.5	5 ft recovery
80	Brown to gray, fine SAND, some fine Gravel, little Silt and Crushed rock, trace cobble; dry (loose).		1.0	5 ft recovery
85	Light brown to gray, fine to medium SAND, some fine to medium Gravel, little Silt, trace cobble; dry (loose).		1.8	5 ft recovery
	Brown to orange, fine SAND, some fine Gravel and Silt, trace cobble; moist to wet.		0.7	1.5 ft recovery
90	Brown, fine to coarse SAND, trace fine gravel; wet (loose).		0.0	5 ft recovery
95	Brown, medium to coarse SAND, some fine to coarse Gravel, little Cobble, trace silt; wet (loose).		0.4	4 ft recovery
	Gray to brown, fine to coarse GRAVEL, some fine Sand, trace silt and cobble; wet (loose).		0.2	
100	Brown, medium SAND, little fine Gravel and Silt; wet (dense).		0.2	5 ft recovery
	Brown, medium SAND, some fine to coarse Gravel, trace silt and cobble; wet (loose).		0.1	
105				End of boring at 105 ft bls

Grout
95' of Schedule 40 PVC Riser
Bentonite Plug
#2 Sand
10' of 20-Slot Schedule 40 PVC Screen
Well Plug

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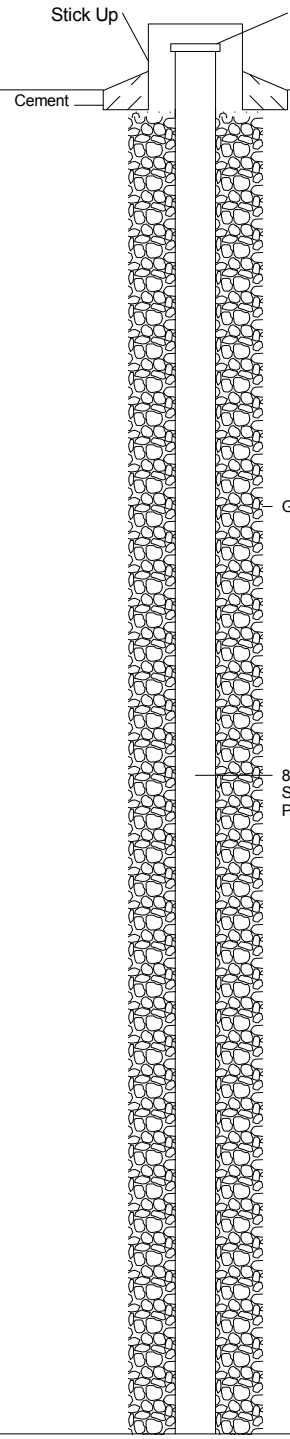
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-040	**48.391148**	**-114.136865**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Rectifier Yards**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/28/16-6/29/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Dark brown, fine SAND, some fine to medium Gravel and Silt, trace cobble; moist (loose).	0.1	3.5 ft recovery
		0.2	Sample CFMW-040-SO-0-0.5 and CFMW-040-SO-0-0.5-Pb collected
	Brown, fine SAND, some fine to coarse Gravel, litle Silt, trace cobble; moist (dense).	0.1	Sample CFMW-040-SO-0.5-2 collected
5		0.9	5
	Brown, fine to coarse GRAVEL, some fine to medium Sand and Cobble, little Silt; moist.		4 ft recovery
		0.9	
	Brown, coarse GRAVEL, some Cobble, little fine Sand, trace silt; moist to wet (loose).	0.1	
10			10
	Brown, medium to coarse GRAVEL, some medium to coarse Sand, little Cobble, trace silt; moist to wet (loose).	0.0	5 ft recovery
	Brown, fine to medium SAND, some medium to coarse Gravel, little Silt, trace cobble; moist.	0.3	Sample CFMW-040-SO-10-12 collected
15			15
	Brown to gray, fine to coarse GRAVEL, some fine to coarse Sand, little Silt and Cobble; moist.	0.3	4 ft recovery
		0.1	
	Gray, fine SAND, little fine to medium Gravel and Crushed rock, trace silt; dry (loose).	0.1	
		1.1	
20	Brown, fine SAND, some Silt, little fine Gravel; moist.		20
	Gray, fine SAND, some Crushed rock, little fine Gravel; dry.	0.5	5 ft recovery
	Brown, fine to medium GRAVEL, some medium to coarse Sand, little Cobble and Silt; moist to wet (dense).	0.0	
25			25
	Brown, fine to medium SAND, some medium to coarse Gravel, trace cobble; moist.		5 ft recovery
	Brown to gray-red tinted, fine to coarse GRAVEL, some fine to medium Sand, little Silt, Cobble and Crushed rock; moist (loose).	0.4	
30			30
			5 ft recovery
		0.5	
35			35
	Gray to light brown, fine SAND, some fine to medium Gravel and Crushed rock, trace cobble and silt; dry.		5 ft recovery
		0.2	
40			40
	Brown, medium to coarse GRAVEL, some fine to medium Sand, little Cobble and Silt; dry to moist; dense.		5 ft recovery
		0.3	
	Gray to light brown, fine SAND, some Crushed rock, little fine to medium Gravel and Silt; dry.	1.9	
45			45
	Brown, medium SAND, some fine to coarse Gravel, little Cobble and Silt; moist.		5 ft recovery
		0.2	
50			50

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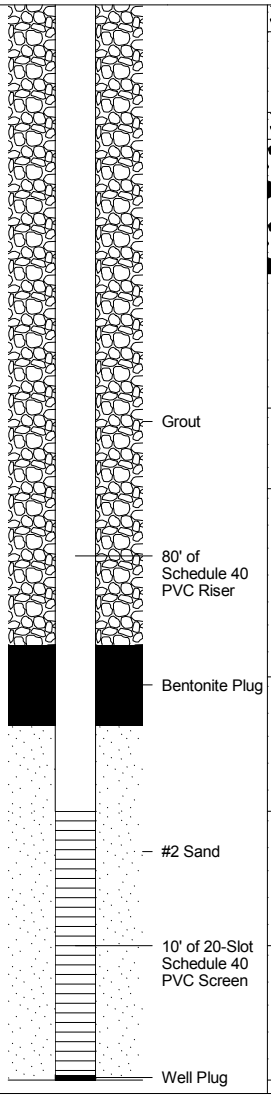
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-040	**48.391148**	**-114.136865**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Gray to brown, fine SAND, some Crushed rock, little fine Gravel and Silt; dry (loose).		0.1	5 ft recovery
	Brown, fine to medium SAND, trace gravel and cobble; moist (loose).		0.1	
55	Gray to brown, fine SAND, some fine Gravel, little Silt; dry (loose).		0.0	5 ft recovery
	Brown to gray, fine to coarse GRAVEL, some fine to coarse Sand, little Silt and Crushed rock, trace cobble; moist.		1.5	
60	Brown, fine SAND, trace silt; moist (dense).		0.8	3.5 ft recovery
65	Brown, fine SAND, little Silt, trace medium gravel and cobble; moist.		1.4	5 ft recovery
70	Brown, fine SAND, little Silt, trace gravel; moist to wet (dense).		1.0	3.5 ft recovery
75	Brown, fine SAND, trace silt; wet (loose).		0.0	5 ft recovery
80	Brown, fine SAND, trace silt; wet.		0.0	4 ft recovery
85	Brown, fine SAND; wet.		0.0	5 ft recovery
90				End of boring at 90 ft bls



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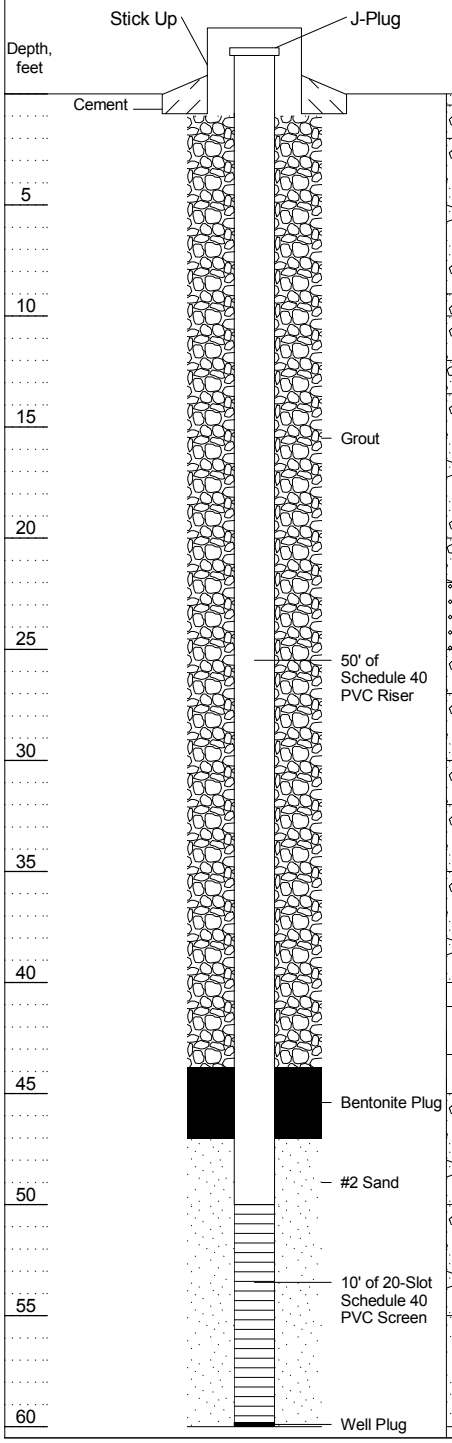
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-042	**48.391642**	**-114.138887**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Main Plant Area**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/16/16-6/18/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch** SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Dark brown, fine SAND, some Silt, trace gravel and topsoil; moist (loose).	0.0	5 ft recovery
	Brown, fine to medium SAND, some coarse Gravel, little Cobble and Silt; moist.	0.1	Sample CFMW-042-SO-0-0.5 and CFMW-042-SO-0-0.5-Pb collected
5	Brown to gray, coarse SAND, some coarse Gravel, trace cobble and crushed rock; dry to moist.	0.4	Sample CFMW-042-SO-0.5-2 collected; 5 ft recovery
		0.9	
10	Gray, fine SAND, some coarse Gravel and Crushed rock, trace cobble; dry.		5 ft recovery
	Brown to gray, fine SAND and GRAVEL, little Cobble and Crushed rock; dry.	0.6	
	Brown, medium to coarse GRAVEL, some medium to coarse Sand, little Cobble, trace silt; moist.	0.1	Sample CFMW-042-SO-10-12 collected
15		0.1	5 ft recovery
	Light brown to gray, fine SAND, some medium Gravel and Crushed rock, little Silt; dry.	0.6	
20	Brown to red, coarse GRAVEL, some fine Sand and Silt, little Cobble; moist to wet.	0.1	5 ft recovery
	Brown to gray, fine to coarse SAND, some medium to coarse Gravel, little Cobble and Crushed rock; dry to moist.	0.2	
25	Brown with red tint, medium to coarse SAND, little Gravel, trace cobble and crushed rock; moist.	0.8	5 ft recovery
	Brown to red, medium SAND, some fine to medium Gravel, little Cobble and Crushed rock; dry to moist.	1.1	
30	Brown with red tint, medium SAND, some fine to medium Gravel, trace cobble; moist.	0.2	5 ft recovery
	Brown to red, medium SAND, some fine to medium Gravel, little Crushed rock, trace cobble; moist to wet.	0.2	
35	Brown, medium SAND, some fine to medium Gravel, trace cobble; moist to wet.	3.0	5 ft recovery
40	Brown, medium to coarse GRAVEL, some Cobble, little fine to medium Sand; wet (loose).	0.2	2 ft recovery
45	Brown, medium to coarse SAND, trace gravel; wet (loose).		4 ft recovery
50	Brown, medium to coarse SAND, little medium Gravel, trace cobble; wet.	0.2	3 ft recovery
55	Brown, fine to medium SAND; wet.	0.1	5 ft recovery
60			End of boring at 60 ft bls

BORING/FEET CFAC BORING LOGS.GPJ ROUX.GDT 11/14/16

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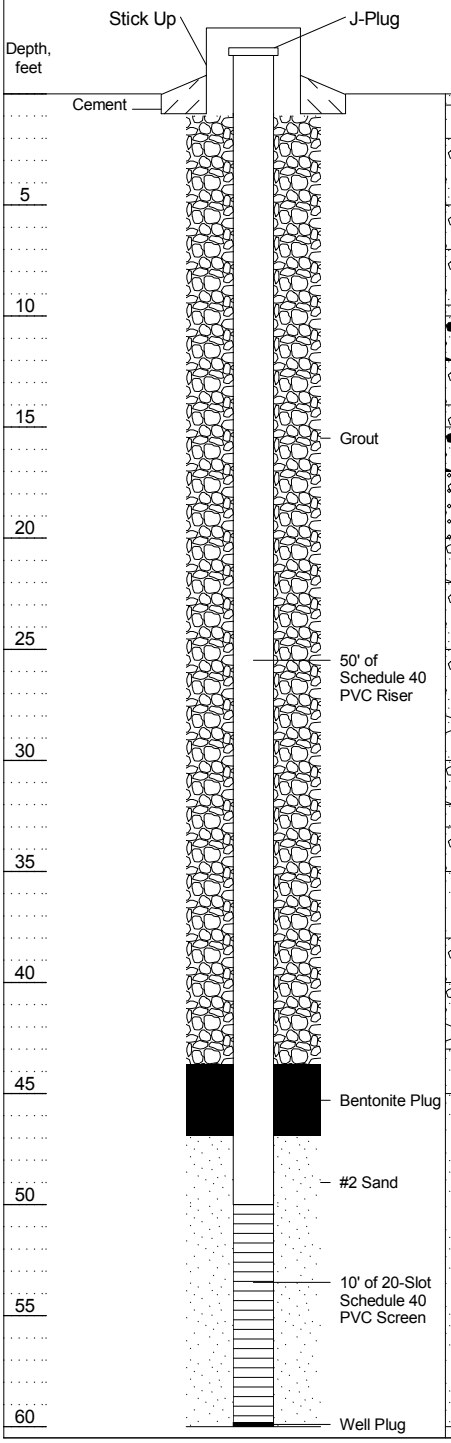
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-043	**48.393775**	**-114.140008**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **West Percolation Pond**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/15/16-6/16/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Dark brown, fine to medium SAND, some Silt, little Gravel, trace cobble; moist.	1.2	2.5 ft recovery
	Dark brown, SILT, some fine to medium Sand, little Gravel, trace cobble; moist.	0.4	Sample CFMW-043-SO-0-0.5 collected
5	Brown, fine to medium SAND, some coarse Gravel, little Cobble and Silt; moist.	0.5	Sample CFMW-043-SO-0.5-2 collected
	Drak brown to brown, fine to medium SAND, some medium to coarse Gravel, little Cobble and Silt; moist.	0.1	5 ft recovery
10	Light brown, fine to medium SAND, Gravel and Silt, trace cobble; moist.	0.3	
	Brown to gray, fine to medium SAND, some coarse Gravel, little Crushed rock, trace silt and cobble; dry.	0.3	5 ft recovery
15	Brown, fine to coarse GRAVEL, some fine to medium Sand, little Cobble, trace silt; moist.	0.1	Sample CFMW-043-SO-10-12 collected
	Gray, fine SAND, some Gravel, little Crushed rock and Cobble; dry.	0.1	5 ft recovery
20	Brown, medium SAND, some medium Gravel, little Crushed rock, trace cobble and silt; moist.	2.7	
	Brown to red, medium to coarse GRAVEL, some medium Sand, little Cobble and Silt; moist.	0.5	5 ft recovery
25	Gray, fine to medium SAND, some coarse Gravel, little Cobble and Crushed rock; dry.	0.3	
	Brown, GRAVEL and SAND, little Cobble and Silt; moist.	0.2	3.5 ft recovery
30	Brown, medium SAND, little Crushed rock, trace cobble and grave; dry to moist.	0.1	
	Brown to gray, fine to medium SAND, some medium to coarse Gravel, little Cobble, trace crushed rock; moist.	0.1	5 ft recovery
35	Brown, coarse GRAVEL, some medium Sand and Cobble; moist.	0.2	
	Brown, medium SAND, trace cobble and gravel; moist to wet.	0.2	5 ft recovery
40	Brown, fine to medium SAND, little medium to coarse Gravel and Cobble, trace silt; moist.	1.0	
	Brown, fine SAND, little Silt, trace cobble and fine gravel; dry to moist.	1.0	2.5 ft recovery
45	Gray, fine SAND and medium GRAVEL, little Crushed rock and Silt, trace cobble; dry.	0.3	
	Brown, medium GRAVEL and medium SAND, little Cobble and Silt; wet.	0.3	5 ft recovery
50	Brown, fine SAND, trace gravel; wet.		
	Brown, fine SAND; wet (loose).		5 ft recovery
55		0.9	
		0.5	5 ft recovery
60		0.4	End of boring at 60 ft bls

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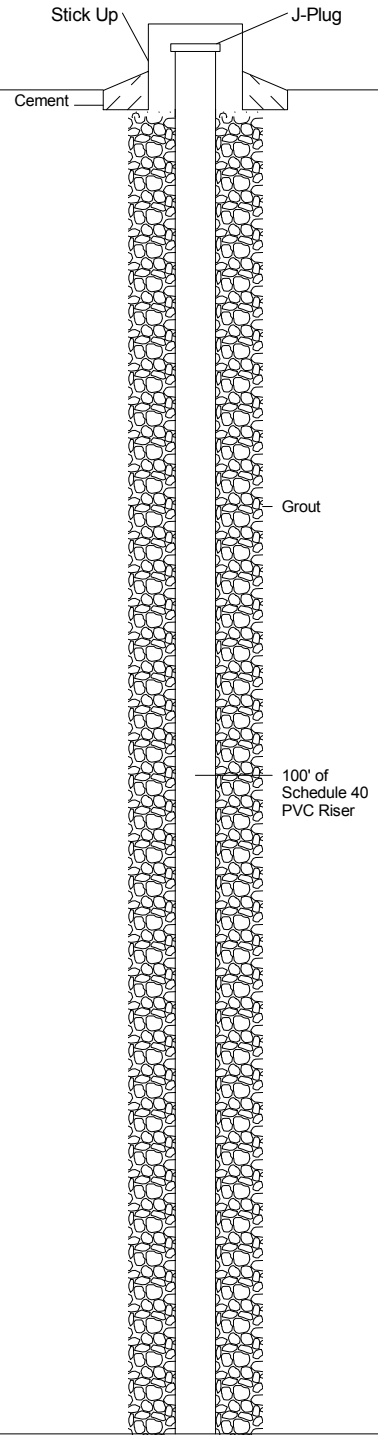
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-044a	**48.393324**	**-114.141918**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **West Percolation Pond**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**7/20/16-7/22/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to coarse SAND and fine to medium GRAVEL, some coarse Gravel, little Cobble and Silt; dry.			4 ft recovery Sample CFMW-044a-SO-0-0.5 and CFMW-044a-SO-0-0.5-Pb collected
5			0.0	Sample CFMW-044a-SO-0.5-2 collected
	Brown, fine to coarse SAND and fine to coarse GRAVEL, little Cobble and Silt; dry.			8 ft recovery
10			0.0	
15			0.0	Sample CFMW-044a-SO-10-12 collected
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt and Cobble; dry.			9 ft recovery
	Brown, fine to coarse SAND, some fine to coarse Gravel, trace cobble; dry.			
20			0.0	
25	Brown, fine to coarse SAND, little fine to medium Gravel; dry.		0.0	
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Cobble; dry.			8 ft recovery
30			0.0	
35				
	Brown, fine to coarse SAND and fine to medium GRAVEL; dry.			6 ft recovery
40			0.0	
	Brown, fine to coarse GRAVEL, trace fine to coarse sand; moist.			
45	Brown, fine to coarse SAND, some fine medium Gravel; moist to wet.		0.0	
	Brown, fine to medium SAND, trace silt; wet.			10 ft recovery
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-044a	**48.393324**	**-114.141918**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, trace silt; wet. *(continued)*		0.0	
55					Sample CFMW-044a-SO-49-54 collected 15 ft recovery
				0.0	
60		Brown, medium GRAVEL; wet.			
				0.0	
65		Brown, fine to medium SAND, trace silt; wet.			
				0.0	
70					
				0.0	15 ft recovery
75		Brown, fine SAND, some medium Sand, little Silt; wet.			
80				0.0	
85					
		Brown, fine SAND and SILT, trace clay; wet (soft).			15 ft recovery
90				0.0	
95					
100					
		Brown to light gray, fine SAND and SILT, trace clay; wet (medium stiff).			15 ft recovery
105					

Grout

100' of Schedule 40 PVC Riser

Bentonite Plug

#2 Sand

10' of 20-Slot Schedule 40 PVC Screen

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-044a	**48.393324**	**-114.141918**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110	Well Plug	Brown to light gray, fine SAND and SILT, trace clay; wet (medium stiff). *(continued)*		0.0	
115	Bentonite				20 ft recovery
120				0.0	
125					
130		Light gray, fine SAND and SILT, trace clay; wet (medium stiff).		0.0	
135					15 ft recovery
140				0.0	
145	Grout	Brown to light gray, fine SAND and SILT, trace clay; wet (medium stiff).			
150				0.0	15 ft recovery
155					
160				0.0	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-044a	**48.393324**	**-114.141918**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Brown to light gray, fine SAND and SILT, trace clay; wet (medium stiff). *(continued)*			
			0.0	15 ft recovery
170	Light gray, fine SAND and SILT, trace clay; wet (medium stiff).			
175	Grout			
180			0.0	
				15 ft recovery
185			0.0	
190	Light gray to light brown, fine SAND and SILT, some high plasticity Clay and fine to medium Gravel; moist (stiff).		0.0	
195				
	Light gray to light brown, fine SAND and SILT, some high plasticity Clay and fine to medium Gravel, litlte medium to coarse Sand, trace cobble; moist (stiff).			15 ft recovery
200			0.0	
205				
210				
				15 ft recovery
215			0.0	
	Light brown, fine SAND and SILT, some high plasticity Clay and fine Gravel, trace medium to coarse sand; moist (stiff).			
220			0.0	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-044a	**48.393324**	**-114.141918**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Brown to tan, fine to coarse SAND and SILT, some high plasticity Clay and fine to coarse Gravel; dry (very stiff).		0.0	
					15 ft recovery
230				0.0	
235	Grout				
		Brown, fine GRAVEL and SILT, some medium to coarse Gravel and fine to coarse Sand, little Clay, trace cobble; wet (dense).		0.0	
240		Brown, coarse SAND, some fine Gravel, little Silt, trace clay; wet (medium dense).		0.0	
				0.0	8 ft recovery
245		Brown, fine SAND and SILT, some high plasticity Clay and fine Gravel; moist (stiff).		0.0	
250		Brown to tan, fine SAND and SILT, some fine Gravel, little Clay; wet (medium stiff).		0.0	8 ft recovery
		Light gray to light brown, fine SAND and SILT, some fine to medium Gravel and low plasticity Clay, little medium to coarse Sand; moist (stiff).		0.0	
255					
		Brown to light gray, fine SAND and SILT, some low plasticity Clay and fine to medium Gravel, little medium to coarse Sand; dry (stiff).			10 ft recovery
260				0.0	
265					
		Brown, fine to coarse SAND and SILT, some Clay and fine to coarse Gravel; moist (very stiff).			11 ft recovery
270				0.0	
		Brown, fine SAND amd SILT, some Clay and fine to coarse Gravel, little medium to coarse Sand; dry (very stiff).			
275				0.0	
					15 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-044a	**48.393324**	**-114.141918**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280		Brown, fine GRAVEL and SILT, some Clay and fine to coarse Sand, litle medium to coarse Gravel; wet (dense). *(continued)*		0.0	
285	Grout				
290					
		Brown, coarse SAND, some fine to medium Sand and Silt, little Clay and medium Gravel; wet (medium dense).			8 ft recovery
295					
		Brown, fine GRAVEL and SILT, some fine to coarse SAND and medium Gravel, little Clay; moist (stiff).			
300				0.0	End of boring at 300 ft bls

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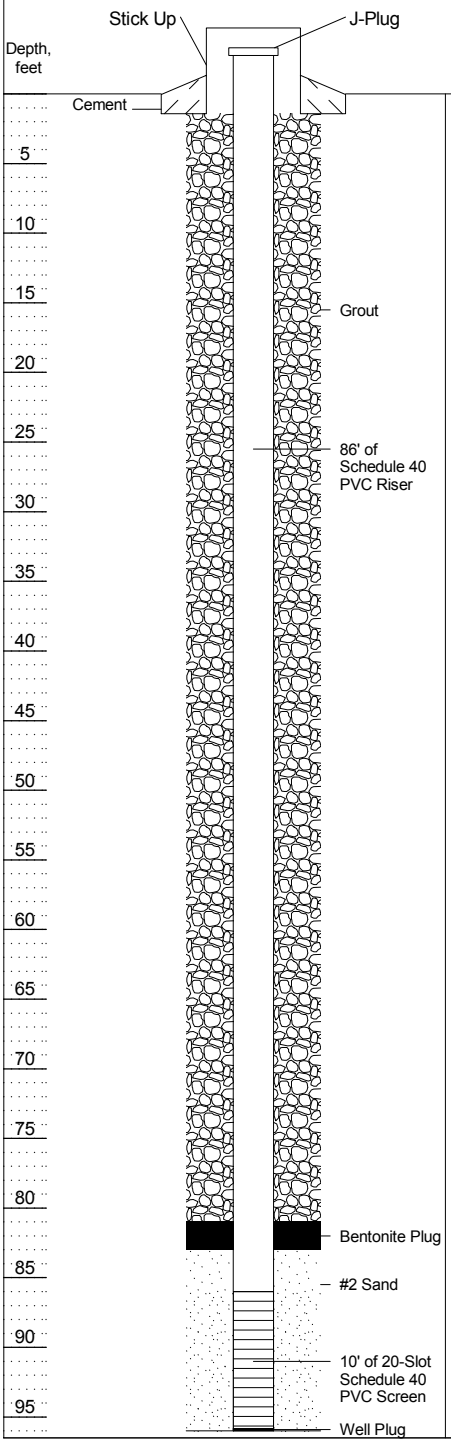
WELL CONSTRUCTION LOG

WELL NO. **CFMW-045**	LATITUDE **48.390253**	LONGITUDE **-114.138103**		
PROJECT NO./NAME **2476.0001Y002 / CFAC RI/FS Phase 1**		LOCATION **2000 Aluminum Drive Columbia Falls, Montana**		
APPROVED BY **A. Muscietta**	LOGGED BY **A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER **Cascade Drilling / Carlos Anguiano**		GEOGRAPHIC AREA **Rectifier Yards**		
DRILL BIT DIAMETER/TYPE **6-in. / Sonic Bit**	BOREHOLE DIAMETER **6-inches**	DRILLING EQUIPMENT/METHOD **Truck Mounted / Rotosonic**	SAMPLING METHOD **Continuous Core**	START-FINISH DATE **8/15/16-8/16/16**
CASING MAT./DIA. **PVC / 2-inch**	SCREEN: TYPE **Slotted** MAT. **PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**			



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Refer to geologic log for adjacent deep monitoring well CFMW-045a for lithology.			
5					5
10					10
15					15
20					20
25					25
30					30
35					35
40					40
45					45
50					50
55					55
60					60
65					65
70					70
75					75
80					80
85					85
90					90
95					95

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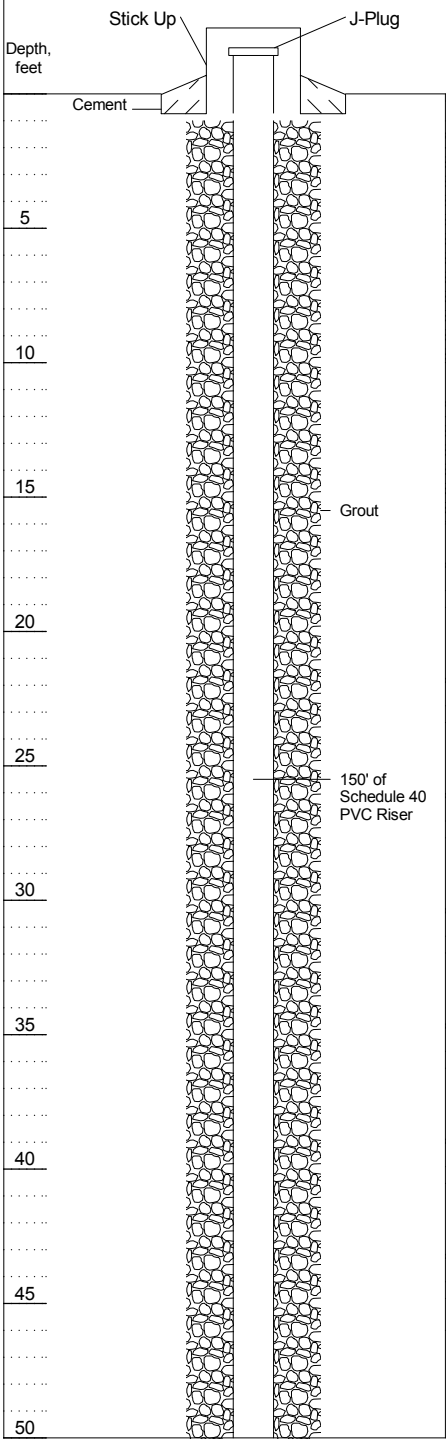
WELL CONSTRUCTION LOG

WELL NO. **CFMW-045a**	LATITUDE **48.390254**	LONGITUDE **-114.138061**		
PROJECT NO./NAME **2476.0001Y002 / CFAC RI/FS Phase 1**		LOCATION **2000 Aluminum Drive Columbia Falls, Montana**		
APPROVED BY **A. Muscietta**	LOGGED BY **A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER **Cascade Drilling / Carlos Anguiano**		GEOGRAPHIC AREA **Rectifier Yards**		
DRILL BIT DIAMETER/TYPE **6-in. / Sonic Bit**	BOREHOLE DIAMETER **6-inches**	DRILLING EQUIPMENT/METHOD **Truck Mounted / Rotosonic**	SAMPLING METHOD **Continuous Core**	START-FINISH DATE **8/12/16-8/16/16**
CASING MAT./DIA. **PVC / 2-inch**	SCREEN: TYPE **Slotted** MAT. **PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**			



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to coarse SAND and fine GRAVEL, little Silt; moist.		0.0	6 ft recovery
	Brown, fine to coarse GRAVEL, little fine to coarse Sand; dry.		0.0	
5				
			0.0	10 ft recovery
10				
	Brown, fine to coarse SAND and fine to medium GRAVEL, trace silt; dry.		0.0	
	Brown, fine to coarse GRAVEL, little fine to coarse Sand; dry.		0.0	
15				
	Brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt, trace cobble; moist.		0.0	10 ft recovery
20				
25				
			0.0	10 ft recovery
30				
35				
			0.0	7 ft recovery
40				
			0.0	10 ft recovery
45				
	Brown, fine to coarse SAND; dry.		0.0	
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-045a	**48.390254**	**-114.138061**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to coarse SAND; dry. *(continued)*			
				0.0	13 ft recovery
55					
60					
		Brown, fine to coarse SAND, little Silt; dry.		0.0	
65				0.0	
	Grout	Brown, fine to coarse SAND; dry		0.0	15 ft recovery
70					
75					
	150' of Schedule 40 PVC Riser				
		Brown, fine to coarse SAND, trace silt; moist.		0.0	
80					
		Brown, medium SAND, some fine to coarse Sand, trace silt; wet.		0.0	15 ft recovery
85					
90					
95					
				0.0	15 ft recovery
100					
105					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-045a	**48.390254**	**-114.138061**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110		Brown, medium SAND, some fine to coarse Sand, trace silt; wet. *(continued)*			
				0.0	15 ft recovery
115	Grout				
120					
125	150' of Schedule 40 PVC Riser				
				0.0	15 ft recovery
130					
135					
140					
		Brown, fine to coarse SAND, little Silt; wet.		0.0	15 ft recovery
145	Bentonite Plug				
150	#2 Sand	Grey to brown, fine to coarse SAND, little Silt; wet.		0.0	
155	10' of 20-Slot Schedule 40 PVC Screen	Grey to brown, fine to coarse SAND, trace silt; wet.		0.0	
		Grey to brown, fine to coarse SAND, some Silt, trace clay; wet (loose).		0.0	15 ft recovery
160	Well Plug				
		Grey to brown, fine to coarse SAND, trace silt; wet.		0.0	
	Bentonite				

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WELL NO.	LATITUDE	LONGITUDE
CFMW-045a	**48.390254**	**-114.138061**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165		Grey to brown, fine to coarse SAND, trace silt; wet. *(continued)*			
		Brown, CLAY, some Silt, trace fine sand; wet (stiff).		0.0	
170		Grey to brown, fine to coarse SAND, some Silt, trace clay; wet (loose).		0.0	
				0.0	15 ft recovery
175	Grout				
		Grey to brown, fine to coarse SAND, trace silt; wet (loose).			
180					
185					
		Grey to brown, fine to coarse SAND, some Silt, trace clay; wet (loose).		0.0	15 ft recovery
190					
195					
200					
		Grey to brown, fine SAND and SILT, little Clay; wet (stiff).		0.0	25 ft recovery
205					
210					
215					
220					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-045a	**48.390254**	**-114.138061**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Grey to brown, fine SAND and SILT, little Clay; wet (stiff). *(continued)*			
225				0.0	15 ft recovery
230	Grout				
235					
240				0.0	
245		Brown to grey, fine SAND and SILT, some Clay, trace fine gravel; wet (stiff).		0.0	
250					
255					
260		Grey CLAY and SILT, little fine to medium Gravel, trace cobble, trace fine to coarse sand; wet (stiff).		0.0	13 ft recovery
265		Grey, fine to coarse SAND, some Clay, some Silt, little fine to medium Gravel; wet (loose).		0.0	
270		Grey, fine to coarse SAND, some Clay, some Silt, little fine to medium gravel; dry (stiff).		0.0	7 ft recovery
275		Brown to tan, fine to coarse SAND, some Silt, some Clay, little fine to medium Gravel, trace cobble; dry (stiff).		0.0	5 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-045a	**48.390254**	**-114.138061**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280			Brown to tan, fine to coarse SAND, some Silt, some Clay, little fine to medium Gravel, trace cobble; dry (stiff). *(continued)*			280
			Brown, fine to coarse SAND, some Silt, some Clay, little fine to medium Gravel; dry (stiff).		0.0	10 ft recovery
285	Grout				0.0	285
290						290
					0.0	9 ft recovery
295			Brown, fine to coarse SAND, some Silt, some Clay, little fine to medium Gravel; dry (stiff).		0.0	295
300						Bottom of boring at 300 ft bls 300

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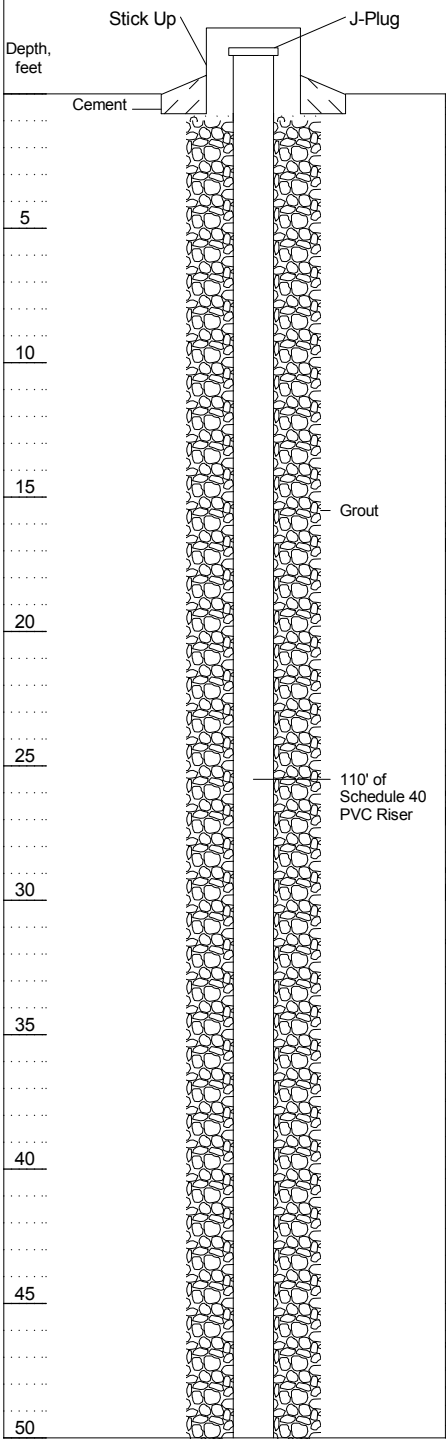
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-047	**48.389726**	**-114.130678**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Rectifier Yards**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/21/16-6/22/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Brown, fine to medium SAND, some fine to coarse Gravel, little Silt, trace cobble; moist.		0.1	5 ft recovery
	Dark brown, fine to medium SAND, some fine to coarse Gravel and Silt, little Cobble; moist.		0.2	Sample CFMW-047-SO-0-0.5 collected Sample CFMW-047-SO-0.5-2 collected
5				5
	Brown, fine to medium SAND, some fine to coarse Gravel, little Silt and Cobble; dry to moist.			2.5 ft recovery
	Brown, coarse GRAVEL, some fine Sand and Cobble, little Silt; dry.		0.1	
10				10
	Brown, fine to medium SAND, some fine to coarse Gravel, trace silt and cobble; moist.		0.4	5 ft recovery
	Brown with red tint, fine to coarse SAND, some fine to coarse Gravel, trace cobble; moist.		0.0	Sample CFMW-047-SO-10-12 collected
15				15
	Brown, fine to coarse GRAVEL, little medium to coarse Sand, trace cobble and silt; moist.		1.1	5 ft recovery
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Silt, trace cobble; moist.		0.4	
20				20
	Brown, fine to medium SAND, some fine to coarse Gravel, trace cobble; moist.		0.1	5 ft recovery
	Brown, fine to medium SAND and fine to coarse GRAVEL, little Silt, trace cobble; moist to wet.		0.2	
25				25
	Brown to gray, fine to coarse GRAVEL, some fine to coarse Sand, little Cobble; moist to wet.		0.1	5 ft recovery
30				30
	Brown to gray, fine to coarse SAND, some fine to coarse Gravel, little Crushed rock and Silt; dry.		0.2	5 ft recovery
35				35
	Brown to gray, fine to medium SAND, some fine to coarse Gravel, little Crushed rock, trace cobble and silt; moist.		0.2	5 ft recovery
40				40
	Brown, fine to medium SAND, little Silt, trace cobble and gravel; moist.		2.2	2.5 ft recovery
45				45
	Brown to gray, SAND, some fine to medium Gravel and Crushed rock, little Cobble and Silt; moist.		0.4	5 ft recovery
50				50

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-047	**48.389726**	**-114.130678**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Gray to brown, fine to medium SAND, little fine to medium Gravel and Crushed rock, trace cobble; dry.		0.3	2.5 ft recovery
55		Brown, fine to medium SAND, little fine to medium Gravel, trace cobble; moist.		0.1	5 ft recovery
60		Gray to brown, fine to coarse SAND, some medium to coarse Gravel, little Silt and Crushed rock, trace cobble; dry.		1.4	5 ft recovery
65	Grout	No recovery.			No recovery
70		Gray to brown, fine to medium SAND, some medium to coarse Gravel, little Silt and Crushed rock, trace cobble; dry.		0.6	5 ft recovery
75	110' of Schedule 40 PVC Riser	Brown to gray, fine to medium SAND, some fine to medium Gravel, little Crushed rock; dry to moist.		1.1	5 ft recovery, orange staining
80		Brown, fine to medium SAND, some fine Gravel, trace cobble and silt; moist.		0.5	5 ft recovery
		Gray, fine SAND, some fine to medium Gravel, little Crushed rock and Silt; dry.		0.5	Orange staining
85		Brown, fine SAND, little Silt; moist to wet.		0.2	5 ft recovery
90		Brown, fine SAND, trace silt; moist.		0.2	5 ft recovery
		Brown, fine SAND, trace coarse gravel; moist to wet.		0.0	
95				2.0	2.5 ft recovery
				0.1	
100		Brown, fine SAND, little Gravel; moist to wet.		0.1	5 ft recovery
		Brown, fine SAND; wet.		0.0	
		Brown, fine SAND; moist to wet.		0.2	
105	Bentonite Plug	Brown, fine SAND; wet.			5 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-047	**48.389726**	**-114.130678**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine SAND; wet. *(continued)*		0.1	
110					5 ft recovery
	#2 Sand			0.2	
115	10' of 20-Slot Schedule 40 PVC Screen				5 ft recovery
				0.1	
120	Well Plug	Brown, fine SAND; moist to wet.		0.0	End of boring at 120 ft bls

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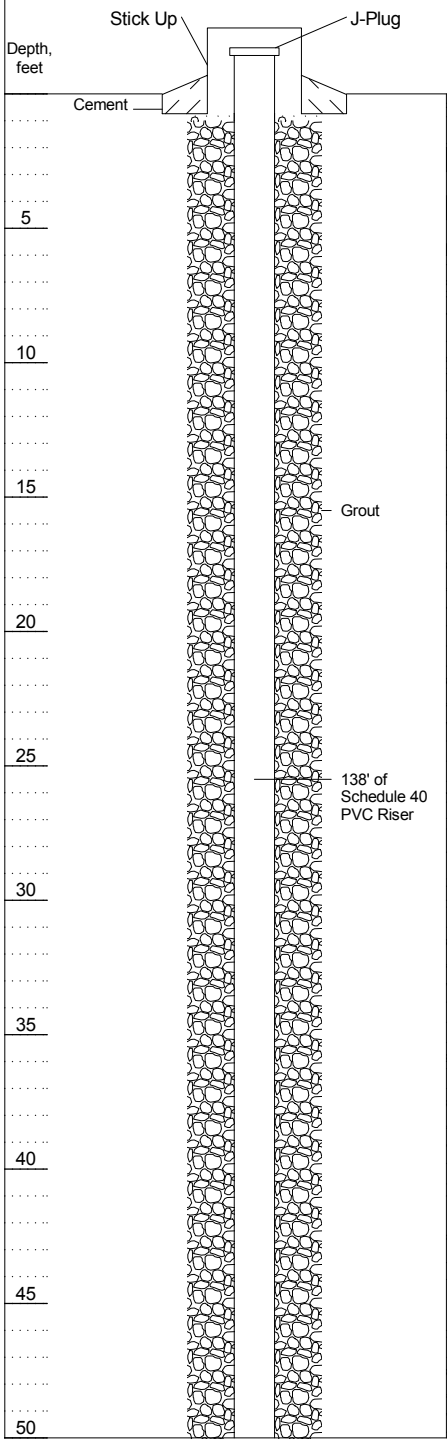
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-049a	**48.389839**	**-114.128787**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Rectifier Yards**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**8/20/16-8/25/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Dark brown, fine to medium SAND, little Silt, little medium to coarse Gravel; moist, loose	0.1	6 ft recovery
		0.0	Sample CFMW-049a-SO-0-0.5 collected
	Dark brown, fine SAND, little fine Gravel; moist loose		CFMW-049a-SO-0-0.5-Pb collected
5	Brown to dark grey, medium to coarse GRAVEL, some fine to medium SAND, little clay, trace cobble; dense, moist	0.0	Sample CFMW-049a-SO-0.5-2 collected
	Brown, medium to coarse GRAVEL, some medium SAND, little Cobble, trace clay; moist, loose		7 ft recovery
10		0.0	
			Sample CFMW-049a-SO-10-12 collected
15			
	Brown to grey, fine to medium SAND, some medium to coarse Gravel, little Silt, trace cobble; moist, dense		10 ft recovery
20			
		0.0	
25			
	Light brown/grey SILT, some fine Sand, some medium to coarse Gravel; moist, soft		10 ft recovery
		0.2	
30			
	Brown, coarse SAND, some fine Gravel, trace cobble; moist, loose		
		0.0	
35			
	Dark brown to grey, medium to course SAND, some fine to coarse Gravel, little Silt; moist, loose		10 ft recovery
		0.1	
40			
	Brown, fine to coarse SAND, some fine to medium Gravel, little Silt, trace cobble; moist, loose		
		0.0	
45			
	Light grey to brown, fine to medium SAND, some fine to coarse Gravel, little Silt; moist, dense		10 ft recovery
50		0.2	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-049a	**48.389839**	**-114.128787**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Light grey to brown, fine to medium SAND, some fine to coarse Gravel, little Silt; moist, dense *(continued)*			
55	Light grey, medium to coarse GRAVEL, some fine Sand, little crushed Rock, trace cobble; dry, loose		0.3	
	Grey to brown, fine to coarse GRAVEL, some fine to medium Sand, little Cobble, trace silt; moist, dense			7 ft recovery
60			0.1	
	Light grey, fine to coarse SAND, some fine to medium Gravel, little pulverized Rock; dry, loose		0.3	
65	Light grey, fine to coarse GRAVEL, some fine to medium SAND, little pulverized Rock; moist to dry, loose			11 ft recovery
70			0.0	
75	Light brown/slight orange, fine to coarse SAND, some fine Gravel, little Silt, trace cobble; moist, loose		0.2	
	Light grey, fine to medium SAND, little fine to medium Gravel, little pulverized Rock; dry to moist, loose			9 ft recovery
80			0.2	
85				
	Brown, fine to medium SAND, trace fine gravel; moist to wet, loose		0.0	
	Light brown, SILT, some fine to medium SAND, trace fine gravel; moist, soft		0.2	10 ft recovery
90	Light grey, fine to medium SAND and GRAVEL, some pulverized Rock, trace cobble; dry, loose			
95			0.0	
	Light brown to grey, fine SAND and medium to coarse GRAVEL, little pulverized Rock, trace cobble, trace silt; moist, loose to dense			10 ft recovery
100			0.6	
105	Light grey, fine SAND, some pulzerived Rock, some fine to medium Gravel, little Cobble; dry, loose		0.2	
				8 ft recovery

Grout

138' of Schedule 40 PVC Riser

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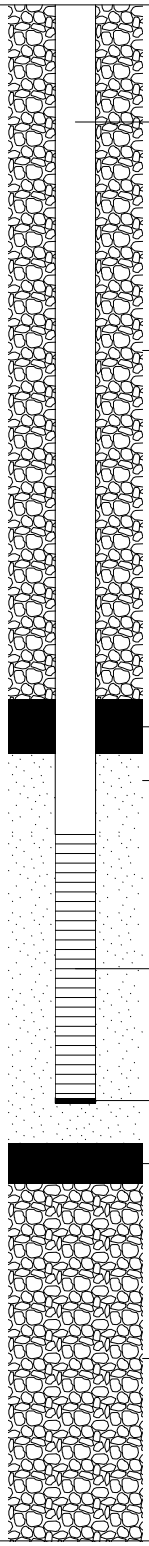
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-049a	**48.389839**	**-114.128787**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110		Brown to gray, fine SAND and fine to coarse GRAVEL, trace cobble; moist, dense *(continued)*		0.0	
115		Brown, fine SAND and fine to medium GRAVEL, little Cobble; wet, loose		0.5	
120				0.0	8 ft recovery Sample CFMW-049a-SO-112-117 collected
125		Brown, fine to medium SAND, trace silt, trace gravel; wet, loose		0.1	
130				0.0	9 ft recovery
135		Brown, fine to medium SAND, some fine to coarse Gravel, little Silt, trace cobble; moist to wet, dense		0.1	
140		Brown, fine to medium SAND and GRAVEL, trace cobble; wet, loose		0.3	9 ft recovery
145		Brown, fine to coarse SAND, some medium to coarse GRAVEL, some Silt, trace cobble; wet, dense		0.2	3 ft recovery
150		Grey, fine to medium GRAVEL, some medium to coarse SAND, little Silt, little Cobble; moist to wet, loose		0.0	7 ft recovery 7" Conductor casing set to 150 ft bls
155		Light brown/slight orange, SILT, little fine to medium Gravel, little low plasticity Clay; dry to moist, stiff		0.1	12 ft recovery
160				0.2	



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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-049a	**48.389839**	**-114.128787**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165		Light brown/slight orange, SILT, trace fine to medium gravel, trace low plasticity clay; moist, stiff *(continued)*		0.8	
		Light brown, SILT, little fine Sand, little fine to medium Gravel; moist, dense		0.7	8 ft recovery
170		Light brown/slight orange, SILT, little low plasticity Clay, little fine Sand, trace fine gravel; moist, stiff		0.3	
175	Grout				
		Light brown/slight orange, SILT, some fine Gravel, little low plasticity Clay, trace fine sand; moist, stiff			15 ft recovery
180				0.1	
185					
190					10 ft recovery
195				0.1	
200		Light brown/light grey, fine SAND and SILT, little coarse Gravel, little pulverized Rock, trace cobble; dry, loose		0.0	
		Light brown, fine SAND and SILT, little fine to medium Gravel, little pulverized Rock, trace cobble; dry, loose		0.0	4 ft recovery
205		Light brown, fine SAND and SILT, some pulverized Rock, little fine Gravel; moist to dry, loose		0.0	9 ft recovery
210		Light brown SILT, little Clay, little coarse Sand, trace medium gravel; moist, stiff		0.2	
215		Brown/slight red, SILT, little Clay, trace fine gravel; moist, stiff		0.1	12 ft recovery
220		Orange brown, SILT, little Clay, trace fine gravel; moist, stiff			

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-049a	**48.389839**	**-114.128787**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Orange brown, SILT, little Clay, trace fine gravel; moist, stiff *(continued)*		0.3	
225					225
		Brown/slight red, SILT, little Clay, trace fine gravel; moist, soft to stiff		0.2	10 ft recovery
230	Grout	Brown/slight red to orange, SILT, little medium to coarse Gravel, little fine Sand; moist, stiff		0.2	230
235					235
		Brown, SILT, little fine Gravel, little fine Sand; moist, soft to stiff		0.2	8 ft recovery
240		Grey, fine to coarse SAND, some pulverized Rock, some fine to medium Gravel; dry, loose		0.2	240
		Light brown, fine SAND and SILT, little fine to edium Gravel; moist, soft to stiff		0.5	
245					245
		Light brown, fine SAND and SILT, some fine Gravel; moist, soft		0.0	10 ft recovery
		Brown, SILT, little fine Gravel, trace clay; moist, stiff			
250				0.3	250
		Grey, fine SAND, some pulverized Rock, little fine Gravel, little Cobble; dry, loose		0.4	
255		Brown/slight orange, SILT, little fine to medium Gravel; moist, stiff		0.7	255
		Brown, SILT, some fine to medium Gravel, little fine Sand; moist, stiff		0.2	15 ft recovery
260		Light brown/slight orange, SILT, little Clay, trace fine to medium gravel, trace fine sand; moist, stiff			260
265				0.0	265
270					270
		Light brown, SILT, little fine to medium Gravel, trace low plasticity clay; moist, stiff			9 ft recovery
275				0.2	275

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-049a	**48.389839**	**-114.128787**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS	
280			Light brown, SILT, little fine to medium Gravel, trace low plasticity clay; moist, stiff *(continued)*				280
						9 ft recovery	
285	Grout				0.1		285
290							290
			Light brown, SILT, little fine Sand, trace fine gravel, trace clay; dry to moist, soft where silt fractured		0.1	3 ft recovery	
295			Brown/slight orange, SILT, little Clay, trace fine gravel; moist, stiff			6 ft recovery	295
					0.0		
300						End of boring at 300 ft bls	300

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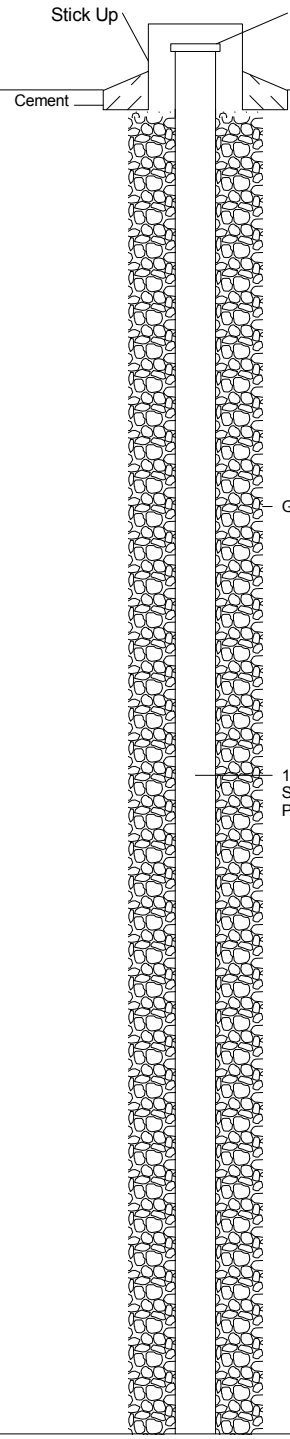
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-050	**48.389354**	**-114.128187**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Main Plant Area**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/22/16-6/24/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to medium SAND, some Silt, little fine Gravel and Topsoil; moist.		1.7	5 ft recovery
	Dark brown, fine to medium SAND, some fine to coarse Gravel and Silt, trace cobble; moist.		0.5	Sample CFMW-050-SO-0-0.5 and CFMW-050-SO-0-0.5-Pb collected
	Dark brown to black, fine to coarse GRAVEL, some fine Sand and Silt, trace cobble; moist (dense).		5.5	Sample CFMW-050-SO-0.5-2 collected
5			5.5	5 ft recovery
	Brown, medium to coarse GRAVEL, some fine Sand, little Silt, trace cobble; moist (dense).		0.1	
	Brown, coarse GRAVEL, some Cobble, little fine to coarse Sand and Silt; moist.		0.5	
10				5 ft recovery
	Brown, coarse SAND, some fine to medium Gravel, trace cobble; moist.		2.0	
	Gray to brown, fine to medium GRAVEL, some fine to medium Sand and Cobble; moist.		1.0	Sample CFMW-050-SO-10-12 collected
15				5 ft recovery
	Gray to red, fine to medium GRAVEL, some fine to coarse Sand, little Cobble and Crushed rock; dry.		0.4	
	Brown, coarse SAND, some fine to medium Gravel, little Crushed rock, trace silt and cobble; moist.		0.7	
20				5 ft recovery
	Brown to gray, fine to medium GRAVEL, some fine to medium Sand, little Silt, trace cobble; dry to moist.		0.7	
	Gray, fine to coarse GRAVEL, some fine to medium Sand, trace silt; dry to moist.		1.4	
25				5 ft recovery
	Brown, fine to medium GRAVEL, some fine Sand, little Silt, trace cobble; moist to wet.		0.3	
	Brown to red, fine to medium SAND, some fine to medium Gravel, trace silt and cobble; moist.		0.2	
30				5 ft recovery
	Brown, medium SAND, some fine to coarse Gravel and Cobble, little Silt; moist.		0.1	
	Brown, fine to coarse GRAVEL, some medium Sand, trace cobble, silt and crushed rock; moist.		0.1	
35				5 ft recovery
	Brown, coarse GRAVEL, some fine Sand and Cobble, little Silt; mosit to wet.		0.1	
	Brown, coarse SAND, some fine to coarse Gravel, little Silt, trace cobble; moist.		0.3	Black and orange staining
40				5 ft recovery
	Brown, fine to medium GRAVEL, little Crushed rock and Silt; dry to moist.		0.2	
	Gray, fine to medium SAND, some fine Gravel, little Crushed rock, trace silt; dry.		0.5	
45				5 ft recovery
	Brown, fine to coarse GRAVEL, some coarse Sand, trace cobble and silt; moist to wet.		0.5	
			0.5	
50			0.2	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-050	**48.389354**	**-114.128187**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Gray, fine to medium GRAVEL, some fine to medium Sand, little Crushed rock, trace cobble; dry. *(continued)*		1.0	5 ft recovery
55				55
			0.0	5 ft recovery
	Brown, fine SAND, trace gravel and silt; dry to moist.		0.0	
60				60
	Brown, fine SAND, little fine to medium Gravel and Silt; dry to moist.		0.0	5 ft recovery
	Gray, fine GRAVEL, some fine to medium Sand, little Silt and Crushed rock; dry.		0.0	
			0.7	
65	Brown, fine SAND, little Silt, trace gravel; dry to moist.			65
	Grout		0.6	5 ft recovery
	Gray, fine to medium GRAVEL, some fine to medium Sand, little Crushed rock, trace cobble and silt; dry.		0.3	
70				70
	Brown, fine to medium GRAVEL, some fine to medium Sand, little Silt, trace cobble; dry to moist.		1.1	5 ft recovery
75	Gray, fine SAND, some fine to medium Gravel, little Silt, trace cobble; dry.			75
	110' of Schedule 40 PVC Riser		0.5	5 ft recovery
	Gray to brown, medium to coarse GRAVEL, some fine to coarse Sand, little Silt, trace cobble; moist.		0.0	
	Gray, fine SAND, some fine to medium Gravel, little Silt, trace cobble; dry.		0.9	
80				80
	Gray, fine to medium GRAVEL, some fine to medium Sand, little Crushed rock, trace silt and cobble; dry.		0.8	5 ft recovery
85				85
	Gray, fine SAND, some fine Gravel and Crushed rock, trace cobble; dry.			4 ft recovery
90			1.0	90
	Brown, coarse SAND, some fine to coarse Gravel, some Silt, trace cobble; moist to wet.		0.8	5 ft recovery
95				95
	Brown to gray, fine to coarse GRAVEL, some fine to coarse Sand, little Silt, trace cobble; dry to moist.		1.1	5 ft recovery Purple staining
	Brown to gray, fine to coarse SAND, some fine Gravel, little Silt and Crushed rock; dry to moist.		3.0	Purple staining
100				100
	Brown, fine SAND, trace gravel; wet.		0.7	5 ft recovery
105				105
	Bentonite Plug			5 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-050	**48.389354**	**-114.128187**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine SAND, trace gravel; wet. *(continued)*		0.9	
110					110
	#2 Sand	Brown with black staining, fine SAND, trace gravel; wet.		0.2	5 ft recovery Black staining
		Brown, fine SAND, trace silt; wet (dense).		0.3	
115	10' of 20-Slot Schedule 40 PVC Screen				115
		Brown, fine to medium SAND, trace silt and gravel; wet.		1.6	5 ft recovery
		Brown, fine to medium SAND, trace silt; wet.		0.2	
120	Well Plug				End of boring at 120 ft bls 120

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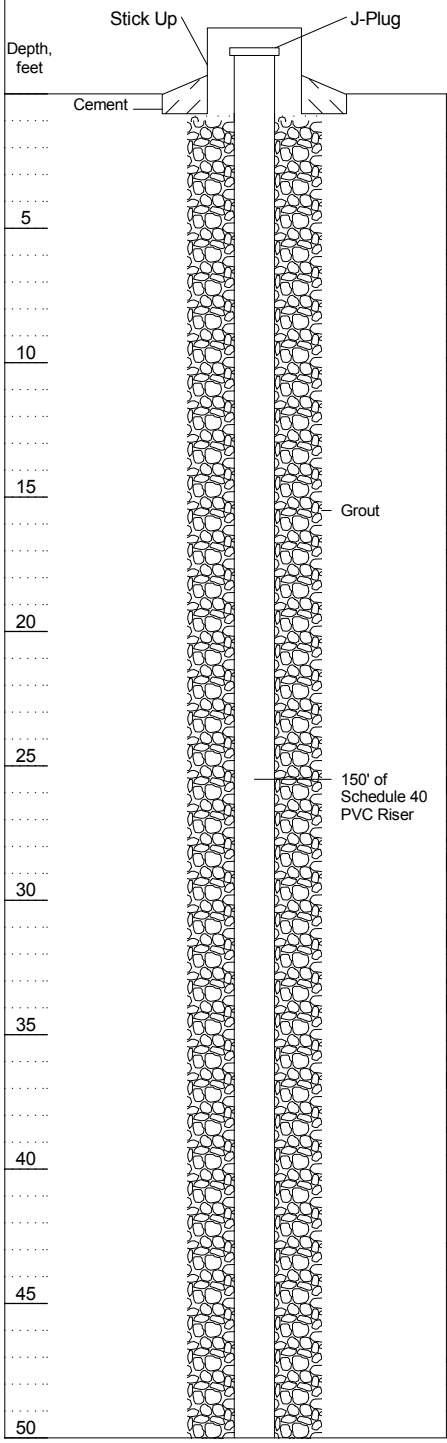
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-053a	**48.390701**	**-114.142032**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Rod Mill**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**8/17/16-8/19/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to coarse SAND and fine to medium GRAVEL, some coarse Gravel, trace cobble; moist (loose).		0.0	4 ft recovery Sample CFMW-053a-SO-0-0.5 collected CFMW-053a-SO-0-0.5-Pb collected
	Brown, medium GRAVEL, some fine and coarse Gravel, little fine to coarse Sand; dry (loose).		0.0	Sample CFMW-053a-SO-0.5-2 collected 10 ft recovery
5				
	Brown, medium GRAVEL, some fine and coarse Gravel, little fine to coarse Sand, trace silt and cobble; dry (loose).			
10			0.0	Sample CFMW-053a-SO-10-12 collected
15				
	Brown, fine to medium GRAVEL, some fine to coarse Sand, little coarse Gravel, trace cobble and silt; dry (loose).		0.0	5 ft recovery
20				
	Brown, fine to coarse GRAVEL, some fine to coarse Sand, little Cobble, trace silt and pulverized cobble; dry (loose).		0.0	9 ft recovery
25				
30			0.0	7 ft recovery
	Brown, fine to coarse GRAVEL and fine to coarse SAND, some pulverized Cobble; dry (loose).		0.0	
35				
	Brown, fine to coarse SAND, some fine to coarse Gravel, little Cobble, trace silt; dry (loose).		0.0	11 ft recovery
40				
45				
	Brown, fine to coarse SAND and fine to coarse GRAVEL, some pulverized		0.0	10 ft recovery
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-053a	**48.390701**	**-114.142032**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Cobble/Boulder, trace silt; dry (loose).		0.0	
	Brown, fine to coarse SAND, some fine Gravel, little Silt, trace medium to coarse gravel; moist (loose). *(continued)*		0.0	
	Brown, fine to coarse SAND, little fine Gravel; moist (loose).			
55	Brown, fine to medium SAND, little Silt; wet (loose).		0.0	55
	Brown, fine to medium SAND, trace silt; wet (loose).			10 ft recovery
60				60
			0.0	
65	Grout			Sample CFMW-053a-SO-59-64 collected 65
	Brown, fine to medium SAND, little Silt; wet (loose).			16 ft recovery
70				70
75	150' of Schedule 40 PVC Riser		0.0	75
80				80
85	Brown, fine to medium SAND, some Silt; wet (loose).			16 ft recovery 85
90				90
			0.0	
95				95
100				100
	Brown, fine SAND, some Silt, little medium Sand, trace clay; wet (medium dense/stiff).			16 ft recovery
105				105

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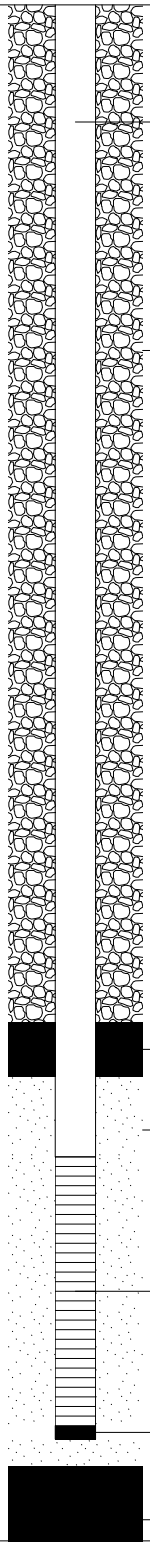
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-053a	**48.390701**	**-114.142032**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**

APPROVED BY	LOGGED BY	
A. Muscietta	**A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110		Brown, fine SAND, some Silt, little medium Sand, trace clay; wet (medium dense/stiff). *(continued)*		0.0	
115					15 ft recovery
120				0.0	
125		Light gray, fine SAND and SILT, little high plasticity Clay; wet (medium dense/stiff).			
130				0.0	
135		Light gray/light brown, fine SAND and SILT, trace high plasticity clay; wet (medium stiff/dense).			16 ft recovery
140				0.0	
145					15 ft recovery
150					
155				0.0	
160					
		Light gray/light brown, fine to medium SAND, some Silt, trace high plasticity clay; wet (medium dense/stiff).			15 ft recovery



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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-053a	**48.390701**	**-114.142032**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Bentonite	Light gray/light brown, fine to medium SAND, some Silt, trace high plasticity clay; wet (medium dense/stiff). *(continued)*			
				0.0	
170					
175					
					10 ft recovery
180	Grout				
				0.0	
185					
					10 ft recovery
190					
				0.0	
195					
					15 ft recovery
200					
				0.0	
205					
210					
					15 ft recovery
215					
				0.0	
220					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-053a	**48.390701**	**-114.142032**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Light brown/light gray, fine SAND and SILT, some high plasticity clay; wet (medium stiff/dense). *(continued)*			
230	Grout	Light gray/light brown, fine SAND and SILT, some high plasticity Clay, trace medium sand; wet (medium dense/stiff).			15 ft recovery
235				0.0	
240					
245		Light gray/light brown, fine SAND and SILT, some high plasticity Clay; wet (medium dense/stiff).			15 ft recovery
250				0.0	
255					
260					20 ft recovery
265				0.0	
270					
275					15 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-053a	**48.390701**	**-114.142032**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280	Grout	Light gray/light brown, fine SAND and SILT, some high plasticity Clay; wet (medium dense/stiff). *(continued)*		0.0	
285		Light gray/light brown, fine to coarse SAND, little Silt, trace clay and fine gravel; wet (loose).		0.0	
290		Light brown/light gray, fine to medium SAND and SILT, little coarse Sand, trace high plasticity clay and fine gravel; wet.		0.0	9 ft recovery
295					
300					

End of boring at 300 ft bls

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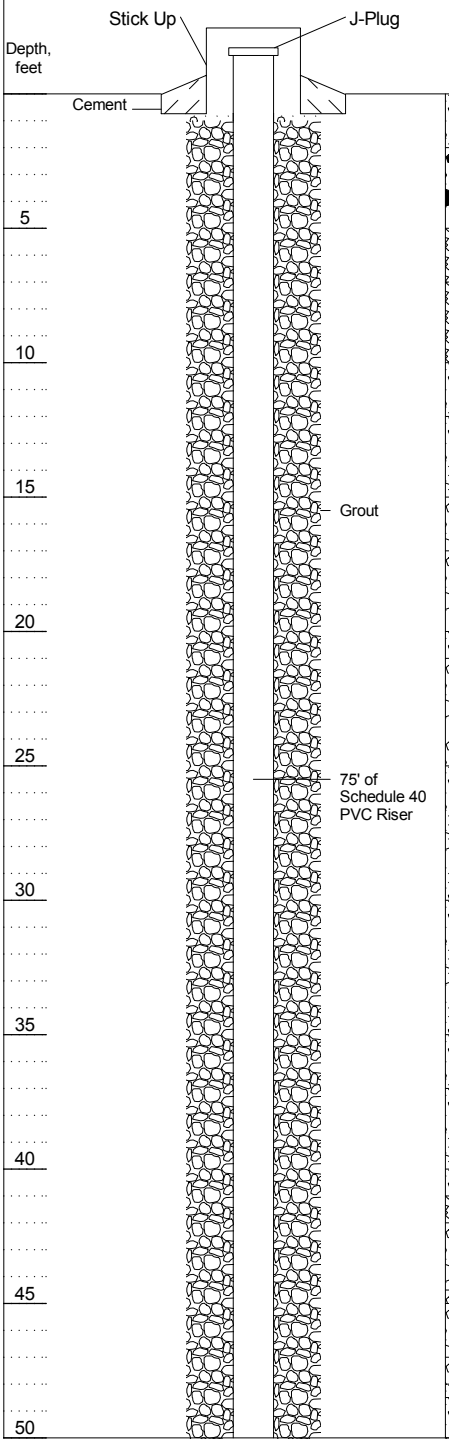
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-054	**48.3905428**	**-114.1444823**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **Rod Mill**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**6/20/16-6/21/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to medium SAND, some medium Gravel, trace cobble and silt; moist.		0.0	2 ft recovery
			0.4	Sample CFMW-054-SO-0-0.5 collected
	Brown to gray, fine to coarse GRAVEL, some medium to coarse Sand, little Cobble, trace silt; moist.		0.4	Sample CFMW-054-SO-0.5-2 collected, black staining
5				5
	Brown to gray, GRAVEL and COBBLE, little fine to medium Sand; dry to moist (loose).		0.4	5 ft recovery
	Gray, medium to coarse GRAVEL and COBBLE, little fine to coarse Sand and Crushed rock; moist.		0.1	
10				10
	Gray, fine SAND and CRUSHED ROCK, little Gravel and Cobble; dry (loose).		3.0	2.5 ft recovery
	Gray, medium to coarse SAND, some Cobble; moist.		1.7	Sample CFMW-054-SO-10-12 collected
15				15
	Gray, medium GRAVEL, some fine Sand, little Cobble; dry.		0.0	3 ft recovery
	Gray, medium to coarse GRAVEL, some fine to coarse Sand, little Cobble, trace silt; dry.		0.1	
20				20
	Gray, fine SAND, some medium to coarse Gravel and Crushed rock, trace cobble; dry.		0.3	5 ft recovery Red staining
	Brown to gray, coarse GRAVEL, some medium to coarse Sand, little Cobble and Crushed rock; dry.		3.0	
25				25
	Brown to reddish brown, fine to medium SAND, little fine to medium Gravel, trace cobble and silt; moist.		0.1	5 ft recovery
30				30
	Brown, medium to coarse SAND, little fine to coarse Gravel, trace cobble; moist to wet.		1.2 1.4	2.5 ft recovery
35				35
	Brown, medium to coarse SAND, some fine to medium Gravel, trace cobble and silt; moist to wet.		1.0	5 ft recovery
	Brown to gray, medium SAND, some fine to medium Gravel, trace cobble and crushed rock; moist to wet.		1.0	
40				40
	Brown to gray, fine SAND, little Gravel and Crushed rock, trace silt; dry.		1.0	5 ft recovery
	Brown, coarse GRAVEL and COBBLE, little medium Sand, trace silt; moist.		1.8 0.7	
	Brown, medium SAND, some medium to coarse Gravel, little Cobble; moist to wet.		0.7	
45				45
	Gray, fine SAND, some medium Gravel, little Crushed rock; dry.		0.5	5 ft recovery
	Brown, medium SAND; wet.		0.5	
	Brown, medium SAND, some coarse Gravel, trace cobble; moist to wet.		0.7	Yellow-orange staining
50	Gray, fine SAND, some Crushed rock, little			50

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-054	**48.3905428**	**-114.1444823**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**S. Ward**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
	medium Gravel; dry.		0.7	5 ft recovery
	Brown to gray, medium to coarse SAND, little fine Gravel, trace cobble; moist.		1.0	
	Gray, fine to coarse SAND, some fine to medium Gravel, little Crushed rock; dry.		1.9	
55	Brown to gray, fine to coarse GRAVEL, some fine to coarse Sand and Cobble, trace silt; moist.			No recovery
	No recovery.			
60	Brown, medium to coarse SAND, some medium to coarse Gravel, little Silt, trace cobble; moist.		1.6	1 ft recovery
65	Brown, medium to coarse SAND, little fine Gravel, trace cobble; wet.		0.7	5 ft recovery
	Brown, fine SAND; wet.		2.2	
70				5 ft recovery
	Brown, fine SAND, little Silt; wet.		2.2	
	Brown, fine to medium SAND; wet (loose).		0.4	
75	Brown, fine to medium SAND, little Silt; wet.			5 ft recovery
80			0.4	
	Brown, medium SAND, trace gravel; wet (loose).			5 ft recovery
			0.0	
85				End of boring at 85 ft bls

Grout

Bentonite Plug

#2 Sand

10' of 20-Slot Schedule 40 PVC Screen

Well Plug

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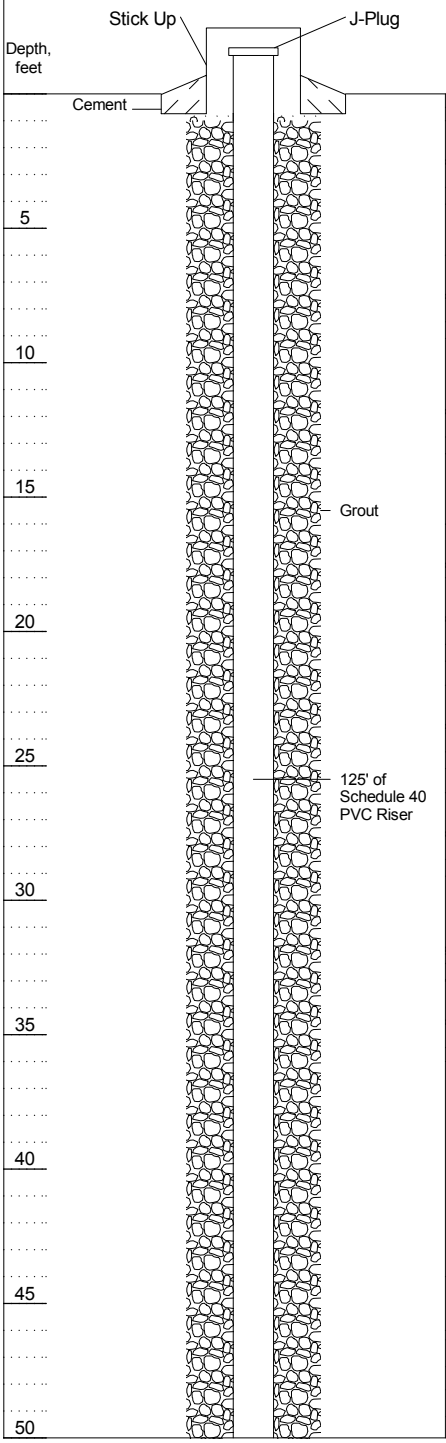
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-056a	**48.394783**	**-114.149879**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A.Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Aluminum City**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**7/15/16-7/19/16**

CASING MAT./DIA.: **SCH 40 PVC / 2-inch**
SCREEN: TYPE **Slotted** MAT. **SCH 40 PVC** TOTAL LENGTH **10.0**ft DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to coarse SAND, little Silt and Organics, trace fine gravel; dry.		0.0	6 ft recovery
	Brown, fine to coarse SAND, little Silt, trace organics and fine gravel; dry.		0.1	Sample CFMW-056a-SO-0-0.5 and CFMW-056a-SO-0-0.5-Pb collected
5	Brown, fine to coarse SAND and GRAVEL (rounded), little Cobble; dry.		0.0	Sample CFMW-056a-SO-0.5-2 collected
	Brown, fine to coarse SAND and fine to coarse GRAVEL (rounded), some Cobble; dry.			10 ft recovery
10			0.0	
15				Sample CFMW-056a-SO-10-12 collected
	Brown, fine to coarse SAND, some fine to coarse Gravel (rounded); dry.		0.0	8 ft recovery
20	Brown, fine to coarse SAND and fine GRAVEL (angular), some medium to coarse Gravel (rounded), trace cobble; dry.		0.0	
	Brown, fine to coarse SAND, little fine to coarse Gravel (angular); dry.			
25			0.0	
	Brown, fine to coarse SAND, little fine to coarse Gravel; dry to moist.			8 ft recovery
30			0.0	
	Brown, fine to medium GRAVEL, little fine to coarse Sand; wet.		0.0	
35	Brown, fine to coarse SAND, trace fine to medium gravel; moist to wet.		0.0	
	Brown, fine to coarse SAND; wet.			10 ft recovery
40			0.0	
				Sample CFMW-056a-SO-37-42 collected
45	Brown to light gray, fine to coarse SAND, trace silt; wet.		0.0	
	Brown, fine to medium SAND, trace silt; wet (loose).			8 ft recovery
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-056a	**48.394783**	**-114.149879**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A.Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, trace silt; wet (loose). *(continued)*		0.0	
55		Brown, fine SAND, some Silt; wet (loose).		0.0	
		Brown, fine to medium SAND, trace silt; wet (loose).			15 ft recovery
		Brown to light brown, fine SAND and SILT, trace clay; wet (loose).			
60					
				0.0	
65					
70					
		Light brown to light gray, fine SAND and SILT, some Gravel, little Clay; wet (medium stiff).			15 ft recovery
75				0.0	
80		Light gray to brown, fine SAND and SILT, trace clay and medium gravel; moist (soft).		0.0	
85					
		Light brown to light gray, fine SAND and SILT, some medium to coarse Gravel, little Clay; wet (medium stiff).			15 ft recovery
90				0.0	
		Light brown to light gray, fine SAND and SILT, some Clay and medium Gravel, trace cobble; moist to wet (stiff).			
95				0.0	
100					
					12 ft recovery
105				0.0	

Grout

125' of Schedule 40 PVC Riser

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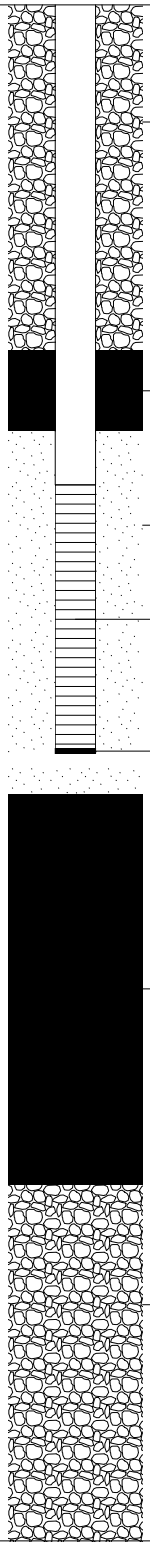
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-056a	**48.394783**	**-114.149879**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A.Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110		Light brown to light gray, fine SAND and SILT, some Clay and medium Gravel, trace cobble; dry (stiff). *(continued)*		0.0	
115				0.0	8 ft recovery
120					7" Conductor casing set to 120 ft bls
125		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, little Clay; moist to wet (medium dense).		0.0	11 ft recovery
130					17 ft recovery
135					
140				0.0	
145					
150					17 ft recovery
155				0.0	
160		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, little Clay; moist to dry (dense).			



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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-056a	**48.394783**	**-114.149879**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A.Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165				0.0	165
		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel, little Clay; moist (dense).			15 ft recovery
170				0.0	170
175	Grout				175
180					180
					15 ft recovery
185					185
190				0.0	190
195					195
					15 ft recovery
200				0.0	200
205		Orange-brown to tan, fine to coarse SAND, some Silt and fine to coarse Gravel and Cobble, little Clay; moist (dense).			205
210				0.0	210
		Orange-brown to tan, fine to coarse SAND, some Silt and fine to caorse Gravel, little Clay and Cobble; moist to wet (medium dense).			13 ft recovery
215				0.0	215
220					220

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-056a	**48.394783**	**-114.149879**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A.Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Dark orange-brown to tan, fine to coarse SAND and SILT, some Clay and fine to coarse Gravel, little Cobble; dry (very stiff). *(continued)*		0.0	
225		Orange-brown to tan, fine to coarse SAND and SILT, some Clay and fine to coarse Gravel, little Cobble; moist (stiff).			13 ft recovery
230				0.0	
	Grout				
235					
		Dark orange-brown, fine to coarse SAND, some Silt and fine to coarse Gravel, little Clay and Cobble; moist to wet (medium dense).			7 ft recovery
240				0.0	
245					14 ft recovery
250				0.0	
255					
260		Dark orange-brown, fine to coarse SAND, some Silt and fine to coarse Gravel, little Clay and Cobble; moist (dense).		0.0	7 ft recovery
		Dark orange-brown, fine to coarse SAND and SILT, some Clay and fine to coarse Gravel, little Cobble; dry (stiff).		0.0	
265					11 ft recovery
				0.0	
270		Dark orange-brown, fine to coarse SAND, some Silt and fine to coarse Gravel, little Clay and Cobble; moist to wet (medium dense).		0.0	
275		Brown to dark gray, fine to coarse SAND and SILT, some Clay and fine to coarse Gravel, little Cobble; dry (stiff).		0.0	
				0.0	3 ft recovery

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WELL NO.	LATITUDE	LONGITUDE
CFMW-056a	**48.394783**	**-114.149879**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A.Muscietta	**A. Hoffmann**	

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280			Brown to dark gray, fine to coarse SAND and SILT, some Clay and fine to coarse Gravel, little Cobble; moist (stiff).			14 ft recovery
285	Grout					
290					0.0	
						End of boring at 294 ft bls

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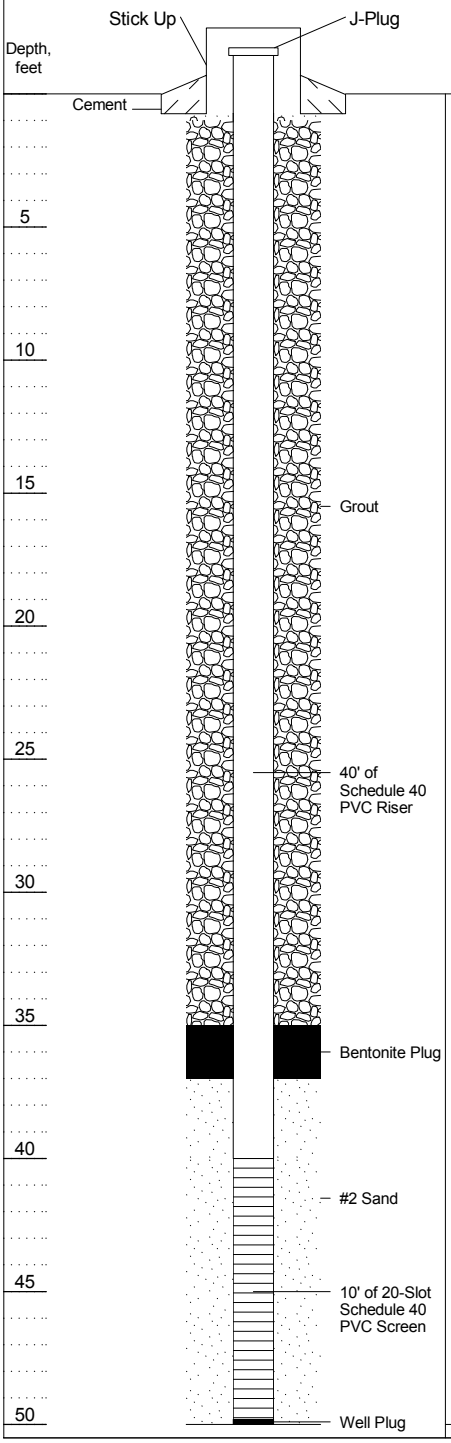
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE		
CFMW-056b	**48.394791**	**-114.149911**		
PROJECT NO./NAME		LOCATION		
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**		
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**		
A. Muscietta	**A. Hoffmann**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Cascade Drilling / Carlos Anguiano		**Aluminum City**		
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**7/19/16-7/19/16**
CASING MAT./DIA.	SCREEN:			
SCH 40 PVC / 2-inch	TYPE **Slotted**	MAT. **SCH 40 PVC**	TOTAL LENGTH **10.0**ft	DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Refer to geologic log for adjacent deep monitoring well CFMW-056a for lithology.			
5					5
10					10
15					15
20					20
25					25
30					30
35					35
40					40
45					45
50					50

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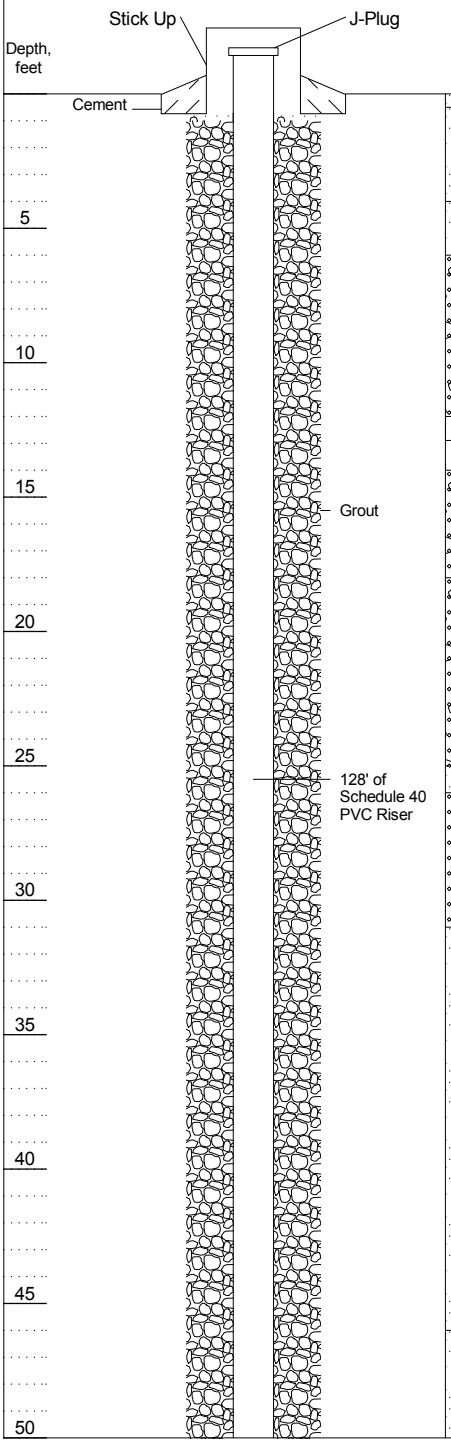
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-057a	**48.391837**	**-114.158263**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Aluminum City**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**7/27/16-7/30/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to medium SAND, trace silt and organics; dry.		0.8	6 ft recovery Sample CFMW-057a-SO-0-0.5 collected
	Brown, fine to medium SAND, trace silt; dry.		0.6	Sample CFMW-057a-SO-0.5-2 collected
5	Brown, fine to medium SAND, some Silt, little Clay; moist.		0.2	
	Brown, fine to coarse SAND and fine to medium GRAVEL, little Silt; moist.		0.0	8 ft recovery
10				
	Brown, medium GRAVEL; moist.		0.0	Sample CFMW-057a-SO-10-12 collected
15	Brown, fine to coarse SAND and fine to medium GRAVEL; dry.		0.0	
			0.0	9 ft recovery
20	Brown, fine to coarse SAND, some fine to coarse GRAVEL, little Cobble; moist.		0.2	
25				
	Brown, fine to medium SAND; wet.		0.1	
	Brown, fine to coarse SAND, trace medium gravel; wet.		0.0	5 ft recovery
30				
	Brown, fine to medium SAND, trace silt; wet (medium dense).			15 ft recovery
35				
				Sample CFMW-057a-SO-30-35 collected
40			0.0	
45				
	Brown, fine to medium SAND, little Silt; wet (medium stiff).			15 ft recovery
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-057a	**48.391837**	**-114.158263**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Brown, fine to medium SAND, little Silt; wet (medium stiff). *(continued)*			
55		Brown, fine to medium SAND, trace silt; wet (loose).		0.0	
60		Brown, fine to coarse SAND; wet (loose).		0.0	15 ft recovery
				0.0	
65	Grout	Brown, fine SAND, some Silt; wet (medium stiff).			
70				0.0	
75	128' of Schedule 40 PVC Riser	Brown, fine SAND and SILT, some high plasticity Clay; wet (medium stiff).			15 ft recovery
				0.0	
80		Light gray, fine SAND and SILT, some high plasticity Clay; wet (medium stiff).		0.0	
85		Light gray, fine SAND and SILT, some high plasticity Clay, little fine Gravel; wet (stiff).		0.0	
90		Brown to light gray, fine to coarse SAND, some fine Gravel, little Silt, trace clay; wet (loose).		0.0	
95		Light brown to light gray, SILT, some low plasticity Clay and fine to medium Sand, little fine Gravel; moist (stiff).		0.0	10 ft recovery
100					
105		Light brown to light gray, SILT, some low plasticity Clay, little fine Gravel, trace fine to coarse sand; moist to dry (very stiff).			12 ft recovery

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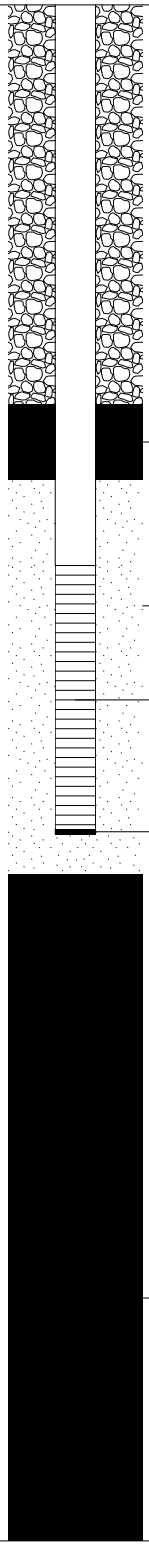
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-057a	**48.391837**	**-114.158263**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110	Light brown to light gray, SILT, some low plasticity Clay, little fine Gravel, trace fine to coarse sand; moist to dry (very stiff). *(continued)*		0.0	
115	Light brown to light gray, SILT, some high plasticity Clay, little fine to coarse Gravel and fine to coarse Sand; dry (stiff).		0.0	7" Conductor casing set to 113 ft bls 13 ft recovery
120	Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel and high plasticity Clay, trace cobble; moist (stiff).		0.0	
125				
130	Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel, little high plasticity Clay, trace cobble; moist to wet (medium stiff).		0.0	14 ft recovery
135				
140				16 ft recovery
145				
150			0.0	
155				
160	Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel, little high plasticity Clay; moist to wet (stiff).		0.0	15 ft recovery

Graphic Log:



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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-057a	**48.391837**	**-114.158263**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Bentonite	Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel, little high plasticity Clay; moist to wet (stiff). *(continued)*			
170	Grout	Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel and high plasticity Clay, trace cobble; moist to wet (stiff).			15 ft recovery
175					
180				0.0	
185		Dark orange-brown, fine to coarse SAND and SILT, some high plasticity Clay and fine to coarse Gravel; moist (stiff).			15 ft recovery
190				0.0	
195					
200		Dark orange-brown, fine to coarse SAND and SILT, some high plasticity Clay and fine to coarse Gravel; moist to wet (stiff).			15 ft recovery
205					
210				0.0	
215				0.0	5 ft recovery
220		Brown, SILT AND CLAY, some fine to coarse SAND and fine to coarse Gravel, trace cobble; dry (very stiff).			

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-057a	**48.391837**	**-114.158263**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
				0.0	15 ft recovery
225		Dark orange-brown, fine to coarse GRAVEL and SILT, some Cobble, little fine to coarse Sand; wet (medium dense).			
230				0.0	
235	Grout				
		Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel, little Cobble and high plasticity Clay; moist to wet (stiff).			15 ft recovery
240				0.0	
245					
250					
		Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel, little Cobble and high plasticity Clay; moist (stiff).			10 ft recovery
255					
260				0.0	
		Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel and high plasticity Clay, little Cobble; dry (stiff).			10 ft recovery
265				0.0	
		Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel and low plasticity Clay, little Cobble; moist (stiff).		0.0	
270					
					13 ft recovery
275					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-057a	**48.391837**	**-114.158263**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS	
280			Dark orange-brown, fine to coarse SAND and SILT, some fine to coarse Gravel and low plasticity Clay, little Cobble; moist (stiff). *(continued)*		0.0		280
285	Grout					16 ft recovery	285
290							290
295					0.0		295
300						End of boring at 300 ft bls	300

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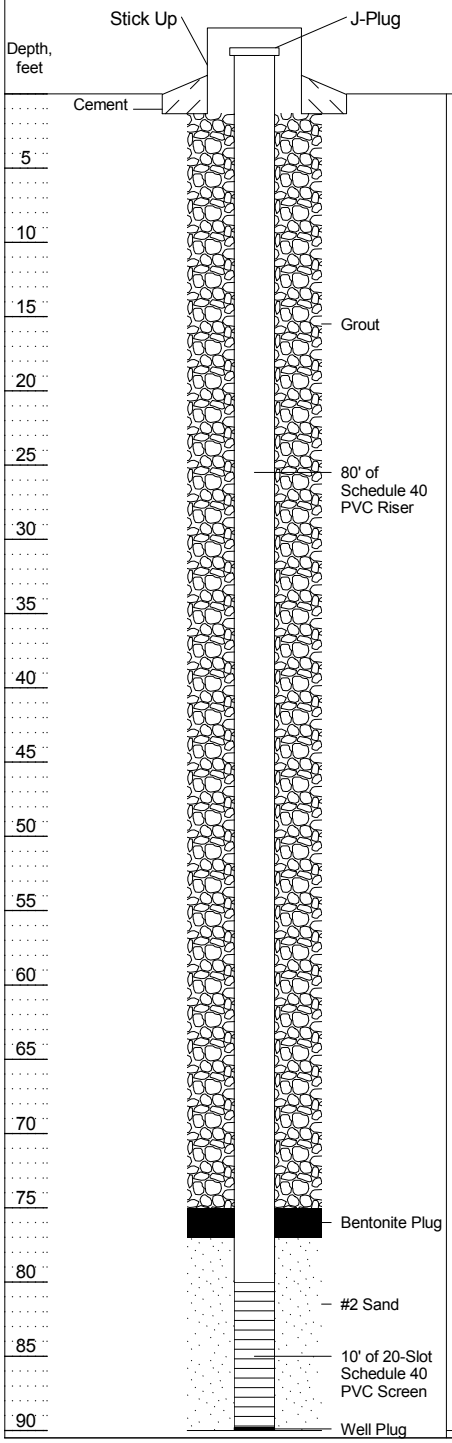
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-059	**48.387677**	**-114.158213**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Aluminum City**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**7/26/16-7/27/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Graphic Log	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
		Refer to geologic log for adjacent deep monitoring well CFMW-059a for lithology.			

BORING/FEET CFAC BORING LOGS.GPJ ROUX.GDT 11/14/16

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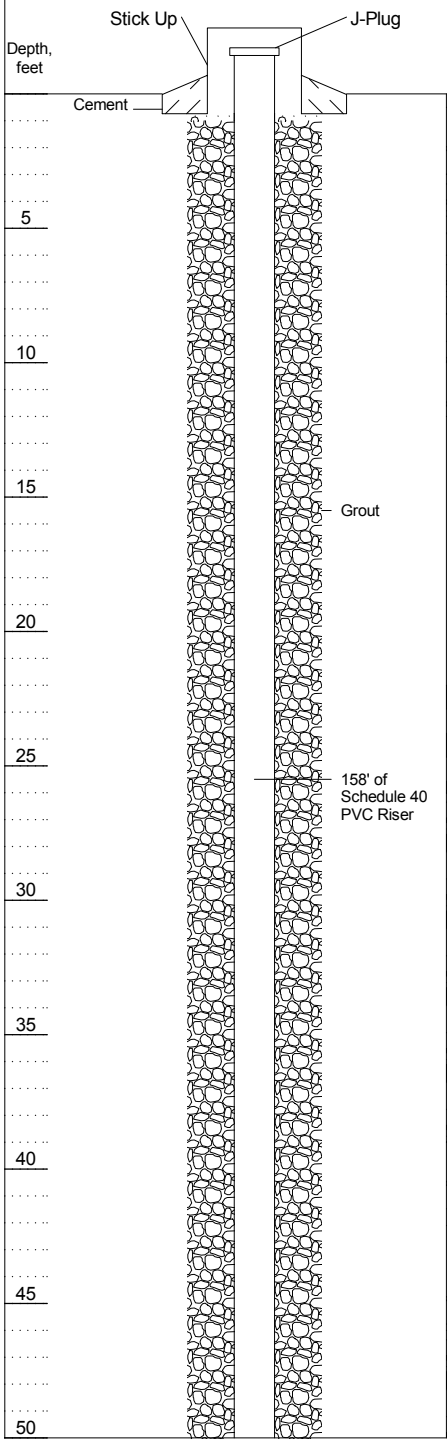
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-059a	**48.387708**	**-114.158134**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **A. Hoffmann**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Carlos Anguiano**	GEOGRAPHIC AREA: **Aluminum City**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Truck Mounted / Rotosonic**	**Continuous Core**	**7/22/16-7/26/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine to coarse SAND, little fine to medium Gravel and Silt; moist.		0.0	5 ft recovery
	Brown, fine to coarse SAND and fine to medium GRAVEL; dry.		0.0	Sample CFMW-059a-SO-0-0.5 and CFMW-059a-SO-0-0.5-Pb collected
5	Brown, fine GRAVEL, some fine to coarse Sand and medium to coarse Gravel; dry.		0.0	Sample CFMW-059a-SO-0.5-2 collected
	Brown, fine GRAVEL, some fine to coarse Sand and medium to coarse Gravel; moist.			10 ft recovery
			0.0	
10				
	Brown, fine to coarse SAND and fine to coarse GRAVEL, trace cobble; dry.		0.0	
	COBBLE (pulverized); dry.			Sample CFMW-059a-SO-10-12 collected
15				
			0.0	
				6 ft recovery
			0.0	
20				
	Brown, medium GRAVEL, trace fine to coarse sand; dry.			
25			0.0	
	Brown, fine to coarse GRAVEL, some Cobble (whole and pulverized), little fine to coarse Sand; dry (loose).			7 ft recovery
30				
			0.0	
35				
				10 ft recovery
			0.0	
40	Brown, fine to coarse SAND and fine to medium GRAVEL, some Cobble (whole and pulverized); dry (loose).			
			0.0	
45				
	Brown, fine to coarse GRAVEL, some Cobble (pulverized), little fine to coarse Sand; dry (loose).			8 ft recovery
50				

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-059a	**48.387708**	**-114.158134**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
			0.0	
	Brown, fine to coarse SAND, some fine to coarse Gravel; dry (loose).			
55			0.0	
			0.0	10 ft recovery
	Brown, fine to medium SAND; moist.			
60			0.0	
65				
	Grout			
	Brown, fine SAND; moist.			10 ft recovery
70			0.0	
75	Brown, fine SAND, trace silt; wet.		0.0	
	158' of Schedule 40 PVC Riser			
	Brown, fine to medium SAND; wet.			15 ft recovery
80			0.0	
85				Sample CFMW-059a-SO-79-84 collected
90				
				15 ft recovery
95				
100			0.0	
105				
				15 ft recovery

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-059a	**48.387708**	**-114.158134**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
110		Brown, fine to medium SAND; wet. *(continued)*			
115		Brown-gray, fine SAND and SILT; wet (medium stiff).		0.0	
120	Grout				15 ft recovery
125				0.0	
130		Brown-gray, fine SAND and SILT, little high plasticity Clay; wet (medium stiff).		0.0	
135					15 ft recovery
140		Light gray to light brown, fine SAND and SILT, some high plasticity Clay; moist to wet (stiff).			
145					
150					15 ft recovery
155	Bentonite Plug			0.0	
160	#2 Sand 10' of 20-Slot Schedule 40 PVC Screen	Brown, coarse SAND, little Silt and fine to medium Sand, trace fine to coarse gravel and cobble; wet.		0.0	

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-059a	**48.387708**	**-114.158134**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
165	Well Plug	Orange-yellow, fine to coarse SAND and SILT, some fine to coarse Gravel and Clay; moist to wet (stiff).			15 ft recovery
170				0.0	
175					
180	Bentonite				15 ft recovery
185					
190				0.0	
195		Brown to dark-orange, fine to coarse SAND and SILT, some fine to coarse Gravel and low plasticity Clay, little Cobble; moist to wet (stiff).			15 ft recovery
200				0.0	
205					
210	Grout	Brown, fine to coarse SAND and SILT, some fine to coarse Gravel and low plasticity Clay, little Cobble; moist to wet (stiff).			11 ft recovery
215				0.0	
220					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-059a	**48.387708**	**-114.158134**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet	Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
225		Brown, fine to coarse SAND and SILT, some fine to coarse Gravel and low plasticity Clay, little Cobble; moist to wet (stiff). *(continued)*			15 ft recovery
230				0.0	
235	Grout				
240					16 ft recovery
245				0.0	
250					
255		Brown, fine to coarse SAND and SILT, some fine to coarse Gravel, little Clay and Cobble; moist to wet (stiff).			11 ft recovery
260				0.0	
265					15 ft recovery
270				0.0	
275					

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WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-059a	**48.387708**	**-114.158134**
PROJECT NO./NAME		LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**
A. Muscietta	**A. Hoffmann**	

Depth, feet		Graphic Log	Visual Description (continued)	Blow Counts per 6"	PID Values (ppm)	REMARKS
280			Brown, fine to coarse SAND and SILT, some fine to coarse Gravel, little Clay and Cobble; moist to wet (stiff). *(continued)*			7 ft recovery
					0.0	
285	Grout		Gray, BOULDER; wet.		0.0	
			Brown, fine to coarse SAND, some fine to coarse Gravel, Silt and Cobble (pulverized); dry (dense).			5 ft recovery
290					0.0	
			Brown, fine to coarse SAND and SILT, some fine to coarse Gravel, little Clay, trace cobble (pulverized); dry (dense).			4 ft recovery
295					0.0	
						4 ft recovery
					0.0	
300						End of boring at 300 ft bls

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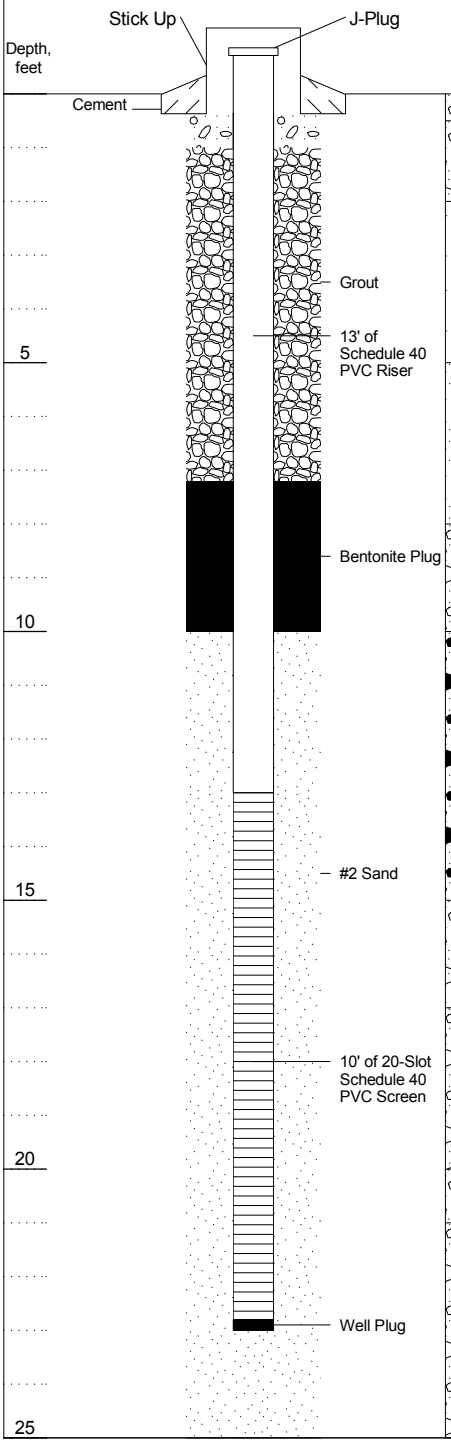
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE
CFMW-061	**48.387514**	**-114.132974**

PROJECT NO./NAME	LOCATION
2476.0001Y002 / CFAC RI/FS Phase 1	**2000 Aluminum Drive**
APPROVED BY: **A. Muscietta** / LOGGED BY: **S. Ward**	**Columbia Falls, Montana**
DRILLING CONTRACTOR/DRILLER: **Cascade Drilling / Jeremiah Charlton**	GEOGRAPHIC AREA: **South Percolation Ponds**

DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**7/12/16-7/13/16**

CASING MAT./DIA.	SCREEN: TYPE	MAT.	TOTAL LENGTH	DIA.	SLOT SIZE
SCH 40 PVC / 2-inch	**Slotted**	**SCH 40 PVC**	**10.0**ft	**2-inch**	**20-Slot**



Depth, feet	Visual Description	Blow Counts per 6"	PID Values (ppm)	REMARKS
	Dark brown, fine SAND, some fine to coarse Gravel, little Cobble, trace silt; moist (loose).		0.6	4 ft recovery
	Brown, fine SAND, some fine to coarse Gravel, little Cobble, trace silt; moist (loose).		1.3	Sample CFMW-061-SO-0-0.5 and CFMW-061-SO-0-0.5-Pb collected
	Light to dark brown, SILT, some fine Sand, trace organic roots; moist (dense).		1.0	Sample CFMW-061-SO-0.5-2 collected
5	Light brown, SAND and SILT, trace fine gravel; moist (stiff).		2.5	5 ft recovery
	Brown, medium to coarse GRAVEL, some fine to medium Sand, little Cobble; wet (loose).		0.3	
10	Brown, fine to coarse GRAVEL, some fine Sand, little Cobble, trace silt; wet (medium dense).		0.6	4 ft recovery
			1.5	
15	Brown, fine to medium SAND, some fine to coarse Gravel and Boulder, little Silt; wet (medium dense).		0.2	5 ft recovery
	Brown, fine to medium GRAVEL, some fine to medium Sand, little Cobble, trace silt; wet (loose).		1.0	
20	Brown to red, medium to coarse SAND, little fine Gravel, trace cobble; wet (loose).		0.2	5 ft recovery
	Brown to red, coarse GRAVEL, some medium to coarse Sand and Cobble, trace silt; wet (loose).		1.2	
25				End of boring at 25 ft bls

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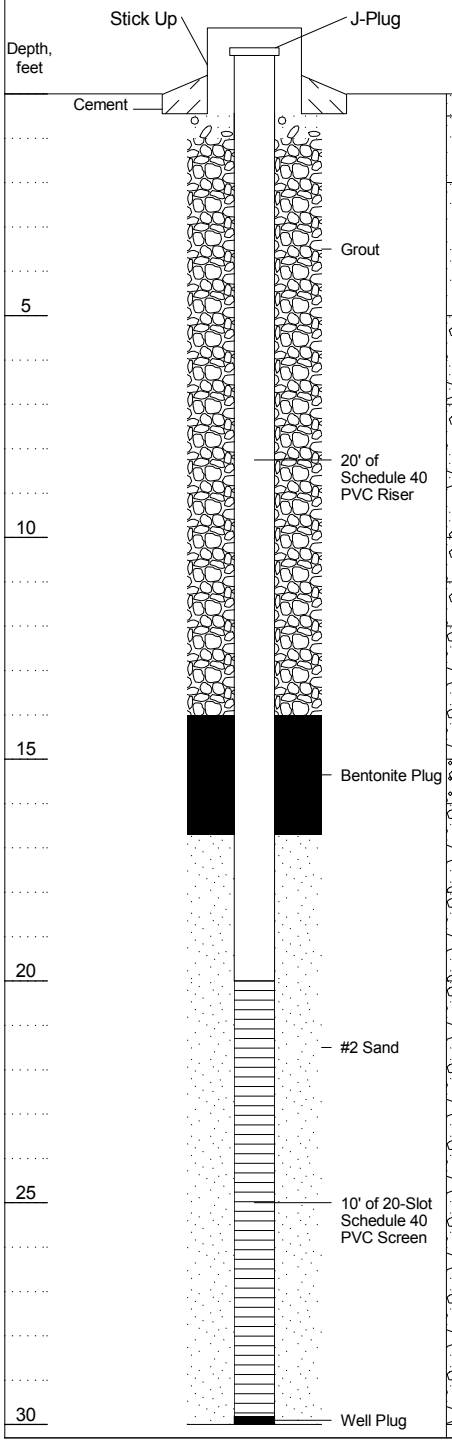
WELL CONSTRUCTION LOG

WELL NO.	LATITUDE	LONGITUDE		
CFMW-064	**48.387453**	**-114.128888**		
PROJECT NO./NAME		LOCATION		
2476.0001Y002 / CFAC RI/FS Phase 1		**2000 Aluminum Drive**		
APPROVED BY	LOGGED BY	**Columbia Falls, Montana**		
A. Muscietta	**S. Ward**			
DRILLING CONTRACTOR/DRILLER		GEOGRAPHIC AREA		
Cascade Drilling / Jeremiah Charlton		**South Percolation Ponds**		
DRILL BIT DIAMETER/TYPE	BOREHOLE DIAMETER	DRILLING EQUIPMENT/METHOD	SAMPLING METHOD	START-FINISH DATE
6-in. / Sonic Bit	**6-inches**	**Track Mounted / Rotosonic**	**Continuous Core**	**7/11/16-7/11/16**
CASING MAT./DIA.	SCREEN:			
SCH 40 PVC / 2-inch	TYPE **Slotted**	MAT. **SCH 40 PVC**	TOTAL LENGTH **10.0**ft	DIA. **2-inch** SLOT SIZE **20-Slot**



Depth, feet	Visual Description	PID Values (ppm)	REMARKS
	Dark brown, fine SAND, little Silt, trace fine gravel, cobble and organic roots; moist.	2.5	4 ft recovery
	Light brown, fine SAND, trace silt; moist (loose).	0.4	Sample CFMW-064-SO-0-0.5 and CFMW-064-SO-0-0.5-Pb collected
	Light brown with red tint, fine SAND, little Silt, trace organic roots; moist (dense).	0.2	Sample CFMW-064-SO-0.5-2 collected
5			5
	Brown with red tint, fine SAND, little fine to coarse Gravel, trace cobble and silt; moist (loose).	0.2	5 ft recovery
	Red-brown to light gray, fine SAND, some fine to coarse Gravel, little Cobble and Crushed rock; dry to moist (loose).	0.3	
10			10
	Brown, fine SAND, little fine to medium Gravel, trace cobble; moist (loose).	1.6	4 ft recovery
	Brown with red tint, fine SAND, some fine to medium Gravel, trace cobble; dry (loose).		
	Brown, fine to medium GRAVEL, some fine Sand and Cobble; wet (medium dense).	0.0	Sample CFMW-064-SO-10-12 collected
15			15
	Brown, fine to coarse SAND, little fine Gravel, trace cobble; wet (loose).	0.0	3 ft recovery
	Brown to gray, fine to medium GRAVEL, some fine to medium Sand, little Cobble; wet (loose).	0.0	
	Gray to brown, fine GRAVEL, some fine to medium Sand, little Cobble; wet (loose).	0.1	
20			20
	Gray to brown, fine to medium GRAVEL, some fine to medium Sand, little Cobble, trace silt; wet (medium dense).	0.1	5 ft recovery
25			25
		0.1	5 ft recovery, some orange staining
30			End of boring at 30 ft bls 30

APPENDIX L

Surface Water Laboratory Analytical Data Tables – Rounds 1 through 4

1. VOCs in Surface Water – Human Health Screening Levels
2. SVOCs in Surface Water – Human Health Screening Levels
3. Metals in Surface Water – Human Health Screening Levels
4. PCBs in Surface Water – Human Health Screening Levels
5. Pesticides in Surface Water – Human Health Screening Levels
6. General Chemistry in Surface Water – Human Health Screening Levels
7. VOCs in Surface Water – Ecological Screening Levels
8. SVOCs in Surface Water – Ecological Screening Levels
9. Metals in Surface Water – Ecological Screening Levels
10. PCBs in Surface Water – Ecological Screening Levels
11. Pesticides in Surface Water – Ecological Screening Levels
12. General Chemistry in Surface Water – Ecological Screening Levels

Appendix L1. Volatile Organic Compounds in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type	N	N	N	N
				Sample Fraction	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
1,1,1-Trichloroethane	200	200	800	ug/l	0.28 U	0.28 U	0.28 U	0.28 UJ
1,1,2,2-Tetrachloroethane	1.7	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	5500	ug/l	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	3	--	--	ug/l	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	--	--	2.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	7	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	--	--	0.7	ug/l	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	35	--	0.4	ug/l	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	0.2	0.2	0.00034	ug/l	0.23 U	0.23 U	0.23 U	0.23 U
1,2-Dichlorobenzene	420	600	30	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	3.8	5	0.17	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	5	5	0.44	ug/l	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	320	--	--	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	75	75	0.48	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	--	--	560	ug/l	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	--	--	3.8	ug/l	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	--	--	630	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	--	--	1400	ug/l	1.1 U	1.1 U	1.1 U	12
Benzene	5	5	0.46	ug/l	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	43	80	3.3	ug/l	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	47	--	0.75	ug/l	0.18 UJ	0.18 UJ	0.18 UJ	0.18 UJ
Carbon disulfide	--	--	81	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	2.3	5	0.46	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	100	100	7.8	ug/l	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	8.3	ug/l	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	4	80	0.87	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	2100	ug/l	0.37 U	0.37 U	0.37 U	0.37 UJ
Chloroform	57	80	0.22	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	30	--	19	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	70	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 UJ
cis-1,3-Dichloropropene	3.4	--	--	ug/l	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	1300	ug/l	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	5.5	80	0.13	ug/l	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	--	--	20	ug/l	0.14 U	0.14 U	0.14 U	0.14 U
Ethylbenzene	530	700	1.5	ug/l	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	--	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	--	--	--	ug/l	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	2000	ug/l	0.58 U	0.58 U	0.58 U	0.58 UJ
Methyl tert-butyl ether	30	--	14	ug/l	0.13 U	0.13 U	0.13 U	0.13 UJ
Methylcyclohexane	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	5	5	11	ug/l	0.47 J	0.21 U	0.9 J	0.21 UJ
m-Xylene & p-Xylene	--	--	--	ug/l	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	10000	--	19	ug/l	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	100	100	120	ug/l	0.17 U	0.17 U	0.17 U	0.17 U
Tetrachloroethene	5	--	--	ug/l	0.12 U	0.12 U	0.12 U	0.12 U

Appendix L1. Volatile Organic Compounds in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type	N	N	N	N
				Sample Fraction	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
Toluene	1000	1000	110	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	100	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 UJ
trans-1,3-Dichloropropene	2	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	5	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Trichlorofluoromethane	10000	--	520	ug/l	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	0.25	2	0.019	ug/l	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L2. Semivolatile Organic Compounds in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type	N	N	N	N
				Sample Fraction	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
1,1'-Biphenyl	--	--	0.083	ug/l	0.66 U	0.63 U	0.68 U	0.63 U
1,2,4,5-Tetrachlorobenzene	0.97	--	0.17	ug/l	0.45 U	0.43 U	0.47 U	0.43 U
1,4-Dioxane	--	--	0.46	ug/l	3.2 U	3.1 U	3.4 U	3.1 U
2,2'-oxybis[1-chloropropane]	1400	--	--	ug/l	0.97 U	0.93 U	1 U	0.93 U
2,3,4,6-Tetrachlorophenol	--	--	24	ug/l	0.72 U	0.69 U	0.75 U	0.69 U
2,4,5-Trichlorophenol	1800	--	120	ug/l	0.51 U	0.49 U	0.53 U	0.49 U
2,4,6-Trichlorophenol	14	--	1.2	ug/l	0.55 U	0.53 U	0.58 U	0.53 U
2,4-Dichlorophenol	77	--	4.6	ug/l	0.66 U	0.63 U	0.68 U	0.63 U
2,4-Dimethylphenol	380	--	36	ug/l	0.95 U	0.91 U	0.99 U	0.91 U
2,4-Dinitrophenol	69	--	3.9	ug/l	2.5 U	2.4 U	2.6 U	2.4 U
2,4-Dinitrotoluene	1.1	--	0.24	ug/l	1.1 U	1 U	1.1 U	1 U
2,6-Dinitrotoluene	0.5	--	0.049	ug/l	0.92 U	0.88 U	0.96 U	0.88 U
2-Chloronaphthalene	1000	--	--	ug/l	0.64 U	0.61 U	0.66 U	0.61 U
2-Chlorophenol	81	--	9.1	ug/l	0.77 U	0.74 U	0.8 U	0.74 U
2-Methylnaphthalene	--	--	3.6	ug/l	0.92 U	0.88 U	0.96 U	0.88 U
2-Methylphenol	--	--	--	ug/l	1.3 U	1.3 U	1.4 U	1.3 U
2-Nitroaniline	--	--	19	ug/l	0.68 U	0.65 U	0.71 U	0.65 U
2-Nitrophenol	--	--	--	ug/l	0.61 U	0.59 U	0.64 U	0.59 U
3 & 4 Methylphenol	--	--	--	ug/l	0.92 U	0.88 U	0.96 U	0.88 U
3,3'-Dichlorobenzidine	0.21	--	0.13	ug/l	1.1 U	1 U	1.1 U	1 U
3-Nitroaniline	--	--	--	ug/l	0.85 U	0.82 U	0.89 U	0.82 U
4,6-Dinitro-2-methylphenol	13	--	--	ug/l	2.1 U	2 U	2.2 U	2 U
4-Bromophenyl phenyl ether	--	--	--	ug/l	1.1 U	1 U	1.1 U	1 U
4-Chloro-3-methylphenol	3000	--	--	ug/l	0.79 U	0.76 U	0.83 U	0.76 U
4-Chloroaniline	--	--	0.37	ug/l	0.76 U	0.73 U	0.79 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	ug/l	1 U	0.96 U	1 U	0.96 U
4-Nitroaniline	--	--	3.8	ug/l	0.5 U	0.48 U	0.52 U	0.48 U
4-Nitrophenol	60	--	--	ug/l	4.8 U	4.7 U	5.1 U	4.7 U
Acenaphthene	670	--	53	ug/l	0.92 U	0.88 U	0.96 U	0.88 U
Acenaphthylene	--	--	--	ug/l	0.68 U	0.65 U	0.71 U	0.65 U
Acetophenone	--	--	190	ug/l	1.1 U	1 U	1.1 U	1 U
Anthracene	8300	--	180	ug/l	0.59 U	0.57 U	0.62 U	0.57 U
Atrazine	3	3	0.3	ug/l	0.8 U	0.77 U	0.84 U	0.77 U
Benzaldehyde	--	--	19	ug/l	0.9 U	0.86 U	0.93 U	0.86 U
Benzo[a]anthracene	**0.038**	--	--	ug/l	0.57 U	0.55 U	0.6 U	**3**
Benzo[a]pyrene	**0.038**	0.2	0.0034	ug/l	0.17 U	0.16 U	0.17 U	**3.9**
Benzo[b]fluoranthene	**0.038**	--	0.034	ug/l	0.46 U	0.44 U	0.48 U	**10**
Benzo[g,h,i]perylene	--	--	--	ug/l	0.78 U	0.75 U	0.82 U	3.9 J
Benzo[k]fluoranthene	0.038	--	0.34	ug/l	0.19 U	0.18 U	0.2 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	5.9	ug/l	0.72 U	0.69 U	0.75 U	0.69 U
Bis(2-chloroethyl)ether	0.3	--	0.014	ug/l	0.13 U	0.12 U	0.13 U	0.12 U
Bis(2-ethylhexyl) phthalate	6	6	5.6	ug/l	0.75 U	0.72 U	0.78 U	0.72 U
Butyl benzyl phthalate	1500	--	16	ug/l	0.63 U	0.6 U	0.65 U	0.6 U
Caprolactam	--	--	990	ug/l	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	--	--	--	ug/l	0.89 U	0.85 U	0.92 U	0.85 U

Appendix L2. Semivolatile Organic Compounds in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type	N	N	N	N
				Sample Fraction	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
Chrysene	**0.038**	--	3.4	ug/l	0.7 U	0.67 U	0.73 U	**7.6**
Dibenz(a,h)anthracene	0.038	--	0.0034	ug/l	0.094 U	0.09 U	0.098 U	0.09 U
Dibenzofuran	--	--	0.79	ug/l	0.89 U	0.85 U	0.92 U	0.85 U
Diethyl phthalate	17000	--	--	ug/l	1 U	1 U	1.1 U	1 U
Dimethyl phthalate	270000	--	--	ug/l	1 U	0.98 U	1.1 U	0.98 U
Di-n-butyl phthalate	2000	--	--	ug/l	0.85 U	0.82 U	0.89 U	0.82 U
Di-n-octyl phthalate	--	--	20	ug/l	0.72 U	0.69 U	0.75 U	0.69 U
Fluoranthene	130	--	80	ug/l	0.75 U	0.72 U	0.78 U	9.3 J
Fluorene	1100	--	29	ug/l	0.83 U	0.8 U	0.87 U	0.8 U
Hexachlorobenzene	0.0028	1	0.0098	ug/l	0.49 U	0.47 U	0.51 U	0.47 U
Hexachlorobutadiene	4.4	--	0.14	ug/l	0.79 U	0.76 U	0.83 U	0.76 U
Hexachlorocyclopentadiene	40	50	0.041	ug/l	0.64 U	0.61 U	0.66 U	0.61 U
Hexachloroethane	14	--	0.33	ug/l	0.094 U	0.09 U	0.098 U	0.09 U
Indeno[1,2,3-cd]pyrene	**0.038**	--	0.034	ug/l	0.22 U	0.21 U	0.23 U	**3.1**
Isophorone	350	--	78	ug/l	0.7 U	0.67 U	0.73 U	0.67 U
Naphthalene	100	--	0.17	ug/l	0.83 U	0.8 U	0.87 U	0.8 U
Nitrobenzene	17	--	0.14	ug/l	0.51 U	0.49 U	0.53 U	0.49 U
N-Nitrosodi-n-propylamine	0.05	--	0.011	ug/l	0.86 U	0.83 U	0.9 U	0.83 U
N-Nitrosodiphenylamine	33	--	12	ug/l	0.77 U	0.74 U	0.8 U	0.74 U
Pentachlorophenol	1	1	0.041	ug/l	2.3 U	2.2 U	2.4 U	2.2 U
Phenanthrene	--	--	--	ug/l	0.68 U	0.65 U	0.71 U	1.5 J
Phenol	300	--	580	ug/l	0.43 U	0.41 U	0.45 U	0.41 U
Pyrene	830	--	12	ug/l	0.86 U	0.83 U	0.9 U	7 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-003	CFSWP-003
				Sample Date	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016
				Sample Designation	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-003-SW	CFSWP-003-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	DI	T	T	T	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	23.7 J	25.6 J	103	824	18.2 U	28.8 J	23.7 J	139	18.2 U	18.2 U	63.5	172
Antimony	**5.6**	6	0.78	ug/l	0.62 U	0.62 U	0.64 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	1000	2000	380	ug/l	107	102	98.4	83.4	70.7	102	101	97.2	68.3	64.4	117	118
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	24200	25300	23600	20800	19700	23200	24300	23700	18900	18400	27700	30000
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	140	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	18.8	36.2
Iron	--	--	1400	ug/l	42.4 U	42.4 U	204	870	42.4 U	42.4 U	42.4 U	137	42.4 U	42.4 U	135	294
Lead	15	15	15	ug/l	0.38 U	0.38 U	0.38 U	0.57 J	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	6320	7060	6060	5770	4890	6030	6750	6150	5040	4520	7650	8430
Manganese	--	--	43	ug/l	2.5 U	2.5 U	4.3 J	24.9	2.5 U	2.5 U	2.5 U	4.5 J	2.5 U	2.5 U	10.9	30.4
Mercury	0.05	2	0.063	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	330	341	368	557	257	306	319	396	257	246	398	476
Selenium	50	50	10	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	1070	1200	1010	815	706	1030	1060	1030	712	583	3780	5990
Thallium	**0.24**	2	0.02	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	2000	--	600	ug/l	7 U	7 U	7 U	8.8 J	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005
				Sample Date	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017
				Sample Designation	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	DI	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	794	746	18.2 U	522	53.3	625	619	18.2 U	143	94.3	521	553
Antimony	**5.6**	6	0.78	ug/l	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.64 U	0.64 U	0.64 U	0.78 J	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	1000	2000	380	ug/l	99.3	85.8	70.2	197	173	103	81.3	67.7	192	179	107	116
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	23200	21900	20500	60700	52400	26200	21000	19900	60200	62600	27900	37000
Chromium	100	100	0.035	ug/l	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	26.4	1.5 J	1.8 J	1.4 U	1.4 U	1.4 U	1.6 J	1.4 U	1.4 U	1.4 U
Cyanide, Free	140	200	0.15	ug/l	1.5 U	3.5 J	5.4	NA	NA	6.4	4.1 J	5.6	NA	NA	8	45.6
Cyanide, Total	**140**	200	0.15	ug/l	7.7 J	9.5 J	12.5	**209**	**178**	21.3	11.5	11.7	**213**	**192**	24.7	**197**
Iron	--	--	1400	ug/l	868	802	164	827	238	611	629	42.4 U	256	266	502	704
Lead	15	15	15	ug/l	0.63 J	0.5 J	0.38 U	0.48 J	2.9	0.55 J	0.38 J	0.38 U	0.38 U	0.38 U	0.41 J	0.39 J
Magnesium	--	--	--	ug/l	6350	6080	5150	18200	15100	7110	5880	4990	17800	17900	7370	10800
Manganese	--	--	43	ug/l	25.6	31.1	12.5	57.1	57.9	24	23.9	8.2	15.7	212	24.1	43.2
Mercury	0.05	2	0.063	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	32.2	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	580	551	286	1120	833	581	495	268	1020	1060	561	762
Selenium	50	50	10	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	2050	2050	2160	36400	26100	4780	2060	1850	36900	35600	5240	18200
Thallium	**0.24**	2	0.02	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	2000	--	600	ug/l	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	19.9	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-005	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-008
				Sample Date	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/16/2016	12/02/2016	03/16/2017	06/14/2017	06/14/2017	09/16/2016
				Sample Designation	CFSWP-005-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	DI	T	T	T	T	DI	T	T	T	T	DI	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	18.2 U	19.9 J	29.8 J	1540	1000	18.2 U	28.9 J	54.5	1460	879	18.2 U	33.9 J
Antimony	**5.6**	6	0.78	ug/l	0.62 U	0.62 U	0.62 U	0.66 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.64 U	0.64 U	0.64 U	0.88 J	0.64 U	0.64 U	0.64 U	0.64 U	0.84 J	0.64 U	0.64 U	0.64 U
Barium	1000	2000	380	ug/l	98.3	105	99.7	103	82.7	64.9	102	102	102	81.9	64	103
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	32700	24200	24500	22000	19700	18200	23100	24500	21700	19300	18300	23200
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	1.3 U	2 J	1.3 U	1.3 U	1.3 U	1.3 U	2 J	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	1.4 U	2.2 J	1.7 J	3 J	1.4 U	1.4 U	3.4 J	1.4 J	1.4 U	1.4 U
Cyanide, Free	140	200	0.15	ug/l	42.2	NA	NA	1.5 U	1.5 U	1.6 J	NA	NA	NA	NA	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	**162**	3.2 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Iron	--	--	1400	ug/l	56 J	42.4 U	42.4 U	1600	1210	42.4 U	42.4 U	42.4 U	1640	1090	42.4 U	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.38 U	0.38 U	1.2	0.7 J	0.38 U	0.38 U	0.38 U	1.2	0.68 J	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	8770	6630	6750	6300	5620	4520	6010	6780	6280	5500	4460	6050
Manganese	--	--	43	ug/l	27.1	2.5 U	2.5 U	51.9	32.6	2.5 U	2.5 U	3.9 J	52	31.8	2.5 U	2.5 U
Mercury	0.05	2	0.063	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 J	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	521	328	315	775	605	240	311	313	748	547	255	317
Selenium	50	50	10	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	14300	1030	1150	1030	710	562	951	1040	1030	677	574	958
Thallium	**0.24**	2	0.02	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	1.9 U	1.9 J	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	2000	--	600	ug/l	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-009	CFSWP-009	CFSWP-009	CFSWP-009	CFSWP-010	CFSWP-010	CFSWP-010	CFSWP-010
				Sample Date	12/02/2016	04/04/2017	06/14/2017	06/14/2017	06/07/2016	04/03/2017	06/12/2017	06/12/2017	06/07/2016	03/15/2017	06/12/2017	06/12/2017
				Sample Designation	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	DI	T	T	T	DI	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	31 J	133	18.2 U	18.2 U	16.8 J	34.8 J	64.4	18.2 U	44.6	507	18.2 U	18.2 U
Antimony	**5.6**	6	0.78	ug/l	0.62 U	0.64 J	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.95 J	0.64 U	0.64 U	0.69 J	0.71 U	0.64 U	0.64 U	0.64 U
Barium	1000	2000	380	ug/l	103	98.6	62.8	63.7	104	77.1	116	116	79.6	63.4	88	85.2
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	25400	24400	17600	18200	50100	46800	53000	52200	47000	38300	50700	48600
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U	1.6 U	1.5 J	1.4 U	1.4 U
Cyanide, Free	140	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	2 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U
Iron	--	--	1400	ug/l	42.4 U	127	42.4 U	42.4 U	49.1 U	42.4 U	42.4 U	42.4 U	49.3 J	392	42.4 U	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.38 U	0.38 U	0.38 U	0.44 U	0.38 U	0.38 U	0.38 U	0.44 U	0.54 J	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	7110	6300	4670	4510	12600	10600	13200	12800	10900	6510	12100	10900
Manganese	--	--	43	ug/l	2.5 U	4.6 J	2.5 U	2.5 U	3 U	3 J	3.4 J	2.5 U	7.8 J	19.6	3.1 J	2.5 U
Mercury	0.05	2	0.063	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	309	378	242	237	560	460	551	511	535	1100	473	417
Selenium	50	50	10	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	1140	1080	666	570	2340	2360	2380	2250	2080	2180	2220	2060
Thallium	**0.24**	2	0.02	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	2.2 J	1.9 U	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U	1.9 U
Zinc	2000	--	600	ug/l	7 U	7 U	7 U	7 U	6.5 U	7 U	7 U	7 U	6.5 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-011	CFSWP-011	CFSWP-011	CFSWP-011	CFSWP-012	CFSWP-012	CFSWP-012	CFSWP-012	CFSWP-012	CFSWP-013	CFSWP-013	CFSWP-013
				Sample Date	06/07/2016	04/03/2017	06/12/2017	06/12/2017	06/07/2016	04/03/2017	04/03/2017	06/12/2017	06/12/2017	06/07/2016	06/07/2016	11/30/2016
				Sample Designation	CFSWP-011-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-012-SW	CFSWP-012-SW	CFSWP-DUP5-SW	CFSWP-012-SW	CFSWP-012-SW	CFSWP-013-SW	CFSWP-DUP1-SW	CFSWP-013-SW
				Sample Type	N	N	N	N	N	N	FD	N	N	N	FD	N
				Sample Fraction	T	T	T	DI	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	28.2 J	37.9 J	18.2 U	18.2 U	35.9 J	27.4 J	37.7 J	18.2 U	18.2 U	30 J	34.6 J	1610
Antimony	**5.6**	6	0.78	ug/l	0.76 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.76 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.71 U	0.64 U	0.64 U	0.64 U	0.8 J	0.64 U	0.64 U	0.64 U	0.64 U	0.71 U	0.71 U	1.8 J
Barium	1000	2000	380	ug/l	78.6	70.8	87.3	86.6	79	70.5	75.8	88.8	85	78	81.2	183
Beryllium	4	4	2.5	ug/l	0.29 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U	0.24 U	0.29 U	0.29 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.72 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U	0.71 U	0.72 U	0.72 U	0.71 U
Calcium	--	--	--	ug/l	47000	46600	50600	48700	46800	45600	45300	50000	48700	46500	47700	40000
Chromium	100	100	0.035	ug/l	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.5 U	1.4 J
Cobalt	--	--	0.6	ug/l	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.5 U	2.4 J
Copper	1300	1300	80	ug/l	2.1 J	1.4 U	1.4 U	1.4 U	4.1	1.4 U	1.4 U	1.4 U	1.4 U	2.2 J	11.7 J	6.2
Cyanide, Free	140	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	4 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	2 U	4 U	4 U	2 U
Iron	--	--	1400	ug/l	49.1 U	42.4 U	42.4 U	42.4 U	72.8 J	42.4 U	54.6 J	42.4 U	42.4 U	49.1 U	49.1 U	2910
Lead	15	15	15	ug/l	0.44 U	0.38 U	0.38 U	0.38 U	0.44 U	0.38 U	0.38 U	0.38 U	0.38 U	0.44 U	0.44 U	2.1
Magnesium	--	--	--	ug/l	10800	10400	12100	11100	10900	10300	10900	12000	11100	10700	11100	11300
Manganese	--	--	43	ug/l	6.3 J	7.5 J	3.8 J	2.5 U	8.6	6.8 J	7.9 J	4.4 J	2.5 U	10.7	11	3750
Mercury	0.05	2	0.063	ug/l	0.14 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.14 U	0.14 U	0.17 U
Nickel	100	--	39	ug/l	1.6 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	1.6 U	2.3 J
Potassium	--	--	--	ug/l	540	454	472	419	537	433	451	474	410	530	556	778
Selenium	50	50	10	ug/l	0.79 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.79 U	0.73 U
Silver	100	--	9.4	ug/l	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.5 U	1.3 U
Sodium	--	--	--	ug/l	2120	2370	2210	2010	2080	2310	2360	2190	2020	2030	2120	2340
Thallium	**0.24**	2	0.02	ug/l	0.31 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U	0.26 U	0.31 U	0.31 U	0.26 U
Vanadium	--	--	8.6	ug/l	2.1 J	1.9 U	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U	1.9 U	1.9 U	1.9 J	1.8 J	1.9 J
Zinc	2000	--	600	ug/l	6.5 U	7 U	7 U	7 U	6.5 U	7 U	7 U	7 U	7 U	6.5 U	6.5 U	18.9

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-015	CFSWP-015
				Sample Date	03/15/2017	06/12/2017	06/12/2017	08/29/2016	11/30/2016	11/30/2016	03/13/2017	03/13/2017	06/13/2017	06/13/2017	08/29/2016	08/29/2016
				Sample Designation	CFSWP-013-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-014-SW	CFSWP-014-SW	CFSWP-DUP3-SW	CFSWP-014-SW	CFSWP-Dup4-SW	CFSWP-014-SW	CFSWP-014-SW	CFSWP-015-SW	CFSWP-DUP2-SW
				Sample Type	N	N	N	N	N	FD	N	FD	N	N	N	FD
				Sample Fraction	T	T	DI	T	T	T	T	T	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	38.6 J	23.1 J	18.2 U	37.6 J	18.2 UJ	27.4 J	18.2 U	18.2 U	33.7 J	18.2 U	44.9	39.7 J
Antimony	**5.6**	6	0.78	ug/l	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.64 J	0.62 J	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	10	10	0.052	ug/l	2.2	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	1000	2000	380	ug/l	73	91.3	86.5	98.1	101	103	109	104	94.4	88.5	103	101
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	42600	50400	48900	43100	52800	53300	55800	52800	50900	50100	47500	44600
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	37.7 J	2.4 J	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	1.4 U	5.4	1.4 U	1.4 U	2.3 J	1.4 UJ	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	140	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	1.5 U	1.5 U	1.5 U	1.5 U	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	2 U	2 U	2 U	2 U	15.3 J	2 UJ	2 U	2 U	2 U	2 U	2.3 J	2 U
Iron	--	--	1400	ug/l	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	304 J	51.7 J	42.4 U	42.4 U	42.4 U	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.38 U	0.38 U	0.41 J	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	10900	12300	11000	13500	13500	13900	13500	12400	12400	11700	13600	13400
Manganese	--	--	43	ug/l	5.7 J	7.1 J	3.2 J	13.2	5.2 J	3.9 J	13.7 J	9.7 J	12.7	2.7 J	8.6 J	5.9 J
Mercury	0.05	2	0.063	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	556	480	419	377	481	486	656	486	467	435	405	357
Selenium	50	50	10	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	1410	2250	2070	3240	2590	2660	5530 J	2490 J	2240 J+	2000	2870	2620
Thallium	**0.24**	2	0.02	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	2000	--	600	ug/l	7 U	14.1 J	7 U	16.4	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016
				Sample Date	11/30/2016	12/20/2016	03/13/2017	06/13/2017	06/13/2017	06/13/2017	06/13/2017	08/29/2016	11/30/2016	03/13/2017	06/12/2017	06/12/2017
				Sample Designation	CFSWP-015-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-DUP7-SW	CFSWP-015-SW	CFSWP-DUP7-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-DUP6-SW
				Sample Type	N	N	N	N	FD	N	FD	N	N	N	N	FD
				Sample Fraction	T	T	T	T	T	DI	DI	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	18.2 U	20 J	18.2 U	45.6	40	18.2 U	18.2 U	59.2	19.5 J	19.6 J	85.5	66.8
Antimony	**5.6**	6	0.78	ug/l	0.62 U	0.62 U	0.67 J	0.62 U	0.62 U	0.62 U	6.2 U	0.62 U	0.62 U	0.78 J	0.62 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	6.4 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	1000	2000	380	ug/l	106	118	107	97.5	97.1	93	96.3	99.5	105	106	98.8	99.4
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	7.1 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	53100	56800	53500	51600	51700	50500	50100	44400	53100	53700	50500	51000
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.9 J	1.4 U
Cyanide, Free	140	200	0.15	ug/l	NA	NA	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	NA	NA	NA	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	10.6	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Iron	--	--	1400	ug/l	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	129 J	54.7 J
Lead	15	15	15	ug/l	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	13600	14000	12500	12600	12700	11700	11700	13500	13900	12600	12200	12400
Manganese	--	--	43	ug/l	4 J	5.5 J	6.6 J	12.5	13	3.5 J	3.2 J	3.5 J	3.6 J	5.6 J	14.7	14
Mercury	0.05	2	0.063	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	484	519	502	469	466	434	429	367	483	495	477	479
Selenium	50	50	10	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	12.8 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	2610	2940	2520	2250	2270	1960	1940	3260	2630	2480	2200	2200
Thallium	**0.24**	2	0.02	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	2000	--	600	ug/l	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	13.5 J	7 UJ

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-016	CFSWP-016	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018
				Sample Date	06/12/2017	06/12/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	06/06/2016	12/01/2016	04/03/2017	06/15/2017	06/15/2017
				Sample Designation	CFSWP-016-SW	CFSWP-DUP6-SW	CFSWP-017-SW	CFSWP-017-SW	CFSWP-017-SW	CFSWP-017-SW	CFSWP-017-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW
				Sample Type	N	FD	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	DI	DI	T	T	T	T	DI	T	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	18.2 U	18.2 U	33.2 J	26.3 J	138	26.6 J	18.2 U	13.5 U	583	60.7	285	18.2 U
Antimony	**5.6**	6	0.78	ug/l	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.71 J	0.64 U	0.64 U	0.64 U	0.64 U
Barium	1000	2000	380	ug/l	93.5	99.8	190	103	94.4	63.4	63.6	268	225	237	237	194
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	50300	50600	33800	25400	23900	17700	18600	48300	77000	46300	62400	49400
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	3.9 J	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	2 J	9.8	1.9 J	5.3	1.4 U
Cyanide, Free	140	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	2 U	2 U	2 U	2 U	2 U	2 U	2 U	4 U	2 U	2 U	77.2	68.2
Iron	--	--	1400	ug/l	42.4 U	42.4 U	63.1 J	42.4 U	128	42.4 U	42.4 U	109 J	449	48.9 J	268	60.5 J
Lead	15	15	15	ug/l	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.44 U	1.7	0.38 U	0.99 J	0.38 U
Magnesium	--	--	--	ug/l	11400	11400	9260	7090	6230	4780	4560	16200	17200	13900	16300	14800
Manganese	--	--	43	ug/l	3.4 J	3.2 J	21.8	2.5 U	4.2 J	2.6 J	2.5 J	5.7 J	8.3	2.5 U	3.4 J	2.5 U
Mercury	0.05	2	0.063	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	1.6 J	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	439	436	439	314	367	247	256	797	600	700	1060	970
Selenium	50	50	10	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	2070	2020	1580	1100	1080	692	576	5660	9290	4600	25800	23500
Thallium	**0.24**	2	0.02	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	2000	--	600	ug/l	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6.5 U	18.2	7 U	15.2 J	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-019	CFSWP-019	CFSWP-019	CFSWP-019	CFSWP-019	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-021	CFSWP-021
				Sample Date	06/06/2016	12/01/2016	04/03/2017	06/15/2017	06/15/2017	06/06/2016	12/01/2016	03/16/2017	06/15/2017	06/15/2017	06/06/2016	11/30/2016
				Sample Designation	CFSWP-019-SW	CFSWP-019-SW	CFSWP-019-SW	CFSWP-019-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-021-SW	CFSWP-021-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	DI	T	T	T	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	18.7 J	61.7	24.5 J	18.2 U	18.2 U	15.3 J	615	18.2 U	18.2 U	18.2 U	95.3	5750
Antimony	**5.6**	6	0.78	ug/l	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.71 U	0.64 U	0.64 U	0.64 U	0.64 U	0.71 U	0.64 U	0.64 U	0.64 U	0.64 U	1.2 J	3.7
Barium	1000	2000	380	ug/l	265	156	244	250	248	305	424	239	275	270	98	219
Beryllium	4	4	2.5	ug/l	0.29 U	0.24 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.72 U	0.71 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U
Calcium	--	--	--	ug/l	49100	51000	45600	38000	37800	45500	73300	38700	41100	39800	50500	82100
Chromium	100	100	0.035	ug/l	1.8 J	1.3 U	4.3	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	3.4 J
Cobalt	--	--	0.6	ug/l	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	2 J
Copper	1300	1300	80	ug/l	3.3 J	1.6 J	1.8 J	1.4 U	1.4 U	1.8 J	4	1.4 U	1.4 U	1.4 U	1.6 U	5.7
Cyanide, Free	140	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	9	2.1 J	1.7 J	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	4 U	2 U	2 U	2 U	2 U	12.5	16.4	11.3	2 U	5.3 J	4 U	2 U
Iron	--	--	1400	ug/l	110 J	134	111 J	42.4 U	42.4 U	49.1 U	451	43.1 J	42.4 U	42.4 U	79.5 J	4760
Lead	15	15	15	ug/l	0.44 U	0.38 U	0.38 U	0.38 U	0.38 U	0.44 U	0.91 J	0.38 U	0.38 U	0.38 U	0.44 U	4.5
Magnesium	--	--	--	ug/l	16200	16500	14000	13300	12700	15600	16500	12600	14000	13200	11700	19500
Manganese	--	--	43	ug/l	4.4 J	9.3	3.4 J	2.5 U	2.5 U	3 U	10.1	5.3 J	5.3 J	4.5 J	4.1 J	127
Mercury	0.05	2	0.063	ug/l	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U
Nickel	100	--	39	ug/l	1.6 U	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	3.9 J
Potassium	--	--	--	ug/l	910	641	678	769	752	818	894	656	652	619	578	1250
Selenium	50	50	10	ug/l	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U
Silver	100	--	9.4	ug/l	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U
Sodium	--	--	--	ug/l	5840	8710	4630	4330	3670	5150	4860	4080	4570	3860	6150	31000
Thallium	**0.24**	2	0.02	ug/l	0.31 U	0.26 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U
Vanadium	--	--	8.6	ug/l	2.1 J	1.9 U	1.9 U	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U	1.9 U	1.9 U	2.1 J	3.9 J
Zinc	2000	--	600	ug/l	6.5 U	7 U	7 U	7 U	7 U	6.5 U	7 U	7 U	7 U	7 U	6.5 U	19.2

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L3. Metals in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-021	CFSWP-021	CFSWP-021	CFSWP-022	CFSWP-022	CFSWP-023	CFSWP-024	CFSWP-024	CFSWP-025	CFSWP-025	CFSWP-025	CFSWP-025
				Sample Date	03/15/2017	06/15/2017	06/15/2017	06/06/2016	04/03/2017	04/03/2017	06/15/2017	06/15/2017	12/20/2016	03/13/2017	06/13/2017	06/13/2017
				Sample Designation	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-022-SW	CFSWP-022-SW	CFSWP-023-SW	CFSWP-024-SW	CFSWP-024-SW	CFSWP-025-SW	CFSWP-025-SW	CFSWP-025-SW	CFSWP-025-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	DI	T	T	T	T	DI	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit												
Aluminum	--	--	2000	ug/l	112	390	18.2 U	937	140	109	8630	4780	44.4	18.2 U	49.5	18.2 U
Antimony	**5.6**	6	0.78	ug/l	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	**7.7**	**7.2**	0.62 U	0.74 J	0.62 U	0.62 U
Arsenic	10	10	0.052	ug/l	0.64 U	0.87 J	0.93 J	0.88 J	0.64 U	0.64 U	2.4	1 J	0.64 U	0.64 U	0.64 U	0.64 U
Barium	1000	2000	380	ug/l	88.7	104	96.5	125	77.9	234	43.4	26.4	122	110	94.7	93.3
Beryllium	4	4	2.5	ug/l	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.71 J	0.51 J	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	5	5	0.92	ug/l	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	3	2.5	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	--	--	--	ug/l	55600	54600	54100	43600	45600	63300	7860	7020	56700	54200	51100	50400
Chromium	100	100	0.035	ug/l	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	2.7 J	1.3 U	1.3 U	8.9	1.3 U	1.3 U
Cobalt	--	--	0.6	ug/l	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.6 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	1300	1300	80	ug/l	1.4 U	1.4 U	1.4 U	2.6 J	1.4 U	3.8 J	16.5	2 J	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	140	200	0.15	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**140**	200	0.15	ug/l	2 U	2 U	2 U	4 U	2 U	7.6 J	2 U	2 U	2 U	2 U	2 U	2 U
Iron	--	--	1400	ug/l	99.2 J	197	42.4 U	302	50.2 J	42.4 U	817	42.4 U	42.4 U	100 J	42.4 U	42.4 U
Lead	15	15	15	ug/l	0.38 U	0.66 J	0.38 U	0.44 U	0.38 U	0.38 U	7.6	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	--	--	--	ug/l	12200	12700	12100	10900	10300	13900	804	384	13900	12700	12400	11700
Manganese	--	--	43	ug/l	3.3 J	8.1	3.4 J	17.8	2.5 U	2.5 U	37.4	31.8	8.9	6.7 J	13.5	3.1 J
Mercury	0.05	2	0.063	ug/l	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	100	--	39	ug/l	1.4 U	2.1 J	1.4 U	1.6 U	1.4 U	1.9 J	55.9	22.1	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	--	--	--	ug/l	499	443	397	785	459	646	814	760	528	509	456	421
Selenium	50	50	10	ug/l	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	100	--	9.4	ug/l	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	--	--	--	ug/l	26300	10700	10400	6900	4490	5280	6730	6180	2880	2530	2250	2010
Thallium	**0.24**	2	0.02	ug/l	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	**0.27 J**	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	--	--	8.6	ug/l	1.9 U	1.9 U	1.9 U	2.2 J	1.9 U	6.9	18	4.3	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	2000	--	600	ug/l	7 U	9.1 J	7 U	6.5 U	7 U	7 U	537	512	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of DEQ-7 Human Health Standa
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L4. Polychlorinated Biphenyls in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type	N	N	N	N
				Sample Fraction	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
Aroclor 1016	0.00064	--	0.14	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1221	0.00064	--	0.0047	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1232	0.00064	--	0.0047	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1242	0.00064	--	0.0078	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1248	0.00064	--	0.0078	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1254	0.00064	--	0.0078	ug/l	0.084 U	0.084 U	0.084 U	0.099 U
Aroclor 1260	0.00064	--	0.0078	ug/l	0.084 U	0.084 U	0.084 U	0.099 U
Aroclor 1268	0.00064	--	--	ug/l	0.084 U	0.084 U	0.084 U	0.099 U
Aroclor-1262	--	--	--	ug/l	0.084 U	0.084 U	0.084 U	0.099 U
Polychlorinated biphenyls, Total	0.00064	--	--	ug/l	0.098 U	0.098 U	0.098 U	0.1 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L5. Organochlorine Pesticides in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type	N	N	N	N
				Sample Fraction	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit				
4,4'-DDD	0.0031	--	0.032	ug/l	0.005 U	0.005 U	0.005 U	0.006 U
4,4'-DDE	0.0022	--	0.046	ug/l	0.004 U	0.004 U	0.004 U	0.002 U
4,4'-DDT	0.0022	--	0.23	ug/l	0.004 U	0.004 U	0.004 U	0.004 U
Aldrin	0.00049	--	0.00092	ug/l	0.004 U	0.004 U	0.004 U	0.003 U
alpha-BHC	0.026	--	0.0072	ug/l	0.006 U	0.006 U	0.006 U	0.007 U
alpha-Chlordane	0.008	--	--	ug/l	0.004 U	0.004 U	0.004 U	0.002 U
beta-BHC	0.091	--	0.025	ug/l	0.005 U	0.005 U	0.005 U	0.004 U
delta-BHC	--	--	--	ug/l	0.006 U	0.006 U	0.006 U	0.005 U
Dieldrin	0.00052	--	0.0018	ug/l	0.004 U	0.004 U	0.004 U	0.003 U
Endosulfan I	62	--	--	ug/l	0.005 U	0.005 U	0.005 U	0.002 U
Endosulfan II	62	--	--	ug/l	0.004 U	0.004 U	0.004 U	0.004 U
Endosulfan sulfate	62	--	--	ug/l	0.005 U	0.005 U	0.005 U	0.006 U
Endrin	0.059	2	0.23	ug/l	0.004 U	0.004 U	0.004 U	0.004 U
Endrin aldehyde	0.29	--	--	ug/l	0.004 U	0.004 U	0.004 U	0.008 U
Endrin ketone	--	--	--	ug/l	0.004 U	0.004 U	0.004 U	0.008 U
gamma-BHC (Lindane)	0.2	0.2	0.042	ug/l	0.004 U	0.004 U	0.004 U	0.012 U
gamma-Chlordane	--	--	--	ug/l	0.005 U	0.005 U	0.005 U	0.003 U
Heptachlor	0.00079	0.4	0.0014	ug/l	0.004 U	0.004 U	0.004 U	0.003 U
Heptachlor epoxide	0.00039	0.2	0.0014	ug/l	0.004 U	0.004 U	0.004 U	0.005 U
Methoxychlor	40	40	3.7	ug/l	0.004 U	0.004 U	0.004 U	0.004 U
Toxaphene	0.0028	3	0.071	ug/l	0.06 U	0.06 U	0.06 U	0.11 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-003
				Sample Date	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	09/09/2016
				Sample Designation	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-003-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	T	DI	T	T	T	T	DI	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	85900	88100	88000	71400	NA	85900	86900	87800	70000	NA	97900
Ammonia	--	--	--	ug/l	72 U	72 UJ	72 U	72 U	NA	72 U	72 UJ	72 U	72 U	NA	72 UJ
Chloride	--	--	--	ug/l	379 J	1110 J-	540	397 J+	NA	342 J	1710 J-	490	255 J+	NA	500
Fluoride	**4000**	4000	80	ug/l	35.8 J-	211 J-	84.2	118	118 J+	35.9 J-	547 J-	95	119	109 J+	181
Hardness as calcium carbonate	--	--	--	ug/l	88000	90000	86000	72000	NA	86000	92000	84000	72000	NA	90000
Nitrate Nitrite as N	10000	10000	--	ug/l	898	100 U	120	124 J+	NA	100 U	100 U	133	125 J+	NA	122
Orthophosphate as P	--	--	--	ug/l	42 R	48 U	48 U	48 U	NA	42 R	48 U	48 U	48 U	NA	42 U
Sulfate	--	--	--	ug/l	3570 J-	6620 J-	3300 J+	2590 J+	NA	3610 J-	17400 J-	3410 J+	2850 J+	NA	4620
Sulfide	--	--	--	ug/l	NA	NA	NA	579 U	NA	NA	NA	NA	579 U	NA	NA
Total Dissolved Solids	--	--	--	mg/l	101	81	82 J	62	NA	91	90	87 J	77	NA	116
Total Suspended Solids	--	--	--	mg/l	1 U	3.8	11.1	34.9	NA	1 U	1 U	8.5	45.7	NA	1.7

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-005	CFSWP-005
				Sample Date	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016
				Sample Designation	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-005-SW	CFSWP-005-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	T	DI	T	T	T	T	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	92000	90200	77500	NA	264000	179000	106000	76000	NA	256000	269000
Ammonia	--	--	--	ug/l	72 UJ	72 U	72 U	NA	72 UJ	72 UJ	72 U	72 U	NA	72 UJ	72 UJ
Chloride	--	--	--	ug/l	904 J-	887 J+	383 J+	NA	3060	2310 J-	1020 J+	312 J+	NA	2910	2910 J-
Fluoride	**4000**	4000	80	ug/l	615 J-	198 J	192	185 J+	2560	1810 J-	342 J	175	167 J+	2570	2100 J-
Hardness as calcium carbonate	--	--	--	ug/l	108000	88000	74000	NA	222000	216000	104000	70000	NA	218000	252000
Nitrate Nitrite as N	10000	10000	--	ug/l	283	144	175 J+	NA	1510	1340	245	206 J+	NA	1680	1620
Orthophosphate as P	--	--	--	ug/l	48 UJ	48 UJ	48 U	NA	42 U	48 UJ	48 UJ	48 U	NA	42 U	48 UJ
Sulfate	--	--	--	ug/l	7120 J-	5050 J	3290 J+	NA	18100	14400 J-	6400 J	3150 J+	NA	17800	18400 J-
Sulfide	--	--	--	ug/l	NA	NA	579 U	NA	NA	NA	NA	579 U	NA	NA	NA
Total Dissolved Solids	--	--	--	mg/l	118	96	82	NA	312	267	116	84	NA	315	284
Total Suspended Solids	--	--	--	mg/l	12.9 J	31.3	35.1	NA	413	1 UJ	22.7	32.7	NA	3.7	5.1 J

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-007	CFSWP-007	CFSWP-007
				Sample Date	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/16/2016	12/02/2016	03/16/2017
				Sample Designation	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	DI	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	112000	155000	NA	86000	87600	79600	69100	NA	83900	87500	80200
Ammonia	--	--	--	ug/l	72 U	72 U	NA	72 UJ	72 UJ	72 U	72 U	NA	72 U	72 UJ	72 U
Chloride	--	--	--	ug/l	1080 J+	855 J+	NA	352	360 J-	804 J+	241 J+	NA	348 J	351 J-	758 J+
Fluoride	**4000**	4000	80	ug/l	457 J	555	558 J+	37.3 J	106 J-	122 J	122	119 J+	33.8 J-	110 J-	114 J
Hardness as calcium carbonate	--	--	--	ug/l	106000	130000	NA	90000	150000	88000	70000	NA	86000	90000	82000
Nitrate Nitrite as N	10000	10000	--	ug/l	255	1550 J+	NA	100 U	100 U	119	127 J+	NA	100 U	100 U	127
Orthophosphate as P	--	--	--	ug/l	48 UJ	48 U	NA	42 U	48 UJ	48 UJ	48 U	NA	42 R	48 U	48 UJ
Sulfate	--	--	--	ug/l	6330 J	8610 J+	NA	3680	3620 J-	4140 J	2620 J+	NA	3530 J-	3590 J-	4720 J
Sulfide	--	--	--	ug/l	NA	579 U	NA	NA	NA	NA	579 U	NA	NA	NA	NA
Total Dissolved Solids	--	--	--	mg/l	127	191	NA	95	90	85	71	NA	100	95	89
Total Suspended Solids	--	--	--	mg/l	15.6	62.2	NA	11.6	1 UJ	82	70.5	NA	1 U	1.9	82.8

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-007	CFSWP-007	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-009	CFSWP-009	CFSWP-009	CFSWP-009
				Sample Date	06/14/2017	06/14/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	06/07/2016	04/03/2017	06/12/2017	06/12/2017
				Sample Designation	CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-009-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	T	T	DI	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	69000	NA	85900	90400	90200	69200	NA	170000	171000	191000	NA
Ammonia	--	--	--	ug/l	72 U	NA	72 U	72 UJ	86 J	72 U	NA	48.9 J	72 U	72 U	NA
Chloride	--	--	--	ug/l	243 J+	NA	335 J	363 J-	573	269 J+	NA	1770 J+	2570 J+	1380 J+	NA
Fluoride	**4000**	4000	80	ug/l	123	118 J+	33.5 J-	107 J-	96.8	124	117 J+	80.3	105	188	185 J+
Hardness as calcium carbonate	--	--	--	ug/l	72000	NA	84000	92000	84000	70000	NA	170000	170000	188000	NA
Nitrate Nitrite as N	10000	10000	--	ug/l	131 J+	NA	100 U	100 U	100	124 J+	NA	100 U	100 U	100 U	NA
Orthophosphate as P	--	--	--	ug/l	48 U	NA	42 R	48 U	48 U	48 U	NA	NA	48 UJ	48 U	NA
Sulfate	--	--	--	ug/l	2620 J+	NA	3490 J-	4010 J-	3710 J+	2600 J+	NA	2790	2360	3410 J+	NA
Sulfide	--	--	--	ug/l	579 U	NA	NA	NA	NA	579 U	NA	NA	NA	579 U	NA
Total Dissolved Solids	--	--	--	mg/l	72	NA	95	69	88 J	74	NA	179	163	225 J	NA
Total Suspended Solids	--	--	--	mg/l	41.5	NA	7.4	1 U	18.7	40	NA	1 U	1.3	1.2	NA

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-010	CFSWP-010	CFSWP-010	CFSWP-010	CFSWP-011	CFSWP-011	CFSWP-011	CFSWP-011	CFSWP-012	CFSWP-012	CFSWP-012
				Sample Date	06/07/2016	03/15/2017	06/12/2017	06/12/2017	06/07/2016	04/03/2017	06/12/2017	06/12/2017	06/07/2016	04/03/2017	04/03/2017
				Sample Designation	CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-012-SW	CFSWP-012-SW	CFSWP-DUP5-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	FD
				Sample Fraction	T	T	T	DI	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	158000	133000	179000	NA	158000	171000	180000	NA	158000	172000	172000
Ammonia	--	--	--	ug/l	23 U	72 U	72 U	NA	23 U	72 U	72 U	NA	23 U	72 UJ	141 J
Chloride	--	--	--	ug/l	1970 J+	320 J+	1640 J+	NA	1710 J+	2640 J+	1650 J+	NA	1720 J+	2640 J+	2660 J+
Fluoride	**4000**	4000	80	ug/l	39.4 J	2600	181	177 J+	38.7 J	103	131	128 J+	39.5 J	101	89.6
Hardness as calcium carbonate	--	--	--	ug/l	164000	138000	180000	NA	156000	170000	168000	NA	152000	168000	170000
Nitrate Nitrite as N	10000	10000	--	ug/l	100 U	216	100 U	NA	100 U	100 U	117	NA	100 U	100 U	100 U
Orthophosphate as P	--	--	--	ug/l	NA	NA	48 U	NA	NA	48 UJ	48 U	NA	NA	48 UJ	48 UJ
Sulfate	--	--	--	ug/l	1930	4460 J+	1880 J+	NA	1910	2160	1910 J+	NA	1900	2210	2140
Sulfide	--	--	--	ug/l	NA	NA	579 U	NA	NA	NA	579 U	NA	NA	NA	NA
Total Dissolved Solids	--	--	--	mg/l	150	139	195 J	NA	170	170	199 J	NA	146	164	163
Total Suspended Solids	--	--	--	mg/l	1.5	20.8	1 U	NA	1 U	3.1	1 U	NA	1.1	1.2	1.3

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-012	CFSWP-012	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-014	CFSWP-014	CFSWP-014
				Sample Date	06/12/2017	06/12/2017	06/07/2016	06/07/2016	11/30/2016	03/15/2017	06/12/2017	06/12/2017	08/29/2016	11/30/2016	11/30/2016
				Sample Designation	CFSWP-012-SW	CFSWP-012-SW	CFSWP-013-SW	CFSWP-DUP1-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-014-SW	CFSWP-014-SW	CFSWP-DUP3-SW
				Sample Type	N	N	N	FD	N	N	N	N	N	N	FD
				Sample Fraction	T	DI	T	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	180000	NA	179000	160000	148000	164000	181000	NA	165000	190000	191000
Ammonia	--	--	--	ug/l	72 U	NA	23 U	27.9 J	72 U	72 U	72 U	NA	72 U	72 U	72 U
Chloride	--	--	--	ug/l	1660 J+	NA	1780 J+	1700 J+	577 J-	349 J+	1660 J+	NA	2670	1580 J-	1630 J-
Fluoride	**4000**	4000	80	ug/l	131	129 J+	39.2 J	38.3 J	473 J-	308	131	126 J+	55.8 J	117 J-	123 J-
Hardness as calcium carbonate	--	--	--	ug/l	164000	NA	156000	156000	170000	158000	172000	NA	164000	196000	192000
Nitrate Nitrite as N	10000	10000	--	ug/l	100 U	NA	100 U	100 U	100 U	100 U	113	NA	100 U	100 U	100 U
Orthophosphate as P	--	--	--	ug/l	48 U	NA	NA	NA	48 UJ	NA	48 U	NA	42 UJ	48 UJ	48 UJ
Sulfate	--	--	--	ug/l	1900 J+	NA	1910	1960	3020 J-	3850 J+	1910 J+	NA	3320	2230 J-	2240 J-
Sulfide	--	--	--	ug/l	579 U	NA	NA	NA	NA	NA	579 U	NA	NA	NA	NA
Total Dissolved Solids	--	--	--	mg/l	212 J	NA	173	159	142	176	207 J	NA	167	172	185
Total Suspended Solids	--	--	--	mg/l	1 U	NA	1.2	1.1	153	2	1 U	NA	1.8	1 U	1 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015
				Sample Date	03/13/2017	03/13/2017	06/13/2017	06/13/2017	08/29/2016	08/29/2016	11/30/2016	12/20/2016	03/13/2017	06/13/2017	06/13/2017
				Sample Designation	CFSWP-014-SW	CFSWP-Dup4-SW	CFSWP-014-SW	CFSWP-014-SW	CFSWP-015-SW	CFSWP-DUP2-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-DUP7-SW
				Sample Type	N	FD	N	N	N	FD	N	N	N	N	FD
				Sample Fraction	T	T	T	DI	T	T	T	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	203000	205000	182000	NA	171000	169000	193000	202000	205000	186000	186000
Ammonia	--	--	--	ug/l	72 U	72 U	72 U	NA	72 U	72 U	72 U	72 U	72 U	72 U	72 U
Chloride	--	--	--	ug/l	3060 J+	3080 J+	1770 J+	NA	2600	2610	1630 J-	1370	3100 J+	1640 J+	1620 J+
Fluoride	**4000**	4000	80	ug/l	126	134	137	130 J+	62.4 J	62.3 J	119 J-	112 J-	129	135	136
Hardness as calcium carbonate	--	--	--	ug/l	200000	202000	176000	NA	178000	170000	196000	208000	202000	180000	184000
Nitrate Nitrite as N	10000	10000	--	ug/l	244	251	144 J	NA	100 U	100 U	100 U	100 U	273	120 J-	120 J-
Orthophosphate as P	--	--	--	ug/l	NA	NA	48 U	NA	42 UJ	42 UJ	48 UJ	48 UJ	NA	48 U	48 U
Sulfate	--	--	--	ug/l	3320 J+	3780 J+	2020 J+	NA	2740	3100	2190 J-	2480 J-	3220 J+	1960 J+	1890 J+
Sulfide	--	--	--	ug/l	NA	NA	579 U	NA	NA	NA	NA	NA	NA	579 U	579 U
Total Dissolved Solids	--	--	--	mg/l	223	180	128	NA	182	176	174	247	194	179	184
Total Suspended Solids	--	--	--	mg/l	1 UJ	1 UJ	3.4	NA	1.3	1.1	1 U	1 U	1 UJ	2.1	1.8

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-015	CFSWP-015	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-017	CFSWP-017
				Sample Date	06/13/2017	06/13/2017	08/29/2016	11/30/2016	03/13/2017	06/12/2017	06/12/2017	06/12/2017	06/12/2017	09/16/2016	12/02/2016
				Sample Designation	CFSWP-015-SW	CFSWP-DUP7-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-DUP6-SW	CFSWP-016-SW	CFSWP-DUP6-SW	CFSWP-017-SW	CFSWP-017-SW
				Sample Type	N	FD	N	N	N	N	FD	N	FD	N	N
				Sample Fraction	DI	DI	T	T	T	T	T	DI	DI	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	NA	NA	173000	194000	208000	185000	185000	NA	NA	116000	89900
Ammonia	--	--	--	ug/l	NA	NA	72 U	72 U	72 U	72 U	72 U	NA	NA	72 U	72 UJ
Chloride	--	--	--	ug/l	NA	NA	2800	1630 J-	2950 J+	1620 J+	1600 J+	NA	NA	864 J	370 J-
Fluoride	**4000**	4000	80	ug/l	121 J+	130 J+	58.8 J	123 J-	132	135	137	131 J+	138 J+	56.2 J-	106 J-
Hardness as calcium carbonate	--	--	--	ug/l	NA	NA	172000	200000	202000	180000	180000	NA	NA	124000	92000
Nitrate Nitrite as N	10000	10000	--	ug/l	NA	NA	100 U	100 U	170	113	131	NA	NA	100 U	100 U
Orthophosphate as P	--	--	--	ug/l	NA	NA	42 UJ	48 UJ	NA	48 U	48 U	NA	NA	42 R	48 U
Sulfate	--	--	--	ug/l	NA	NA	2700	2270 J-	3240 J+	1990 J+	1980 J+	NA	NA	4300 J-	4810 J-
Sulfide	--	--	--	ug/l	NA	NA	NA	NA	NA	579 U	579 U	NA	NA	NA	NA
Total Dissolved Solids	--	--	--	mg/l	NA	NA	193	196	204	210 J	221 J	NA	NA	120	96
Total Suspended Solids	--	--	--	mg/l	NA	NA	1	1.1	19 J	4.4	4	NA	NA	4.9	1 U

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-019	CFSWP-019	CFSWP-019
				Sample Date	04/04/2017	06/14/2017	06/14/2017	06/06/2016	12/01/2016	04/03/2017	06/15/2017	06/15/2017	06/06/2016	12/01/2016	04/03/2017
				Sample Designation	CFSWP-017-SW	CFSWP-017-SW	CFSWP-017-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-019-SW	CFSWP-019-SW	CFSWP-019-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	T	DI	T	T	T	T	DI	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	89100	69000	NA	162000	207000	183000	233000	NA	164000	207000	183000
Ammonia	--	--	--	ug/l	72 U	72 U	NA	178	72 UJ	72 U	84.4 J	NA	53 J	72 UJ	72 U
Chloride	--	--	--	ug/l	523	227 J+	NA	2160 J+	1910 J-	1720 J+	2300 J+	NA	1930 J+	1860 J-	1550 J+
Fluoride	**4000**	4000	80	ug/l	85.7	121	119 J+	353	828 J-	365	1700	1860	379	785 J-	350
Hardness as calcium carbonate	--	--	--	ug/l	88000	66000	NA	180000	260000	184000	216000	NA	180000	208000	180000
Nitrate Nitrite as N	10000	10000	--	ug/l	100	140 J+	NA	100 U	100 U	117	1700	NA	100 U	100 U	124
Orthophosphate as P	--	--	--	ug/l	48 U	48 U	NA	NA	48 UJ	48 UJ	48 U	NA	NA	48 UJ	48 UJ
Sulfate	--	--	--	ug/l	3750 J+	2610 J+	NA	3390	4660 J-	4510	12200 J+	NA	3270	5110 J-	4260
Sulfide	--	--	--	ug/l	NA	579 U	NA	NA	NA	NA	579 U	NA	NA	NA	NA
Total Dissolved Solids	--	--	--	mg/l	87 J	74	NA	176	210	172	336	NA	183	201	172
Total Suspended Solids	--	--	--	mg/l	4.9	42.2	NA	8	112 J	9.6	59.2	NA	1.4	12.4 J	3.3

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-019	CFSWP-019	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-021	CFSWP-021	CFSWP-021	CFSWP-021
				Sample Date	06/15/2017	06/15/2017	06/06/2016	12/01/2016	03/16/2017	06/15/2017	06/15/2017	06/06/2016	11/30/2016	03/15/2017	06/15/2017
				Sample Designation	CFSWP-019-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	T	DI	T	T	T	T	DI	T	T	T	T
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit											
Alkalinity	--	--	--	ug/l	167000	NA	154000	183000	169000	175000	NA	148000	228000	206000	200000
Ammonia	--	--	--	ug/l	88.7 J	NA	23 U	72 UJ	82.4 J	126	NA	28.4 J	72 U	72 U	72 U
Chloride	--	--	--	ug/l	1470 J+	NA	2240 J+	1590 J-	1500 J+	1320 J+	NA	1590 J+	2250 J-	1740 J+	1620 J+
Fluoride	**4000**	4000	80	ug/l	305	304	250	265 J-	330 J	308	289	166	189 J-	231	243
Hardness as calcium carbonate	--	--	--	ug/l	168000	NA	176000	256000	160000	160000	NA	168000	304000	204000	184000
Nitrate Nitrite as N	10000	10000	--	ug/l	100 U	NA	117	186	191	204	NA	100 U	100 U	100 U	137
Orthophosphate as P	--	--	--	ug/l	48 U	NA	NA	48 UJ	48 UJ	48 U	NA	NA	48 UJ	NA	48 U
Sulfate	--	--	--	ug/l	3140 J+	NA	3590	3250 J-	4490 J	3240 J+	NA	7440	73100 J-	78900 J+	20300 J+
Sulfide	--	--	--	ug/l	579 U	NA	NA	NA	NA	579 U	NA	NA	NA	NA	579 U
Total Dissolved Solids	--	--	--	mg/l	203	NA	193	185	164	217	NA	176	309	296	252
Total Suspended Solids	--	--	--	mg/l	18.4	NA	2.5	113 J	1.8	11.3	NA	3.1	72.8	1 U	10.1

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L6. General Chemistry in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location	CFSWP-021	CFSWP-022	CFSWP-022	CFSWP-023	CFSWP-024	CFSWP-024	CFSWP-025	CFSWP-025	CFSWP-025	CFSWP-025
				Sample Date	06/15/2017	06/06/2016	04/03/2017	04/03/2017	06/15/2017	06/15/2017	12/20/2016	03/13/2017	06/13/2017	06/13/2017
				Sample Designation	CFSWP-021-SW	CFSWP-022-SW	CFSWP-022-SW	CFSWP-023-SW	CFSWP-024-SW	CFSWP-024-SW	CFSWP-025-SW	CFSWP-025-SW	CFSWP-025-SW	CFSWP-025-SW
				Sample Type	N	N	N	N	N	N	N	N	N	N
				Sample Fraction	DI	T	T	T	T	DI	T	T	T	DI
Parameter	DEQ-7 Human Health Standards	EPA Risk Based Screening Level Drinking Water MCL	EPA Risk Based Screening Level Tapwater RSL	Unit										
Alkalinity	--	--	--	ug/l	NA	144000	170000	217000	13900	NA	201000	207000	185000	NA
Ammonia	--	--	--	ug/l	NA	23 U	72 U	72 U	1840	NA	72 U	72 U	72 U	NA
Chloride	--	--	--	ug/l	NA	1640 J+	1990 J+	1600 J+	1390 J+	NA	1400	2950 J+	1660 J+	NA
Fluoride	**4000**	4000	80	ug/l	188	177	223	2150	**22400 J+**	**21500**	115 J-	128	134	130 J+
Hardness as calcium carbonate	--	--	--	ug/l	NA	172000	166000	224000	50000	NA	206000	204000	176000	NA
Nitrate Nitrite as N	10000	10000	--	ug/l	NA	100 U	100 U	127	327	NA	100 U	161	163 J-	NA
Orthophosphate as P	--	--	--	ug/l	NA	NA	48 UJ	48 UJ	48 U	NA	48 UJ	NA	48 U	NA
Sulfate	--	--	--	ug/l	NA	6540	5660	13200	4390 J+	NA	2510 J-	3250 J+	1960 J+	NA
Sulfide	--	--	--	ug/l	NA	NA	NA	NA	579 U	NA	NA	NA	579 U	NA
Total Dissolved Solids	--	--	--	mg/l	NA	169	177	232	84	NA	243	166	192	NA
Total Suspended Solids	--	--	--	mg/l	NA	262	1.6	7.4	58	NA	3.5	1 UJ	4.4	NA

Bolding indicates an exceedance of DEQ-7 Human Health Standards
Shading indicates an exceedance of EPA Drinking Water MCLs
Red indicates an exceedance of EPA Tapwater RSLs

Appendix L7. Volatile Organic Compounds in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

					Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
					Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
					Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
					Sample Type	N	N	N	N
					Sample Fraction	T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit				
1,1,1-Trichloroethane	11	--	--	DE	ug/l	0.28 U	0.28 U	0.28 U	0.28 UJ
1,1,2,2-Tetrachloroethane	610	--	--	DE	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
1,1,2-Trichloro-1,2,2-trifluoroethane	--	--	--	--	ug/l	0.34 U	0.34 U	0.34 U	0.34 U
1,1,2-Trichloroethane	1200	--	--	DE	ug/l	0.08 U	0.08 U	0.08 U	0.08 U
1,1-Dichloroethane	47	--	--	DE	ug/l	0.24 U	0.24 U	0.24 U	0.24 U
1,1-Dichloroethene	25	--	--	DE	ug/l	0.34 U	0.34 U	0.34 U	0.34 U
1,2,3-Trichlorobenzene	8	--	--	F	ug/l	0.35 U	0.35 U	0.35 U	0.35 U
1,2,4-Trichlorobenzene	24	--	--	EF	ug/l	0.27 U	0.27 U	0.27 U	0.27 U
1,2-Dibromo-3-Chloropropane	--	--	--	--	ug/l	0.23 U	0.23 U	0.23 U	0.23 U
1,2-Dichlorobenzene	0.7	--	--	E	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
1,2-Dichloroethane	100	--	--	EF	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
1,2-Dichloropropane	--	--	--	--	ug/l	0.18 U	0.18 U	0.18 U	0.18 U
1,3-Dichlorobenzene	71	--	--	D	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
1,4-Dichlorobenzene	15	--	--	D	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
2-Butanone (MEK)	14000	--	--	DE	ug/l	2.2 U	2.2 U	2.2 U	2.2 U
2-Hexanone	99	--	--	DE	ug/l	0.72 U	0.72 U	0.72 U	0.72 U
4-Methyl-2-pentanone (MIBK)	170	--	--	ED	ug/l	0.63 U	0.63 U	0.63 U	0.63 U
Acetone	1500	--	--	DE	ug/l	1.1 U	1.1 U	1.1 U	12
Benzene	130	--	--	D	ug/l	0.09 U	0.09 U	0.09 U	0.09 U
Bromoform	320	--	--	DE	ug/l	0.18 U	0.18 U	0.18 U	0.18 U
Bromomethane	--	--	--	--	ug/l	0.18 UJ	0.18 UJ	0.18 UJ	0.18 UJ
Carbon disulfide	0.92	--	--	DE	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Carbon tetrachloride	9.8	--	--	D	ug/l	0.33 U	0.33 U	0.33 U	0.33 U
Chlorobenzene	1.3	--	--	E	ug/l	0.24 U	0.24 U	0.24 U	0.24 U
Chlorobromomethane	--	--	--	--	ug/l	0.3 U	0.3 U	0.3 U	0.3 U
Chlorodibromomethane	--	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Chloroethane	--	--	--	--	ug/l	0.37 U	0.37 U	0.37 U	0.37 UJ
Chloroform	1.8	--	--	E	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Chloromethane	--	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
cis-1,2-Dichloroethene	590	--	--	D	ug/l	0.26 U	0.26 U	0.26 U	0.26 UJ
cis-1,3-Dichloropropene	0.055	--	--	D	ug/l	0.16 U	0.16 U	0.16 U	0.16 U
Cyclohexane	--	--	--	--	ug/l	0.26 U	0.26 U	0.26 U	0.26 U
Dichlorobromomethane	--	--	--	--	ug/l	0.15 U	0.15 U	0.15 U	0.15 U
Dichlorodifluoromethane	--	--	--	--	ug/l	0.14 U	0.14 U	0.14 U	0.14 U
Ethylbenzene	7.3	--	--	D	ug/l	0.3 U	0.3 U	0.3 U	0.3 U
Ethylene Dibromide	--	--	--	--	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
Isopropylbenzene	2.6	--	--	E	ug/l	0.32 U	0.32 U	0.32 U	0.32 U
Methyl acetate	--	--	--	--	ug/l	0.58 U	0.58 U	0.58 U	0.58 UJ
Methyl tert-butyl ether	10000	--	--	F	ug/l	0.13 U	0.13 U	0.13 U	0.13 UJ
Methylcyclohexane	--	--	--	--	ug/l	0.22 U	0.22 U	0.22 U	0.22 U
Methylene Chloride	98.1	--	--	E	ug/l	0.47 J	0.21 U	0.9 J	0.21 UJ
m-Xylene & p-Xylene	1.8	--	--	D	ug/l	0.28 U	0.28 U	0.28 U	0.28 U
o-Xylene	13	--	--	D	ug/l	0.32 U	0.32 U	0.32 U	0.32 U
Styrene	72	--	--	EF	ug/l	0.17 U	0.17 U	0.17 U	0.17 U
Tetrachloroethene	98	--	--	D	ug/l	0.12 U	0.12 U	0.12 U	0.12 U
Toluene	2	--	--	EF	ug/l	0.25 U	0.25 U	0.25 U	0.25 U
trans-1,2-Dichloroethene	590	--	--	D	ug/l	0.18 U	0.18 U	0.18 U	0.18 UJ
trans-1,3-Dichloropropene	0.055	--	--	D	ug/l	0.19 U	0.19 U	0.19 U	0.19 U
Trichloroethene	21	--	--	E	ug/l	0.22 U	0.22 U	0.22 U	0.22 U

Appendix L7. Volatile Organic Compounds in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

					Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
					Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
					Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
					Sample Type	N	N	N	N
					Sample Fraction	T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit				
Trichlorofluoromethane	--	--	--	--	ug/l	0.15 U	0.15 U	0.15 U	0.15 U
Vinyl chloride	930	--	--	E	ug/l	0.06 U	0.06 U	0.06 U	0.06 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L8. Semivolatile Organic Compounds in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date		06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation		CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type		N	N	N	N
				Sample Fraction		T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit				
1,1'-Biphenyl	14	--	--	DE	ug/l	0.66 U	0.63 U	0.68 U	0.63 U
1,2,4,5-Tetrachlorobenzene	3	--	--	E	ug/l	0.45 U	0.43 U	0.47 U	0.43 U
1,4-Dioxane	--	--	--	--	ug/l	3.2 U	3.1 U	3.4 U	3.1 U
2,2'-oxybis[1-chloropropane]	--	--	--	--	ug/l	0.97 U	0.93 U	1 U	0.93 U
2,3,4,6-Tetrachlorophenol	1	--	--	F	ug/l	0.72 U	0.69 U	0.75 U	0.69 U
2,4,5-Trichlorophenol	--	--	--	--	ug/l	0.51 U	0.49 U	0.53 U	0.49 U
2,4,6-Trichlorophenol	4.9	--	--	E	ug/l	0.55 U	0.53 U	0.58 U	0.53 U
2,4-Dichlorophenol	11	--	--	E	ug/l	0.66 U	0.63 U	0.68 U	0.63 U
2,4-Dimethylphenol	--	--	--	--	ug/l	0.95 U	0.91 U	0.99 U	0.91 U
2,4-Dinitrophenol	--	--	--	--	ug/l	2.5 U	2.4 U	2.6 U	2.4 U
2,4-Dinitrotoluene	44	--	--	E	ug/l	1.1 U	1 U	1.1 U	1 U
2,6-Dinitrotoluene	81	--	--	E	ug/l	0.92 U	0.88 U	0.96 U	0.88 U
2-Chloronaphthalene	--	--	--	--	ug/l	0.64 U	0.61 U	0.66 U	0.61 U
2-Chlorophenol	24	--	--	E	ug/l	0.77 U	0.74 U	0.8 U	0.74 U
2-Methylnaphthalene	4.7	--	--	E	ug/l	0.92 U	0.88 U	0.96 U	0.88 U
2-Methylphenol	13	--	--	DE	ug/l	1.3 U	1.3 U	1.4 U	1.3 U
2-Nitroaniline	--	--	--	--	ug/l	0.68 U	0.65 U	0.71 U	0.65 U
2-Nitrophenol	300	--	--	D	ug/l	0.61 U	0.59 U	0.64 U	0.59 U
3 & 4 Methylphenol	--	--	--	--	ug/l	0.92 U	0.88 U	0.96 U	0.88 U
3,3'-Dichlorobenzidine	4.5	--	--	E	ug/l	1.1 U	1 U	1.1 U	1 U
3-Nitroaniline	--	--	--	--	ug/l	0.85 U	0.82 U	0.89 U	0.82 U
4,6-Dinitro-2-methylphenol	--	--	--	--	ug/l	2.1 U	2 U	2.2 U	2 U
4-Bromophenyl phenyl ether	1.5	--	--	DE	ug/l	1.1 U	1 U	1.1 U	1 U
4-Chloro-3-methylphenol	--	--	--	--	ug/l	0.79 U	0.76 U	0.83 U	0.76 U
4-Chloroaniline	232	--	--	E	ug/l	0.76 U	0.73 U	0.79 U	0.73 U
4-Chlorophenyl phenyl ether	--	--	--	--	ug/l	1 U	0.96 U	1 U	0.96 U
4-Nitroaniline	--	--	--	--	ug/l	0.5 U	0.48 U	0.52 U	0.48 U
4-Nitrophenol	60	--	--	E	ug/l	4.8 U	4.7 U	5.1 U	4.7 U
Acenaphthene	5.8	--	--	EF	ug/l	0.92 U	0.88 U	0.96 U	0.88 U
Acenaphthylene	--	--	--	--	ug/l	0.68 U	0.65 U	0.71 U	0.65 U
Acetophenone	--	--	--	--	ug/l	1.1 U	1 U	1.1 U	1 U
Anthracene	0.012	--	--	EF	ug/l	0.59 U	0.57 U	0.62 U	0.57 U
Atrazine	1.8	--	--	EF	ug/l	0.8 U	0.77 U	0.84 U	0.77 U
Benzaldehyde	--	--	--	--	ug/l	0.9 U	0.86 U	0.93 U	0.86 U
Benzo[a]anthracene	**0.018**	--	--	EF	ug/l	0.57 U	0.55 U	0.6 U	**3**
Benzo[a]pyrene	**0.014**	--	--	D	ug/l	0.17 U	0.16 U	0.17 U	**3.9**
Benzo[b]fluoranthene	--	--	--	--	ug/l	0.46 U	0.44 U	0.48 U	10
Benzo[g,h,i]perylene	--	--	--	--	ug/l	0.78 U	0.75 U	0.82 U	3.9 J
Benzo[k]fluoranthene	--	--	--	--	ug/l	0.19 U	0.18 U	0.2 U	0.18 U
Bis(2-chloroethoxy)methane	--	--	--	--	ug/l	0.72 U	0.69 U	0.75 U	0.69 U
Bis(2-chloroethyl)ether	--	--	--	--	ug/l	0.13 U	0.12 U	0.13 U	0.12 U
Bis(2-ethylhexyl) phthalate	3	--	--	D	ug/l	0.75 U	0.72 U	0.78 U	0.72 U
Butyl benzyl phthalate	19	--	--	ED	ug/l	0.63 U	0.6 U	0.65 U	0.6 U
Caprolactam	--	--	--	--	ug/l	1.1 U	1.1 U	1.1 U	1.1 U
Carbazole	--	--	--	--	ug/l	0.89 U	0.85 U	0.92 U	0.85 U
Chrysene	--	--	--	--	ug/l	0.7 U	0.67 U	0.73 U	7.6
Dibenz(a,h)anthracene	--	--	--	--	ug/l	0.094 U	0.09 U	0.098 U	0.09 U
Dibenzofuran	3.7	--	--	DE	ug/l	0.89 U	0.85 U	0.92 U	0.85 U
Diethyl phthalate	210	--	--	DE	ug/l	1 U	1 U	1.1 U	1 U

Appendix L8. Semivolatile Organic Compounds in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date		06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation		CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type		N	N	N	N
				Sample Fraction		T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit				
Dimethyl phthalate	--	--	--	--	ug/l	1 U	0.98 U	1.1 U	0.98 U
Di-n-butyl phthalate	19	--	--	EF	ug/l	0.85 U	0.82 U	0.89 U	0.82 U
Di-n-octyl phthalate	22	--	--	E	ug/l	0.72 U	0.69 U	0.75 U	0.69 U
Fluoranthene	**0.04**	--	--	EF	ug/l	0.75 U	0.72 U	0.78 U	**9.3 J**
Fluorene	3	--	--	EF	ug/l	0.83 U	0.8 U	0.87 U	0.8 U
Hexachlorobenzene	0.0003	--	--	E	ug/l	0.49 U	0.47 U	0.51 U	0.47 U
Hexachlorobutadiene	1.3	--	--	EF	ug/l	0.79 U	0.76 U	0.83 U	0.76 U
Hexachlorocyclopentadiene	--	--	--	--	ug/l	0.64 U	0.61 U	0.66 U	0.61 U
Hexachloroethane	12	--	--	DE	ug/l	0.094 U	0.09 U	0.098 U	0.09 U
Indeno[1,2,3-cd]pyrene	--	--	--	--	ug/l	0.22 U	0.21 U	0.23 U	3.1
Isophorone	--	--	--	--	ug/l	0.7 U	0.67 U	0.73 U	0.67 U
Naphthalene	1.1	--	--	EF	ug/l	0.83 U	0.8 U	0.87 U	0.8 U
Nitrobenzene	--	--	--	--	ug/l	0.51 U	0.49 U	0.53 U	0.49 U
N-Nitrosodi-n-propylamine	--	--	--	--	ug/l	0.86 U	0.83 U	0.9 U	0.83 U
N-Nitrosodiphenylamine	210	--	--	DE	ug/l	0.77 U	0.74 U	0.8 U	0.74 U
Pentachlorophenol	0.5	4.000	5.300	EF	ug/l	2.3 U	2.2 U	2.4 U	2.2 U
Phenanthrene	**0.4**	--	--	EF	ug/l	0.68 U	0.65 U	0.71 U	**1.5 J**
Phenol	4	--	--	EF	ug/l	0.43 U	0.41 U	0.45 U	0.41 U
Pyrene	**0.025**	--	--	EF	ug/l	0.86 U	0.83 U	0.9 U	**7 J**

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-003
				Sample Date		09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	09/09/2016
				Sample Designation		CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-003-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	T	T	DI	T	T	T	T	DI	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	23.7 J	25.6 J	**103**	**824**	18.2 U	28.8 J	23.7 J	**139**	18.2 U	18.2 U	63.5
Antimony	30	--	--	DE	ug/l	0.62 U	0.62 U	0.64 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**4**	--	--	DE	ug/l	**107**	**102**	**98.4**	**83.4**	**70.7**	**102**	**101**	**97.2**	**68.3**	**64.4**	**117**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	24200	25300	23600	20800	19700	23200	24300	23700	18900	18400	27700
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	**18.8**
Iron	**158**	1000	--	C	ug/l	42.4 U	42.4 U	**204**	**870**	42.4 U	42.4 U	42.4 U	137	42.4 U	42.4 U	135
Lead	**0.54**	2.548	13.980	A	ug/l	0.38 U	0.38 U	0.38 U	**0.57 J**	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	6320	7060	6060	5770	4890	6030	6750	6150	5040	4520	7650
Manganese	**120**	--	--	DE	ug/l	2.5 U	2.5 U	4.3 J	24.9	2.5 U	2.5 U	2.5 U	4.5 J	2.5 U	2.5 U	10.9
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	330	341	368	557	257	306	319	396	257	246	398
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	1070	1200	1010	815	706	1030	1060	1030	712	583	3780
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	7 U	8.8 J	7 U	7 U	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-005	CFSWP-005
				Sample Date		12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016
				Sample Designation		CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-005-SW	CFSWP-005-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	T	DI	T	T	T	T	DI	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	**172**	**794**	**746**	18.2 U	**522**	53.3	**625**	**619**	18.2 U	**143**	**94.3**
Antimony	30	--	--	DE	ug/l	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.78 J	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**4**	--	--	DE	ug/l	**118**	**99.3**	**85.8**	**70.2**	**197**	**173**	**103**	**81.3**	**67.7**	**192**	**179**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	30000	23200	21900	20500	60700	52400	26200	21000	19900	60200	62600
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 J
Copper	**0.23**	8.038	3.790	C	ug/l	1.4 U	1.4 U	1.4 U	**26.4**	**1.5 J**	**1.8 J**	1.4 U	1.4 U	1.4 U	**1.6 J**	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	NA	1.5 U	3.5 J	**5.4**	NA	NA	**6.4**	4.1 J	**5.6**	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	**36.2**	**7.7 J**	**9.5 J**	**12.5**	**209**	**178**	**21.3**	**11.5**	**11.7**	**213**	**192**
Iron	**158**	1000	--	C	ug/l	**294**	**868**	**802**	**164**	**827**	**238**	**611**	**629**	42.4 U	**256**	**266**
Lead	**0.54**	2.548	13.980	A	ug/l	0.38 U	**0.63 J**	0.5 J	0.38 U	0.48 J	**2.9**	**0.55 J**	0.38 J	0.38 U	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	8430	6350	6080	5150	18200	15100	7110	5880	4990	17800	17900
Manganese	**120**	--	--	DE	ug/l	30.4	25.6	31.1	12.5	57.1	57.9	24	23.9	8.2	15.7	**212**
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.4 U	**32.2**	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	476	580	551	286	1120	833	581	495	268	1020	1060
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	5990	2050	2050	2160	36400	26100	4780	2060	1850	36900	35600
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	19.9	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-007	CFSWP-007	CFSWP-007
				Sample Date		03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/16/2016	12/02/2016	03/16/2017
				Sample Designation		CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	DI	T	T	T	T	DI	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	**521**	**553**	18.2 U	19.9 J	29.8 J	**1540**	**1000**	18.2 U	28.9 J	54.5	**1460**
Antimony	30	--	--	DE	ug/l	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.66 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.88 J	0.64 U	0.64 U	0.64 U	0.64 U	0.84 J
Barium	**4**	--	--	DE	ug/l	**107**	**116**	**98.3**	**105**	**99.7**	**103**	**82.7**	**64.9**	**102**	**102**	**102**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	27900	37000	32700	24200	24500	22000	19700	18200	23100	24500	21700
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	2 J	1.3 U	1.3 U	1.3 U	1.3 U	2 J
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	**2.2 J**	**1.7 J**	**3 J**	1.4 U	1.4 U	**3.4 J**
Cyanide, Free	**5**	5.200	22	EF	ug/l	**8**	**45.6**	**42.2**	NA	NA	1.5 U	1.5 U	1.6 J	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	**24.7**	**197**	**162**	3.2 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Iron	**158**	1000	--	C	ug/l	**502**	**704**	56 J	42.4 U	42.4 U	**1600**	**1210**	42.4 U	42.4 U	42.4 U	**1640**
Lead	**0.54**	2.548	13.980	A	ug/l	0.41 J	0.39 J	0.38 U	0.38 U	0.38 U	**1.2**	**0.7 J**	0.38 U	0.38 U	0.38 U	**1.2**
Magnesium	82000	--	--	CE	ug/l	7370	10800	8770	6630	6750	6300	5620	4520	6010	6780	6280
Manganese	**120**	--	--	DE	ug/l	24.1	43.2	27.1	2.5 U	2.5 U	51.9	32.6	2.5 U	2.5 U	3.9 J	52
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 J
Potassium	53000	--	--	CE	ug/l	561	762	521	328	315	775	605	240	311	313	748
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	5240	18200	14300	1030	1150	1030	710	562	951	1040	1030
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 J	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-007	CFSWP-007	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-009	CFSWP-009	CFSWP-009	CFSWP-009
				Sample Date		06/14/2017	06/14/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	06/07/2016	04/03/2017	06/12/2017	06/12/2017
				Sample Designation		CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-009-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	DI	T	T	T	T	DI	T	T	T	DI
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	**879**	18.2 U	33.9 J	31 J	**133**	18.2 U	18.2 U	16.8 J	34.8 J	64.4	18.2 U
Antimony	30	--	--	DE	ug/l	0.62 U	0.62 U	0.62 U	0.62 U	0.64 J	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.95 J	0.64 U	0.64 U	0.69 J
Barium	**4**	--	--	DE	ug/l	**81.9**	**64**	**103**	**103**	**98.6**	**62.8**	**63.7**	**104**	**77.1**	**116**	**116**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	19300	18300	23200	25400	24400	17600	18200	50100	46800	53000	52200
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	**1.4 J**	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	2 U	2 U	2 U	2 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U
Iron	**158**	1000	--	C	ug/l	**1090**	42.4 U	42.4 U	42.4 U	127	42.4 U	42.4 U	49.1 U	42.4 U	42.4 U	42.4 U
Lead	**0.54**	2.548	13.980	A	ug/l	**0.68 J**	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.44 U	0.38 U	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	5500	4460	6050	7110	6300	4670	4510	12600	10600	13200	12800
Manganese	**120**	--	--	DE	ug/l	31.8	2.5 U	2.5 U	2.5 U	4.6 J	2.5 U	2.5 U	3 U	3 J	3.4 J	2.5 U
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	547	255	317	309	378	242	237	560	460	551	511
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	677	574	958	1140	1080	666	570	2340	2360	2380	2250
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	2.2 J	1.9 U	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	7 U	7 U	7 U	7 U	7 U	6.5 U	7 U	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-010	CFSWP-010	CFSWP-010	CFSWP-010	CFSWP-011	CFSWP-011	CFSWP-011	CFSWP-011	CFSWP-012	CFSWP-012	CFSWP-012
				Sample Date		06/07/2016	03/15/2017	06/12/2017	06/12/2017	06/07/2016	04/03/2017	06/12/2017	06/12/2017	06/07/2016	04/03/2017	04/03/2017
				Sample Designation		CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-011-SW	CFSWP-012-SW	CFSWP-012-SW	CFSWP-DUP5-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N	FD
				Sample Fraction		T	T	T	DI	T	T	T	DI	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	44.6	**507**	18.2 U	18.2 U	28.2 J	37.9 J	18.2 U	18.2 U	35.9 J	27.4 J	37.7 J
Antimony	30	--	--	DE	ug/l	0.76 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.71 U	0.64 U	0.64 U	0.64 U	0.71 U	0.64 U	0.64 U	0.64 U	0.8 J	0.64 U	0.64 U
Barium	**4**	--	--	DE	ug/l	**79.6**	**63.4**	**88**	**85.2**	**78.6**	**70.8**	**87.3**	**86.6**	**79**	**70.5**	**75.8**
Beryllium	**0.66**	--	--	DE	ug/l	0.29 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.72 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	47000	38300	50700	48600	47000	46600	50600	48700	46800	45600	45300
Chromium	64.3	74.700	--	E	ug/l	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	1.6 U	**1.5 J**	1.4 U	1.4 U	**2.1 J**	1.4 U	1.4 U	1.4 U	**4.1**	1.4 U	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	4 U	2 U	2 U	2 U	4 U	2 U	2 U	2 U	4 U	2 U	2 U
Iron	**158**	1000	--	C	ug/l	49.3 J	**392**	42.4 U	42.4 U	49.1 U	42.4 U	42.4 U	42.4 U	72.8 J	42.4 U	54.6 J
Lead	**0.54**	2.548	13.980	A	ug/l	0.44 U	0.54 J	0.38 U	0.38 U	0.44 U	0.38 U	0.38 U	0.38 U	0.44 U	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	10900	6510	12100	10900	10800	10400	12100	11100	10900	10300	10900
Manganese	**120**	--	--	DE	ug/l	7.8 J	19.6	3.1 J	2.5 U	6.3 J	7.5 J	3.8 J	2.5 U	8.6	6.8 J	7.9 J
Mercury	0.026	0.910	1.700	EF	ug/l	0.14 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.6 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	535	1100	473	417	540	454	472	419	537	433	451
Selenium	1	5	20	EF	ug/l	0.79 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	2080	2180	2220	2060	2120	2370	2210	2010	2080	2310	2360
Thallium	0.8	--	--	EF	ug/l	0.31 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	2.1 J	1.9 U	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	6.5 U	7 U	7 U	7 U	6.5 U	7 U	7 U	7 U	6.5 U	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-012	CFSWP-012	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-014	CFSWP-014	CFSWP-014
				Sample Date		06/12/2017	06/12/2017	06/07/2016	06/07/2016	11/30/2016	03/15/2017	06/12/2017	06/12/2017	08/29/2016	11/30/2016	11/30/2016
				Sample Designation		CFSWP-012-SW	CFSWP-012-SW	CFSWP-013-SW	CFSWP-DUP1-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-014-SW	CFSWP-014-SW	CFSWP-DUP3-SW
				Sample Type		N	N	N	FD	N	N	N	N	N	N	FD
				Sample Fraction		T	DI	T	T	T	T	T	DI	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	18.2 U	18.2 U	30 J	34.6 J	**1610**	38.6 J	23.1 J	18.2 U	37.6 J	18.2 UJ	27.4 J
Antimony	30	--	--	DE	ug/l	0.62 U	0.62 U	0.76 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	0.64 U	0.71 U	0.71 U	1.8 J	2.2	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**4**	--	--	DE	ug/l	**88.8**	**85**	**78**	**81.2**	**183**	**73**	**91.3**	**86.5**	**98.1**	**101**	**103**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.29 U	0.29 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.71 U	0.72 U	0.72 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	50000	48700	46500	47700	40000	42600	50400	48900	43100	52800	53300
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.3 U	1.5 U	1.5 U	1.4 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.5 U	1.5 U	2.4 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	1.4 U	1.4 U	**2.2 J**	**11.7 J**	**6.2**	1.4 U	1.4 U	1.4 U	**5.4**	1.4 U	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	2 U	2 U	4 U	4 U	2 U	2 U	2 U	2 U	2 U	**15.3 J**	2 UJ
Iron	**158**	1000	--	C	ug/l	42.4 U	42.4 U	49.1 U	49.1 U	**2910**	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U
Lead	**0.54**	2.548	13.980	A	ug/l	0.38 U	0.38 U	0.44 U	0.44 U	**2.1**	0.38 U	0.38 U	0.38 U	0.41 J	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	12000	11100	10700	11100	11300	10900	12300	11000	13500	13500	13900
Manganese	**120**	--	--	DE	ug/l	4.4 J	2.5 U	10.7	11	**3750**	5.7 J	7.1 J	3.2 J	13.2	5.2 J	3.9 J
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.14 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.6 U	1.6 U	2.3 J	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	474	410	530	556	778	556	480	419	377	481	486
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.79 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.3 U	1.5 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	2190	2020	2030	2120	2340	1410	2250	2070	3240	2590	2660
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.31 U	0.31 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	1.9 J	1.8 J	1.9 J	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	6.5 U	6.5 U	18.9	7 U	14.1 J	7 U	16.4	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015
				Sample Date		03/13/2017	03/13/2017	06/13/2017	06/13/2017	08/29/2016	08/29/2016	11/30/2016	12/20/2016	03/13/2017	06/13/2017	06/13/2017
				Sample Designation		CFSWP-014-SW	CFSWP-Dup4-SW	CFSWP-014-SW	CFSWP-014-SW	CFSWP-015-SW	CFSWP-DUP2-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-DUP7-SW
				Sample Type		N	FD	N	N	N	FD	N	N	N	N	FD
				Sample Fraction		T	T	T	DI	T	T	T	T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	18.2 U	18.2 U	33.7 J	18.2 U	44.9	39.7 J	18.2 U	20 J	18.2 U	45.6	40
Antimony	30	--	--	DE	ug/l	0.64 J	0.62 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.67 J	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**4**	--	--	DE	ug/l	**109**	**104**	**94.4**	**88.5**	**103**	**101**	**106**	**118**	**107**	**97.5**	**97.1**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	55800	52800	50900	50100	47500	44600	53100	56800	53500	51600	51700
Chromium	64.3	74.700	--	E	ug/l	37.7 J	2.4 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	**2.3 J**	1.4 UJ	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	1.5 U	1.5 U	1.5 U	1.5 U	NA	NA	NA	NA	1.5 U	1.5 U	1.5 U
Cyanide, Total	**5**	5.200	22	EF	ug/l	2 U	2 U	2 U	2 U	2.3 J	2 U	**10.6**	2 U	2 U	2 U	2 U
Iron	**158**	1000	--	C	ug/l	**304 J**	51.7 J	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U
Lead	**0.54**	2.548	13.980	A	ug/l	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	13500	12400	12400	11700	13600	13400	13600	14000	12500	12600	12700
Manganese	**120**	--	--	DE	ug/l	13.7 J	9.7 J	12.7	2.7 J	8.6 J	5.9 J	4 J	5.5 J	6.6 J	12.5	13
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	656	486	467	435	405	357	484	519	502	469	466
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	5530 J	2490 J	2240 J+	2000	2870	2620	2610	2940	2520	2250	2270
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-015	CFSWP-015	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-017	CFSWP-017
				Sample Date		06/13/2017	06/13/2017	08/29/2016	11/30/2016	03/13/2017	06/12/2017	06/12/2017	06/12/2017	06/12/2017	09/16/2016	12/02/2016
				Sample Designation		CFSWP-015-SW	CFSWP-DUP7-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-DUP6-SW	CFSWP-016-SW	CFSWP-DUP6-SW	CFSWP-017-SW	CFSWP-017-SW
				Sample Type		N	FD	N	N	N	N	FD	N	FD	N	N
				Sample Fraction		DI	DI	T	T	T	T	T	DI	DI	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	18.2 U	18.2 U	59.2	19.5 J	19.6 J	85.5	66.8	18.2 U	18.2 U	33.2 J	26.3 J
Antimony	30	--	--	DE	ug/l	0.62 U	6.2 U	0.62 U	0.62 U	0.78 J	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	6.4 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**4**	--	--	DE	ug/l	**93**	**96.3**	**99.5**	**105**	**106**	**98.8**	**99.4**	**93.5**	**99.8**	**190**	**103**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	7.1 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	50500	50100	44400	53100	53700	50500	51000	50300	50600	33800	25400
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	**1.9 J**	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	1.5 U	1.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Iron	**158**	1000	--	C	ug/l	42.4 U	42.4 U	42.4 U	42.4 U	42.4 U	129 J	54.7 J	42.4 U	42.4 U	63.1 J	42.4 U
Lead	**0.54**	2.548	13.980	A	ug/l	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	11700	11700	13500	13900	12600	12200	12400	11400	11400	9260	7090
Manganese	**120**	--	--	DE	ug/l	3.5 J	3.2 J	3.5 J	3.6 J	5.6 J	14.7	14	3.4 J	3.2 J	21.8	2.5 U
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	434	429	367	483	495	477	479	439	436	439	314
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	12.8 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	1960	1940	3260	2630	2480	2200	2200	2070	2020	1580	1100
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	7 U	7 U	7 U	13.5 J	7 UJ	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-019	CFSWP-019	CFSWP-019
				Sample Date		04/04/2017	06/14/2017	06/14/2017	06/06/2016	12/01/2016	04/03/2017	06/15/2017	06/15/2017	06/06/2016	12/01/2016	04/03/2017
				Sample Designation		CFSWP-017-SW	CFSWP-017-SW	CFSWP-017-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-019-SW	CFSWP-019-SW	CFSWP-019-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	DI	T	T	T	T	DI	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	**138**	26.6 J	18.2 U	13.5 U	**583**	60.7	**285**	18.2 U	18.7 J	61.7	24.5 J
Antimony	30	--	--	DE	ug/l	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	0.64 U	0.64 U	0.71 J	0.64 U	0.64 U	0.64 U	0.64 U	0.71 U	0.64 U	0.64 U
Barium	**4**	--	--	DE	ug/l	**94.4**	**63.4**	**63.6**	**268**	**225**	**237**	**237**	**194**	**265**	**156**	**244**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	23900	17700	18600	48300	77000	46300	62400	49400	49100	51000	45600
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.3 U	1.3 U	3.9 J	1.3 U	1.3 U	1.3 U	1.3 U	1.8 J	1.3 U	4.3
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	1.4 U	1.4 U	1.4 U	**2 J**	**9.8**	**1.9 J**	**5.3**	1.4 U	**3.3 J**	**1.6 J**	**1.8 J**
Cyanide, Free	**5**	5.200	22	EF	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	2 U	2 U	2 U	4 U	2 U	2 U	**77.2**	**68.2**	4 U	2 U	2 U
Iron	**158**	1000	--	C	ug/l	128	42.4 U	42.4 U	109 J	**449**	48.9 J	**268**	60.5 J	110 J	134	111 J
Lead	**0.54**	2.548	13.980	A	ug/l	0.38 U	0.38 U	0.38 U	0.44 U	**1.7**	0.38 U	**0.99 J**	0.38 U	0.44 U	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	6230	4780	4560	16200	17200	13900	16300	14800	16200	16500	14000
Manganese	**120**	--	--	DE	ug/l	4.2 J	2.6 J	2.5 J	5.7 J	8.3	2.5 U	3.4 J	2.5 U	4.4 J	9.3	3.4 J
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.4 U	1.6 U	1.6 J	1.4 U	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	367	247	256	797	600	700	1060	970	910	641	678
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	1080	692	576	5660	9290	4600	25800	23500	5840	8710	4630
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	7 U	6.5 U	18.2	7 U	15.2 J	7 U	6.5 U	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-019	CFSWP-019	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-021	CFSWP-021	CFSWP-021	CFSWP-021
				Sample Date		06/15/2017	06/15/2017	06/06/2016	12/01/2016	03/16/2017	06/15/2017	06/15/2017	06/06/2016	11/30/2016	03/15/2017	06/15/2017
				Sample Designation		CFSWP-019-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	DI	T	T	T	T	DI	T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit											
Aluminum	**87**	87	750	A	ug/l	18.2 U	18.2 U	15.3 J	**615**	18.2 U	18.2 U	18.2 U	**95.3**	**5750**	**112**	**390**
Antimony	30	--	--	DE	ug/l	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U	0.62 U	0.76 U	0.62 U	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.64 U	0.64 U	0.71 U	0.64 U	0.64 U	0.64 U	0.64 U	1.2 J	**3.7**	0.64 U	0.87 J
Barium	**4**	--	--	DE	ug/l	**250**	**248**	**305**	**424**	**239**	**275**	**270**	**98**	**219**	**88.7**	**104**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U	0.24 U	0.29 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U	0.71 U	0.72 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	38000	37800	45500	73300	38700	41100	39800	50500	82100	55600	54600
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	3.4 J	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	2 J	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	1.4 U	1.4 U	**1.8 J**	**4**	1.4 U	1.4 U	1.4 U	1.6 U	**5.7**	1.4 U	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	NA	NA	NA	NA	**9**	2.1 J	1.7 J	NA	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	2 U	2 U	**12.5**	**16.4**	**11.3**	2 U	**5.3 J**	4 U	2 U	2 U	2 U
Iron	**158**	1000	--	C	ug/l	42.4 U	42.4 U	49.1 U	**451**	43.1 J	42.4 U	42.4 U	79.5 J	**4760**	99.2 J	**197**
Lead	**0.54**	2.548	13.980	A	ug/l	0.38 U	0.38 U	0.44 U	**0.91 J**	0.38 U	0.38 U	0.38 U	0.44 U	**4.5**	0.38 U	**0.66 J**
Magnesium	82000	--	--	CE	ug/l	13300	12700	15600	16500	12600	14000	13200	11700	19500	12200	12700
Manganese	**120**	--	--	DE	ug/l	2.5 U	2.5 U	3 U	10.1	5.3 J	5.3 J	4.5 J	4.1 J	**127**	3.3 J	8.1
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.4 U	1.6 U	1.4 U	1.4 U	1.4 U	1.4 U	1.6 U	3.9 J	1.4 U	2.1 J
Potassium	53000	--	--	CE	ug/l	769	752	818	894	656	652	619	578	1250	499	443
Selenium	1	5	20	EF	ug/l	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	4330	3670	5150	4860	4080	4570	3860	6150	31000	26300	10700
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U	0.26 U	0.31 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	1.9 U	2.1 J	1.9 U	1.9 U	1.9 U	1.9 U	2.1 J	3.9 J	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	7 U	6.5 U	7 U	7 U	7 U	7 U	6.5 U	19.2	7 U	9.1 J

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L9. Metals in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-021	CFSWP-022	CFSWP-022	CFSWP-023	CFSWP-024	CFSWP-024	CFSWP-025	CFSWP-025	CFSWP-025	CFSWP-025
				Sample Date		06/15/2017	06/06/2016	04/03/2017	04/03/2017	06/15/2017	06/15/2017	12/20/2016	03/13/2017	06/13/2017	06/13/2017
				Sample Designation		CFSWP-021-SW	CFSWP-022-SW	CFSWP-022-SW	CFSWP-023-SW	CFSWP-024-SW	CFSWP-024-SW	CFSWP-025-SW	CFSWP-025-SW	CFSWP-025-SW	CFSWP-025-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		DI	T	T	T	T	DI	T	T	T	DI
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Aluminum	**87**	87	750	A	ug/l	18.2 U	**937**	**140**	**109**	**8630**	**4780**	44.4	18.2 U	49.5	18.2 U
Antimony	30	--	--	DE	ug/l	0.62 U	0.76 U	0.62 U	0.62 U	7.7	7.2	0.62 U	0.74 J	0.62 U	0.62 U
Arsenic	**3.1**	150	340	D	ug/l	0.93 J	0.88 J	0.64 U	0.64 U	2.4	1 J	0.64 U	0.64 U	0.64 U	0.64 U
Barium	**4**	--	--	DE	ug/l	**96.5**	**125**	**77.9**	**234**	**43.4**	**26.4**	**122**	**110**	**94.7**	**93.3**
Beryllium	**0.66**	--	--	DE	ug/l	0.24 U	0.29 U	0.24 U	0.24 U	**0.71 J**	0.51 J	0.24 U	0.24 U	0.24 U	0.24 U
Cadmium	**0.09**	0.238	0.520	F	ug/l	0.71 U	0.72 U	0.71 U	0.71 U	**3**	**2.5**	0.71 U	0.71 U	0.71 U	0.71 U
Calcium	116000	--	--	CE	ug/l	54100	43600	45600	63300	7860	7020	56700	54200	51100	50400
Chromium	64.3	74.700	--	E	ug/l	1.3 U	1.5 U	1.3 U	1.3 U	2.7 J	1.3 U	1.3 U	8.9	1.3 U	1.3 U
Cobalt	5.1	--	--	C	ug/l	1.3 U	1.5 U	1.3 U	1.3 U	1.6 J	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Copper	**0.23**	8.038	3.790	C	ug/l	1.4 U	**2.6 J**	1.4 U	**3.8 J**	**16.5**	**2 J**	1.4 U	1.4 U	1.4 U	1.4 U
Cyanide, Free	**5**	5.200	22	EF	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	**5**	5.200	22	EF	ug/l	2 U	4 U	2 U	**7.6 J**	2 U	2 U	2 U	2 U	2 U	2 U
Iron	**158**	1000	--	C	ug/l	42.4 U	**302**	50.2 J	42.4 U	**817**	42.4 U	42.4 U	100 J	42.4 U	42.4 U
Lead	**0.54**	2.548	13.980	A	ug/l	0.38 U	0.44 U	0.38 U	0.38 U	**7.6**	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Magnesium	82000	--	--	CE	ug/l	12100	10900	10300	13900	804	384	13900	12700	12400	11700
Manganese	**120**	--	--	DE	ug/l	3.4 J	17.8	2.5 U	2.5 U	37.4	31.8	8.9	6.7 J	13.5	3.1 J
Mercury	0.026	0.910	1.700	EF	ug/l	0.17 U	0.14 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U
Nickel	**5**	45.009	145	C	ug/l	1.4 U	1.6 U	1.4 U	1.9 J	**55.9**	**22.1**	1.4 U	1.4 U	1.4 U	1.4 U
Potassium	53000	--	--	CE	ug/l	397	785	459	646	814	760	528	509	456	421
Selenium	1	5	20	EF	ug/l	0.73 U	0.79 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U
Silver	0.067	--	0.374	B	ug/l	1.3 U	1.5 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Sodium	680000	--	--	CE	ug/l	10400	6900	4490	5280	6730	6180	2880	2530	2250	2010
Thallium	0.8	--	--	EF	ug/l	0.26 U	0.31 U	0.26 U	0.26 U	0.27 J	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Vanadium	20	--	--	DE	ug/l	1.9 U	2.2 J	1.9 U	6.9	18	4.3	1.9 U	1.9 U	1.9 U	1.9 U
Zinc	**30**	103.361	37.000	CF	ug/l	7 U	6.5 U	7 U	7 U	**537**	**512**	7 U	7 U	7 U	7 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standa
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L10. Polychlorinated Biphenyls in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

					Sample Location	CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
					Sample Date	06/06/2016	06/06/2016	06/06/2016	06/15/2017
					Sample Designation	CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
					Sample Type	N	N	N	N
					Sample Fraction	T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit				
Aroclor 1016	0.000074	0.014	--	E	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1221	0.000074	0.014	--	E	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1232	0.000074	0.014	--	E	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1242	0.000074	0.014	--	E	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1248	0.000074	0.014	--	E	ug/l	0.098 U	0.098 U	0.098 U	0.1 U
Aroclor 1254	0.000074	0.014	--	E	ug/l	0.084 U	0.084 U	0.084 U	0.099 U
Aroclor 1260	0.000074	0.014	--	E	ug/l	0.084 U	0.084 U	0.084 U	0.099 U
Aroclor 1268	0.014	0.014	--	A	ug/l	0.084 U	0.084 U	0.084 U	0.099 U
Aroclor-1262	--	--	--	--	ug/l	0.084 U	0.084 U	0.084 U	0.099 U
Polychlorinated biphenyls, Total	0.000074	0.014	--	E	ug/l	0.098 U	0.098 U	0.098 U	0.1 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L11. Organochlorine Pesticides in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-018	CFSWP-019	CFSWP-020	CFSWP-024
				Sample Date		06/06/2016	06/06/2016	06/06/2016	06/15/2017
				Sample Designation		CFSWP-018-SW	CFSWP-019-SW	CFSWP-020-SW	CFSWP-024-SW
				Sample Type		N	N	N	N
				Sample Fraction		T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit				
4,4'-DDD	0.001	--	--	F	ug/l	0.005 U	0.005 U	0.005 U	0.006 U
4,4'-DDE	0.001	--	--	F	ug/l	0.004 U	0.004 U	0.004 U	0.002 U
4,4'-DDT	0.0005	0.001	0.500	E	ug/l	0.004 U	0.004 U	0.004 U	0.004 U
Aldrin	0.004	1.500	1.500	F	ug/l	0.004 U	0.004 U	0.004 U	0.003 U
alpha-BHC	2.2	--	--	D	ug/l	0.006 U	0.006 U	0.006 U	0.007 U
alpha-Chlordane	0.0043	0.004	--	ABE	ug/l	0.004 U	0.004 U	0.004 U	0.002 U
beta-BHC	2.2	--	--	D	ug/l	0.005 U	0.005 U	0.005 U	0.004 U
delta-BHC	2.2	--	--	D	ug/l	0.006 U	0.006 U	0.006 U	0.005 U
Dieldrin	0.056	0.056	0.240	ABE	ug/l	0.004 U	0.004 U	0.004 U	0.003 U
Endosulfan I	0.003	0.056	0.110	F	ug/l	0.005 U	0.005 U	0.005 U	0.002 U
Endosulfan II	0.051	0.056	0.110	DE	ug/l	0.004 U	0.004 U	0.004 U	0.004 U
Endosulfan sulfate	0.051	--	--	D	ug/l	0.005 U	0.005 U	0.005 U	0.006 U
Endrin	0.0023	0.036	0.086	F	ug/l	0.004 U	0.004 U	0.004 U	0.004 U
Endrin aldehyde	0.036	--	--	B	ug/l	0.004 U	0.004 U	0.004 U	0.008 U
Endrin ketone	0.036	--	--	B	ug/l	0.004 U	0.004 U	0.004 U	0.008 U
gamma-BHC (Lindane)	0.01	0.950	--	EF	ug/l	0.004 U	0.004 U	0.004 U	0.012 U
gamma-Chlordane	0.0043	0.004	--	ABE	ug/l	0.005 U	0.005 U	0.005 U	0.003 U
Heptachlor	0.0019	0.004	0.260	E	ug/l	0.004 U	0.004 U	0.004 U	0.003 U
Heptachlor epoxide	0.0019	0.004	0.260	E	ug/l	0.004 U	0.004 U	0.004 U	0.005 U
Methoxychlor	0.019	0.030	--	DE	ug/l	0.004 U	0.004 U	0.004 U	0.004 U
Toxaphene	0.0002	0	0.730	ABE	ug/l	0.06 U	0.06 U	0.06 U	0.11 U

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-001	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002	CFSWP-002
				Sample Date		09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017
				Sample Designation		CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-001-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW	CFSWP-002-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	T	T	DI	T	T	T	T	DI
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	85900	88100	88000	71400	NA	85900	86900	87800	70000	NA
Ammonia	--	--	--	--	ug/l	72 U	72 UJ	72 U	72 U	NA	72 U	72 UJ	72 U	72 U	NA
Chloride	120000	--	--	F	ug/l	379 J	1110 J-	540	397 J+	NA	342 J	1710 J-	490	255 J+	NA
Fluoride	**120**	--	--	F	ug/l	35.8 J-	**211 J-**	84.2	118	118 J+	35.9 J-	**547 J-**	95	119	109 J+
Hardness as calcium carbonate	--	--	--	--	ug/l	88000	90000	86000	72000	NA	86000	92000	84000	72000	NA
Nitrate Nitrite as N	--	--	--	--	ug/l	898	100 U	120	124 J+	NA	100 U	100 U	133	125 J+	NA
Orthophosphate as P	--	--	--	--	ug/l	42 R	48 U	48 U	48 U	NA	42 R	48 U	48 U	48 U	NA
Sulfate	--	--	--	--	ug/l	3570 J-	6620 J-	3300 J+	2590 J+	NA	3610 J-	17400 J-	3410 J+	2850 J+	NA
Sulfide	--	--	--	--	ug/l	NA	NA	NA	579 U	NA	NA	NA	NA	579 U	NA
Total Dissolved Solids	--	--	--	--	mg/l	101	81	82 J	62	NA	91	90	87 J	77	NA
Total Suspended Solids	--	--	--	--	mg/l	1 U	3.8	11.1	34.9	NA	1 U	1 U	8.5	45.7	NA

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-003	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004	CFSWP-004
				Sample Date		09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017
				Sample Designation		CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-003-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW	CFSWP-004-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	T	T	DI	T	T	T	T	DI
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	97900	92000	90200	77500	NA	264000	179000	106000	76000	NA
Ammonia	--	--	--	--	ug/l	72 UJ	72 UJ	72 U	72 U	NA	72 UJ	72 UJ	72 U	72 U	NA
Chloride	120000	--	--	F	ug/l	500	904 J-	887 J+	383 J+	NA	3060	2310 J-	1020 J+	312 J+	NA
Fluoride	**120**	--	--	F	ug/l	**181**	**615 J-**	**198 J**	**192**	**185 J+**	**2560**	**1810 J-**	**342 J**	**175**	**167 J+**
Hardness as calcium carbonate	--	--	--	--	ug/l	90000	108000	88000	74000	NA	222000	216000	104000	70000	NA
Nitrate Nitrite as N	--	--	--	--	ug/l	122	283	144	175 J+	NA	1510	1340	245	206 J+	NA
Orthophosphate as P	--	--	--	--	ug/l	42 U	48 UJ	48 UJ	48 U	NA	42 U	48 UJ	48 UJ	48 U	NA
Sulfate	--	--	--	--	ug/l	4620	7120 J-	5050 J	3290 J+	NA	18100	14400 J-	6400 J	3150 J+	NA
Sulfide	--	--	--	--	ug/l	NA	NA	NA	579 U	NA	NA	NA	NA	579 U	NA
Total Dissolved Solids	--	--	--	--	mg/l	116	118	96	82	NA	312	267	116	84	NA
Total Suspended Solids	--	--	--	--	mg/l	1.7	12.9 J	31.3	35.1	NA	413	1 UJ	22.7	32.7	NA

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-005	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006	CFSWP-006
				Sample Date		09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017	09/09/2016	12/01/2016	03/16/2017	06/14/2017	06/14/2017
				Sample Designation		CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-005-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW	CFSWP-006-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	T	T	DI	T	T	T	T	DI
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	256000	269000	112000	155000	NA	86000	87600	79600	69100	NA
Ammonia	--	--	--	--	ug/l	72 UJ	72 UJ	72 U	72 U	NA	72 UJ	72 UJ	72 U	72 U	NA
Chloride	120000	--	--	F	ug/l	2910	2910 J-	1080 J+	855 J+	NA	352	360 J-	804 J+	241 J+	NA
Fluoride	**120**	--	--	F	ug/l	**2570**	**2100 J-**	**457 J**	**555**	**558 J+**	37.3 J	106 J-	**122 J**	**122**	119 J+
Hardness as calcium carbonate	--	--	--	--	ug/l	218000	252000	106000	130000	NA	90000	150000	88000	70000	NA
Nitrate Nitrite as N	--	--	--	--	ug/l	1680	1620	255	1550 J+	NA	100 U	100 U	119	127 J+	NA
Orthophosphate as P	--	--	--	--	ug/l	42 U	48 UJ	48 UJ	48 U	NA	42 U	48 UJ	48 UJ	48 U	NA
Sulfate	--	--	--	--	ug/l	17800	18400 J-	6330 J	8610 J+	NA	3680	3620 J-	4140 J	2620 J+	NA
Sulfide	--	--	--	--	ug/l	NA	NA	NA	579 U	NA	NA	NA	NA	579 U	NA
Total Dissolved Solids	--	--	--	--	mg/l	315	284	127	191	NA	95	90	85	71	NA
Total Suspended Solids	--	--	--	--	mg/l	3.7	5.1 J	15.6	62.2	NA	11.6	1 UJ	82	70.5	NA

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-007	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008	CFSWP-008
				Sample Date		09/16/2016	12/02/2016	03/16/2017	06/14/2017	06/14/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017	06/14/2017
				Sample Designation		CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-007-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW	CFSWP-008-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	T	T	DI	T	T	T	T	DI
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	83900	87500	80200	69000	NA	85900	90400	90200	69200	NA
Ammonia	--	--	--	--	ug/l	72 U	72 UJ	72 U	72 U	NA	72 U	72 UJ	86 J	72 U	NA
Chloride	120000	--	--	F	ug/l	348 J	351 J-	758 J+	243 J+	NA	335 J	363 J-	573	269 J+	NA
Fluoride	**120**	--	--	F	ug/l	33.8 J-	110 J-	114 J	**123**	118 J+	33.5 J-	107 J-	96.8	**124**	117 J+
Hardness as calcium carbonate	--	--	--	--	ug/l	86000	90000	82000	72000	NA	84000	92000	84000	70000	NA
Nitrate Nitrite as N	--	--	--	--	ug/l	100 U	100 U	127	131 J+	NA	100 U	100 U	100	124 J+	NA
Orthophosphate as P	--	--	--	--	ug/l	42 R	48 U	48 UJ	48 U	NA	42 R	48 U	48 U	48 U	NA
Sulfate	--	--	--	--	ug/l	3530 J-	3590 J-	4720 J	2620 J+	NA	3490 J-	4010 J-	3710 J+	2600 J+	NA
Sulfide	--	--	--	--	ug/l	NA	NA	NA	579 U	NA	NA	NA	NA	579 U	NA
Total Dissolved Solids	--	--	--	--	mg/l	100	95	89	72	NA	95	69	88 J	74	NA
Total Suspended Solids	--	--	--	--	mg/l	1 U	1.9	82.8	41.5	NA	7.4	1 U	18.7	40	NA

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-009	CFSWP-009	CFSWP-009	CFSWP-009	CFSWP-010	CFSWP-010	CFSWP-010	CFSWP-010	CFSWP-011	CFSWP-011
				Sample Date		06/07/2016	04/03/2017	06/12/2017	06/12/2017	06/07/2016	03/15/2017	06/12/2017	06/12/2017	06/07/2016	04/03/2017
				Sample Designation		CFSWP-009-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-009-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-010-SW	CFSWP-011-SW	CFSWP-011-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		T	T	T	DI	T	T	T	DI	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	170000	171000	191000	NA	158000	133000	179000	NA	158000	171000
Ammonia	--	--	--	--	ug/l	48.9 J	72 U	72 U	NA	23 U	72 U	72 U	NA	23 U	72 U
Chloride	120000	--	--	F	ug/l	1770 J+	2570 J+	1380 J+	NA	1970 J+	320 J+	1640 J+	NA	1710 J+	2640 J+
Fluoride	**120**	--	--	F	ug/l	80.3	105	**188**	**185 J+**	39.4 J	**2600**	**181**	**177 J+**	38.7 J	103
Hardness as calcium carbonate	--	--	--	--	ug/l	170000	170000	188000	NA	164000	138000	180000	NA	156000	170000
Nitrate Nitrite as N	--	--	--	--	ug/l	100 U	100 U	100 U	NA	100 U	216	100 U	NA	100 U	100 U
Orthophosphate as P	--	--	--	--	ug/l	NA	48 UJ	48 U	NA	NA	NA	48 U	NA	NA	48 UJ
Sulfate	--	--	--	--	ug/l	2790	2360	3410 J+	NA	1930	4460 J+	1880 J+	NA	1910	2160
Sulfide	--	--	--	--	ug/l	NA	NA	579 U	NA	NA	NA	579 U	NA	NA	NA
Total Dissolved Solids	--	--	--	--	mg/l	179	163	225 J	NA	150	139	195 J	NA	170	170
Total Suspended Solids	--	--	--	--	mg/l	1 U	1.3	1.2	NA	1.5	20.8	1 U	NA	1 U	3.1

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-011	CFSWP-011	CFSWP-012	CFSWP-012	CFSWP-012	CFSWP-012	CFSWP-012	CFSWP-013	CFSWP-013	CFSWP-013
				Sample Date		06/12/2017	06/12/2017	06/07/2016	04/03/2017	04/03/2017	06/12/2017	06/12/2017	06/07/2016	06/07/2016	11/30/2016
				Sample Designation		CFSWP-011-SW	CFSWP-011-SW	CFSWP-012-SW	CFSWP-012-SW	CFSWP-DUP5-SW	CFSWP-012-SW	CFSWP-012-SW	CFSWP-013-SW	CFSWP-DUP1-SW	CFSWP-013-SW
				Sample Type		N	N	N	N	FD	N	N	N	FD	N
				Sample Fraction		T	DI	T	T	T	T	DI	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	180000	NA	158000	172000	172000	180000	NA	179000	160000	148000
Ammonia	--	--	--	--	ug/l	72 U	NA	23 U	72 UJ	141 J	72 U	NA	23 U	27.9 J	72 U
Chloride	120000	--	--	F	ug/l	1650 J+	NA	1720 J+	2640 J+	2660 J+	1660 J+	NA	1780 J+	1700 J+	577 J-
Fluoride	**120**	--	--	F	ug/l	**131**	**128 J+**	39.5 J	101	89.6	**131**	**129 J+**	39.2 J	38.3 J	**473 J-**
Hardness as calcium carbonate	--	--	--	--	ug/l	168000	NA	152000	168000	170000	164000	NA	156000	156000	170000
Nitrate Nitrite as N	--	--	--	--	ug/l	117	NA	100 U	100 U	100 U	100 U	NA	100 U	100 U	100 U
Orthophosphate as P	--	--	--	--	ug/l	48 U	NA	NA	48 UJ	48 UJ	48 U	NA	NA	NA	48 UJ
Sulfate	--	--	--	--	ug/l	1910 J+	NA	1900	2210	2140	1900 J+	NA	1910	1960	3020 J-
Sulfide	--	--	--	--	ug/l	579 U	NA	NA	NA	NA	579 U	NA	NA	NA	NA
Total Dissolved Solids	--	--	--	--	mg/l	199 J	NA	146	164	163	212 J	NA	173	159	142
Total Suspended Solids	--	--	--	--	mg/l	1 U	NA	1.1	1.2	1.3	1 U	NA	1.2	1.1	153

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-013	CFSWP-013	CFSWP-013	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014	CFSWP-014
				Sample Date		03/15/2017	06/12/2017	06/12/2017	08/29/2016	11/30/2016	11/30/2016	03/13/2017	03/13/2017	06/13/2017	06/13/2017
				Sample Designation		CFSWP-013-SW	CFSWP-013-SW	CFSWP-013-SW	CFSWP-014-SW	CFSWP-014-SW	CFSWP-DUP3-SW	CFSWP-014-SW	CFSWP-Dup4-SW	CFSWP-014-SW	CFSWP-014-SW
				Sample Type		N	N	N	N	N	FD	N	FD	N	N
				Sample Fraction		T	T	DI	T	T	T	T	T	T	DI
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	164000	181000	NA	165000	190000	191000	203000	205000	182000	NA
Ammonia	--	--	--	--	ug/l	72 U	72 U	NA	72 U	72 U	72 U	72 U	72 U	72 U	NA
Chloride	120000	--	--	F	ug/l	349 J+	1660 J+	NA	2670	1580 J-	1630 J-	3060 J+	3080 J+	1770 J+	NA
Fluoride	**120**	--	--	F	ug/l	**308**	**131**	**126 J+**	55.8 J	117 J-	**123 J-**	**126**	**134**	**137**	**130 J+**
Hardness as calcium carbonate	--	--	--	--	ug/l	158000	172000	NA	164000	196000	192000	200000	202000	176000	NA
Nitrate Nitrite as N	--	--	--	--	ug/l	100 U	113	NA	100 U	100 U	100 U	244	251	144 J	NA
Orthophosphate as P	--	--	--	--	ug/l	NA	48 U	NA	42 UJ	48 UJ	48 UJ	NA	NA	48 U	NA
Sulfate	--	--	--	--	ug/l	3850 J+	1910 J+	NA	3320	2230 J-	2240 J-	3320 J+	3780 J+	2020 J+	NA
Sulfide	--	--	--	--	ug/l	NA	579 U	NA	NA	NA	NA	NA	NA	579 U	NA
Total Dissolved Solids	--	--	--	--	mg/l	176	207 J	NA	167	172	185	223	180	128	NA
Total Suspended Solids	--	--	--	--	mg/l	2	1 U	NA	1.8	1 U	1 U	1 UJ	1 UJ	3.4	NA

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-015	CFSWP-016
				Sample Date		08/29/2016	08/29/2016	11/30/2016	12/20/2016	03/13/2017	06/13/2017	06/13/2017	06/13/2017	06/13/2017	08/29/2016
				Sample Designation		CFSWP-015-SW	CFSWP-DUP2-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-015-SW	CFSWP-DUP7-SW	CFSWP-015-SW	CFSWP-DUP7-SW	CFSWP-016-SW
				Sample Type		N	FD	N	N	N	N	FD	N	FD	N
				Sample Fraction		T	T	T	T	T	T	T	DI	DI	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	171000	169000	193000	202000	205000	186000	186000	NA	NA	173000
Ammonia	--	--	--	--	ug/l	72 U	72 U	72 U	72 U	72 U	72 U	72 U	NA	NA	72 U
Chloride	120000	--	--	F	ug/l	2600	2610	1630 J-	1370	3100 J+	1640 J+	1620 J+	NA	NA	2800
Fluoride	**120**	--	--	F	ug/l	62.4 J	62.3 J	119 J-	112 J-	**129**	**135**	**136**	**121 J+**	**130 J+**	58.8 J
Hardness as calcium carbonate	--	--	--	--	ug/l	178000	170000	196000	208000	202000	180000	184000	NA	NA	172000
Nitrate Nitrite as N	--	--	--	--	ug/l	100 U	100 U	100 U	100 U	273	120 J-	120 J-	NA	NA	100 U
Orthophosphate as P	--	--	--	--	ug/l	42 UJ	42 UJ	48 UJ	48 UJ	NA	48 U	48 U	NA	NA	42 UJ
Sulfate	--	--	--	--	ug/l	2740	3100	2190 J-	2480 J-	3220 J+	1960 J+	1890 J+	NA	NA	2700
Sulfide	--	--	--	--	ug/l	NA	NA	NA	NA	NA	579 U	579 U	NA	NA	NA
Total Dissolved Solids	--	--	--	--	mg/l	182	176	174	247	194	179	184	NA	NA	193
Total Suspended Solids	--	--	--	--	mg/l	1.3	1.1	1 U	1 U	1 UJ	2.1	1.8	NA	NA	1

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-016	CFSWP-017	CFSWP-017	CFSWP-017	CFSWP-017
				Sample Date		11/30/2016	03/13/2017	06/12/2017	06/12/2017	06/12/2017	06/12/2017	09/16/2016	12/02/2016	04/04/2017	06/14/2017
				Sample Designation		CFSWP-016-SW	CFSWP-016-SW	CFSWP-016-SW	CFSWP-DUP6-SW	CFSWP-016-SW	CFSWP-DUP6-SW	CFSWP-017-SW	CFSWP-017-SW	CFSWP-017-SW	CFSWP-017-SW
				Sample Type		N	N	N	FD	N	FD	N	N	N	N
				Sample Fraction		T	T	T	T	DI	DI	T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	194000	208000	185000	185000	NA	NA	116000	89900	89100	69000
Ammonia	--	--	--	--	ug/l	72 U	72 U	72 U	72 U	NA	NA	72 U	72 UJ	72 U	72 U
Chloride	120000	--	--	F	ug/l	1630 J-	2950 J+	1620 J+	1600 J+	NA	NA	864 J	370 J-	523	227 J+
Fluoride	**120**	--	--	F	ug/l	**123 J-**	**132**	**135**	**137**	**131 J+**	**138 J+**	56.2 J-	106 J-	85.7	**121**
Hardness as calcium carbonate	--	--	--	--	ug/l	200000	202000	180000	180000	NA	NA	124000	92000	88000	66000
Nitrate Nitrite as N	--	--	--	--	ug/l	100 U	170	113	131	NA	NA	100 U	100 U	100	140 J+
Orthophosphate as P	--	--	--	--	ug/l	48 UJ	NA	48 U	48 U	NA	NA	42 R	48 U	48 U	48 U
Sulfate	--	--	--	--	ug/l	2270 J-	3240 J+	1990 J+	1980 J+	NA	NA	4300 J-	4810 J-	3750 J+	2610 J+
Sulfide	--	--	--	--	ug/l	NA	NA	579 U	579 U	NA	NA	NA	NA	NA	579 U
Total Dissolved Solids	--	--	--	--	mg/l	196	204	210 J	221 J	NA	NA	120	96	87 J	74
Total Suspended Solids	--	--	--	--	mg/l	1.1	19 J	4.4	4	NA	NA	4.9	1 U	4.9	42.2

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-017	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-018	CFSWP-019	CFSWP-019	CFSWP-019	CFSWP-019
				Sample Date		06/14/2017	06/06/2016	12/01/2016	04/03/2017	06/15/2017	06/15/2017	06/06/2016	12/01/2016	04/03/2017	06/15/2017
				Sample Designation		CFSWP-017-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-018-SW	CFSWP-019-SW	CFSWP-019-SW	CFSWP-019-SW	CFSWP-019-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		DI	T	T	T	T	DI	T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	NA	162000	207000	183000	233000	NA	164000	207000	183000	167000
Ammonia	--	--	--	--	ug/l	NA	178	72 UJ	72 U	84.4 J	NA	53 J	72 UJ	72 U	88.7 J
Chloride	120000	--	--	F	ug/l	NA	2160 J+	1910 J-	1720 J+	2300 J+	NA	1930 J+	1860 J-	1550 J+	1470 J+
Fluoride	**120**	--	--	F	ug/l	119 J+	**353**	**828 J-**	**365**	**1700**	**1860**	**379**	**785 J-**	**350**	**305**
Hardness as calcium carbonate	--	--	--	--	ug/l	NA	180000	260000	184000	216000	NA	180000	208000	180000	168000
Nitrate Nitrite as N	--	--	--	--	ug/l	NA	100 U	100 U	117	1700	NA	100 U	100 U	124	100 U
Orthophosphate as P	--	--	--	--	ug/l	NA	NA	48 UJ	48 UJ	48 U	NA	NA	48 UJ	48 UJ	48 U
Sulfate	--	--	--	--	ug/l	NA	3390	4660 J-	4510	12200 J+	NA	3270	5110 J-	4260	3140 J+
Sulfide	--	--	--	--	ug/l	NA	NA	NA	NA	579 U	NA	NA	NA	NA	579 U
Total Dissolved Solids	--	--	--	--	mg/l	NA	176	210	172	336	NA	183	201	172	203
Total Suspended Solids	--	--	--	--	mg/l	NA	8	112 J	9.6	59.2	NA	1.4	12.4 J	3.3	18.4

Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-019	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-020	CFSWP-021	CFSWP-021	CFSWP-021	CFSWP-021
				Sample Date		06/15/2017	06/06/2016	12/01/2016	03/16/2017	06/15/2017	06/15/2017	06/06/2016	11/30/2016	03/15/2017	06/15/2017
				Sample Designation		CFSWP-019-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-020-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW	CFSWP-021-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		DI	T	T	T	T	DI	T	T	T	T
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	NA	154000	183000	169000	175000	NA	148000	228000	206000	200000
Ammonia	--	--	--	--	ug/l	NA	23 U	72 UJ	82.4 J	126	NA	28.4 J	72 U	72 U	72 U
Chloride	120000	--	--	F	ug/l	NA	2240 J+	1590 J-	1500 J+	1320 J+	NA	1590 J+	2250 J-	1740 J+	1620 J+
Fluoride	**120**	--	--	F	ug/l	**304**	**250**	**265 J-**	**330 J**	**308**	**289**	**166**	**189 J-**	**231**	**243**
Hardness as calcium carbonate	--	--	--	--	ug/l	NA	176000	256000	160000	160000	NA	168000	304000	204000	184000
Nitrate Nitrite as N	--	--	--	--	ug/l	NA	117	186	191	204	NA	100 U	100 U	100 U	137
Orthophosphate as P	--	--	--	--	ug/l	NA	NA	48 UJ	48 UJ	48 U	NA	NA	48 UJ	NA	48 U
Sulfate	--	--	--	--	ug/l	NA	3590	3250 J-	4490 J	3240 J+	NA	7440	73100 J-	78900 J+	20300 J+
Sulfide	--	--	--	--	ug/l	NA	NA	NA	NA	579 U	NA	NA	NA	NA	579 U
Total Dissolved Solids	--	--	--	--	mg/l	NA	193	185	164	217	NA	176	309	296	252
Total Suspended Solids	--	--	--	--	mg/l	NA	2.5	113 J	1.8	11.3	NA	3.1	72.8	1 U	10.1

Bolding indicates an exceedance of the Minimum ESV
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Red indicates an exceedance of Acute Aquatic Life Standards

Appendix L12. General Chemistry in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

				Sample Location		CFSWP-021	CFSWP-022	CFSWP-022	CFSWP-023	CFSWP-024	CFSWP-024	CFSWP-025	CFSWP-025	CFSWP-025	CFSWP-025
				Sample Date		06/15/2017	06/06/2016	04/03/2017	04/03/2017	06/15/2017	06/15/2017	12/20/2016	03/13/2017	06/13/2017	06/13/2017
				Sample Designation		CFSWP-021-SW	CFSWP-022-SW	CFSWP-022-SW	CFSWP-023-SW	CFSWP-024-SW	CFSWP-024-SW	CFSWP-025-SW	CFSWP-025-SW	CFSWP-025-SW	CFSWP-025-SW
				Sample Type		N	N	N	N	N	N	N	N	N	N
				Sample Fraction		DI	T	T	T	T	DI	T	T	T	DI
Parameter	Minimum ESV	DEQ 7 Chronic	DEQ 7 Acute	Minimum ESV Source	Unit										
Alkalinity	--	--	--	--	ug/l	NA	144000	170000	217000	13900	NA	201000	207000	185000	NA
Ammonia	--	--	--	--	ug/l	NA	23 U	72 U	72 U	1840	NA	72 U	72 U	72 U	NA
Chloride	120000	--	--	F	ug/l	NA	1640 J+	1990 J+	1600 J+	1390 J+	NA	1400	2950 J+	1660 J+	NA
Fluoride	**120**	--	--	F	ug/l	**188**	**177**	**223**	**2150**	**22400 J+**	**21500**	115 J-	**128**	**134**	**130 J+**
Hardness as calcium carbonate	--	--	--	--	ug/l	NA	172000	166000	224000	50000	NA	206000	204000	176000	NA
Nitrate Nitrite as N	--	--	--	--	ug/l	NA	100 U	100 U	127	327	NA	100 U	161	163 J-	NA
Orthophosphate as P	--	--	--	--	ug/l	NA	NA	48 UJ	48 UJ	48 U	NA	48 UJ	NA	48 U	NA
Sulfate	--	--	--	--	ug/l	NA	6540	5660	13200	4390 J+	NA	2510 J-	3250 J+	1960 J+	NA
Sulfide	--	--	--	--	ug/l	NA	NA	NA	NA	579 U	NA	NA	NA	579 U	NA
Total Dissolved Solids	--	--	--	--	mg/l	NA	169	177	232	84	NA	243	166	192	NA
Total Suspended Solids	--	--	--	--	mg/l	NA	262	1.6	7.4	58	NA	3.5	1 UJ	4.4	NA

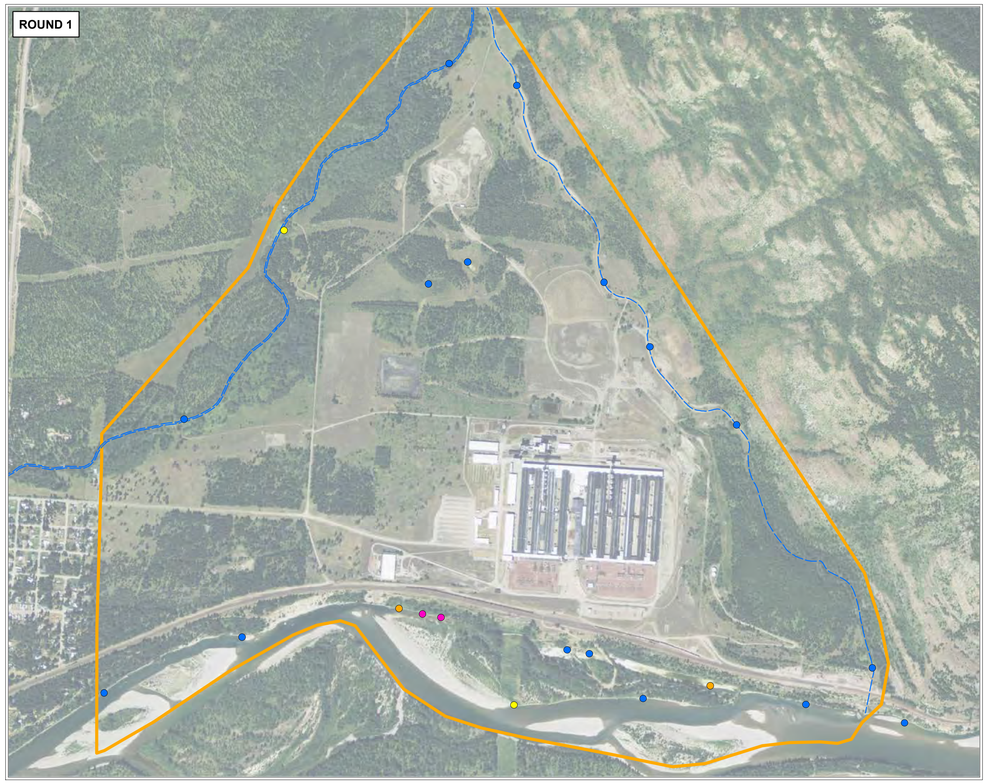
Bolding indicates an exceedance of the Minimum ESV
Shading indicates an exceedance of Chronic Aquatic Life Standards
Red indicates an exceedance of Acute Aquatic Life Standards

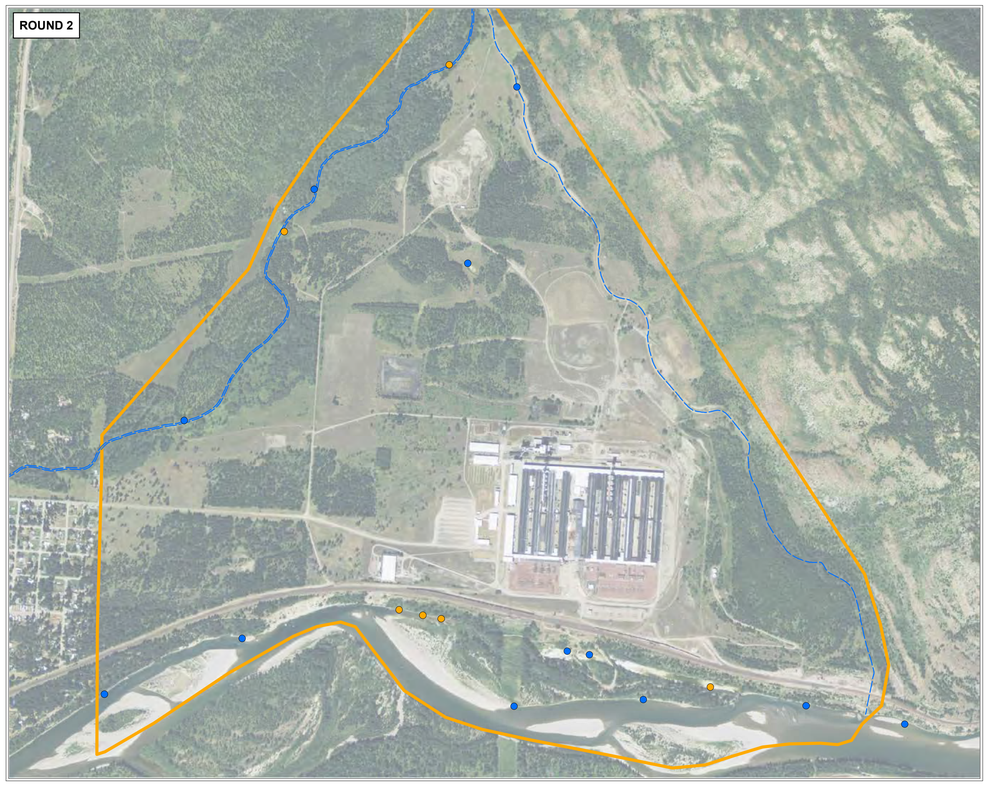
APPENDIX M

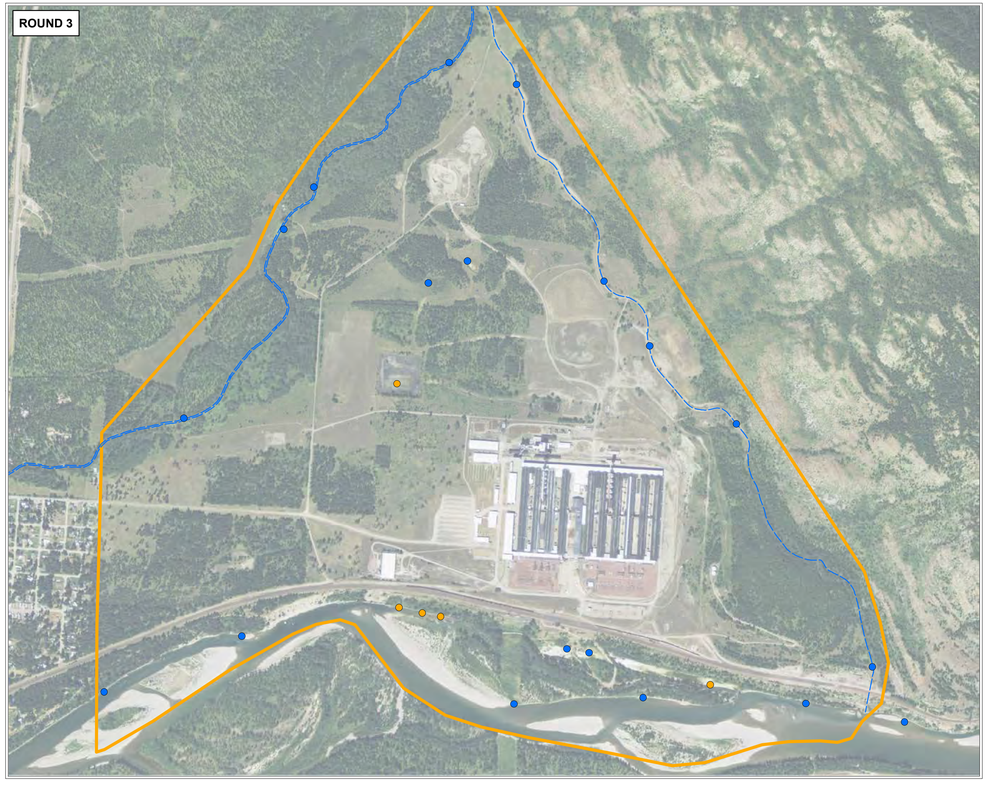
Surface Water Thematic Maps – Rounds 1 through 4

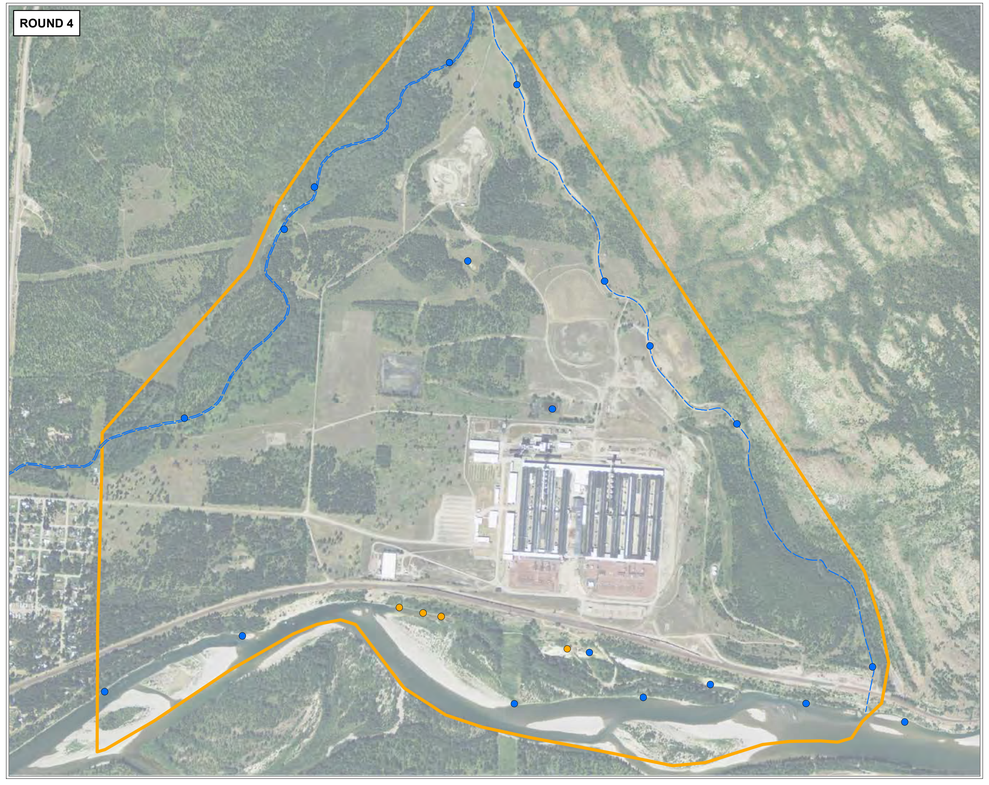
1. Concentrations of Total Cyanide in Rounds 1,2,3, and 4 Surface Water
2. Concentrations of Free Cyanide in Rounds 3 and 4 Surface Water
3. Concentrations of Dissolved Cyanide in Round 4 Surface Water
4. Concentrations of Dissolved Free Cyanide in Round 4 Surface Water
5. Concentrations of Total Fluoride in Rounds 1,2,3, and 4 Surface Water
6. Concentrations of Dissolved Fluoride in Round 4 Surface Water
7. Concentrations of Total Aluminum in Rounds 1,2,3, and 4 Surface Water
8. Concentrations of Total Arsenic in Rounds 1,2,3, and 4 Surface Water
9. Concentrations of Total Cobalt in Rounds 1,2,3, and 4 Surface Water
10. Concentrations of Total Copper in Rounds 1,2,3, and 4 Surface Water
11. Concentrations of Total Iron in Rounds 1,2,3, and 4 Surface Water
12. Concentrations of Total Lead in Rounds 1,2,3, and 4 Surface Water
13. Concentrations of Total Manganese in Rounds 1,2,3, and 4 Surface Water
14. Concentrations of Total Thallium in Rounds 1,2,3, and 4 Surface Water
15. Concentrations of Dissolved Aluminum in Round 4 Surface Water
16. Concentrations of Dissolved Arsenic in Round 4 Surface Water
17. Concentrations of Dissolved Cobalt in Round 4 Surface Water
18. Concentrations of Dissolved Copper in Round 4 Surface Water
19. Concentrations of Dissolved Iron in Round 4 Surface Water
20. Concentrations of Dissolved Lead in Round 4 Surface Water
21. Concentrations of Dissolved Manganese in Round 4 Surface Water
22. Concentrations of Dissolved Thallium in Round 4 Surface Water
23. Concentrations of Alkalinity in Rounds 1,2,3, and 4 Surface Water

24. Concentrations of Ammonia in Rounds 1,2,3, and 4 Surface Water
25. Concentrations of Chloride in Rounds 1,2,3, and 4 Surface Water
26. Concentrations of Hardness as Calcium Carbonate in Rounds 1,2,3, and 4 Surface Water
27. Concentrations of Nitrate and Nitrite in Rounds 1,2,3, and 4 Surface Water
28. Concentrations of Orthophosphate in Rounds 1,2,3, and 4 Surface Water
29. Concentrations of Sulfate in Rounds 1,2,3, and 4 Surface Water
30. Concentrations of Sulfide in Round 4 Surface Water









CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2U)
- ND – 0.15
- 0.15 – 5
- 5 – 200
- 200 – 2,000
- >2,000

SCREENING LEVEL	CYANIDE, TOTAL
DEQ-7 HUMAN HEALTH STANDARD	140
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	200
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.15
MINIMUM ESV	5
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	5.2
DEQ-7 ACUTE AQUATIC LIFE STANDARD	22

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL CYANIDE IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M1
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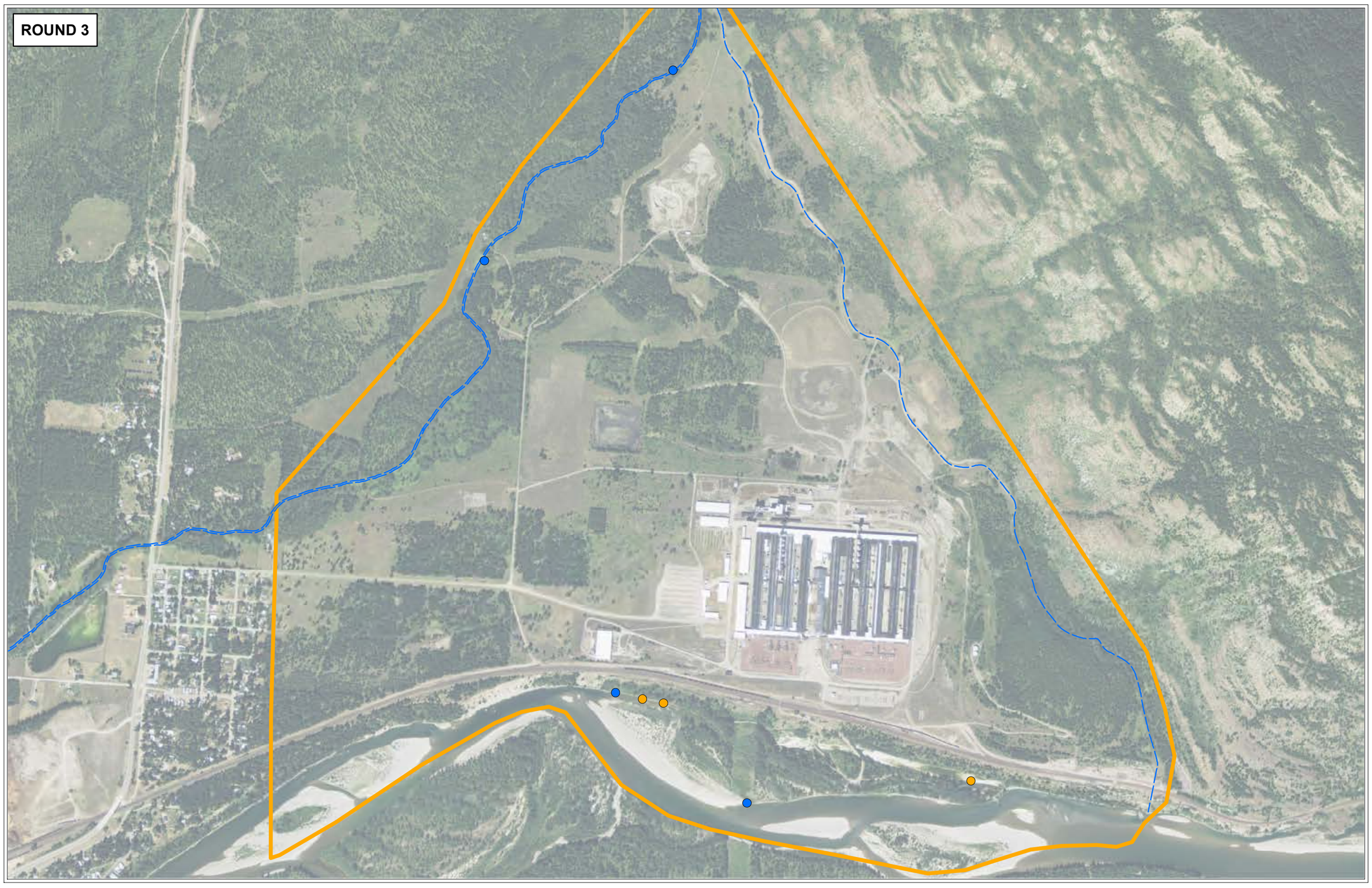

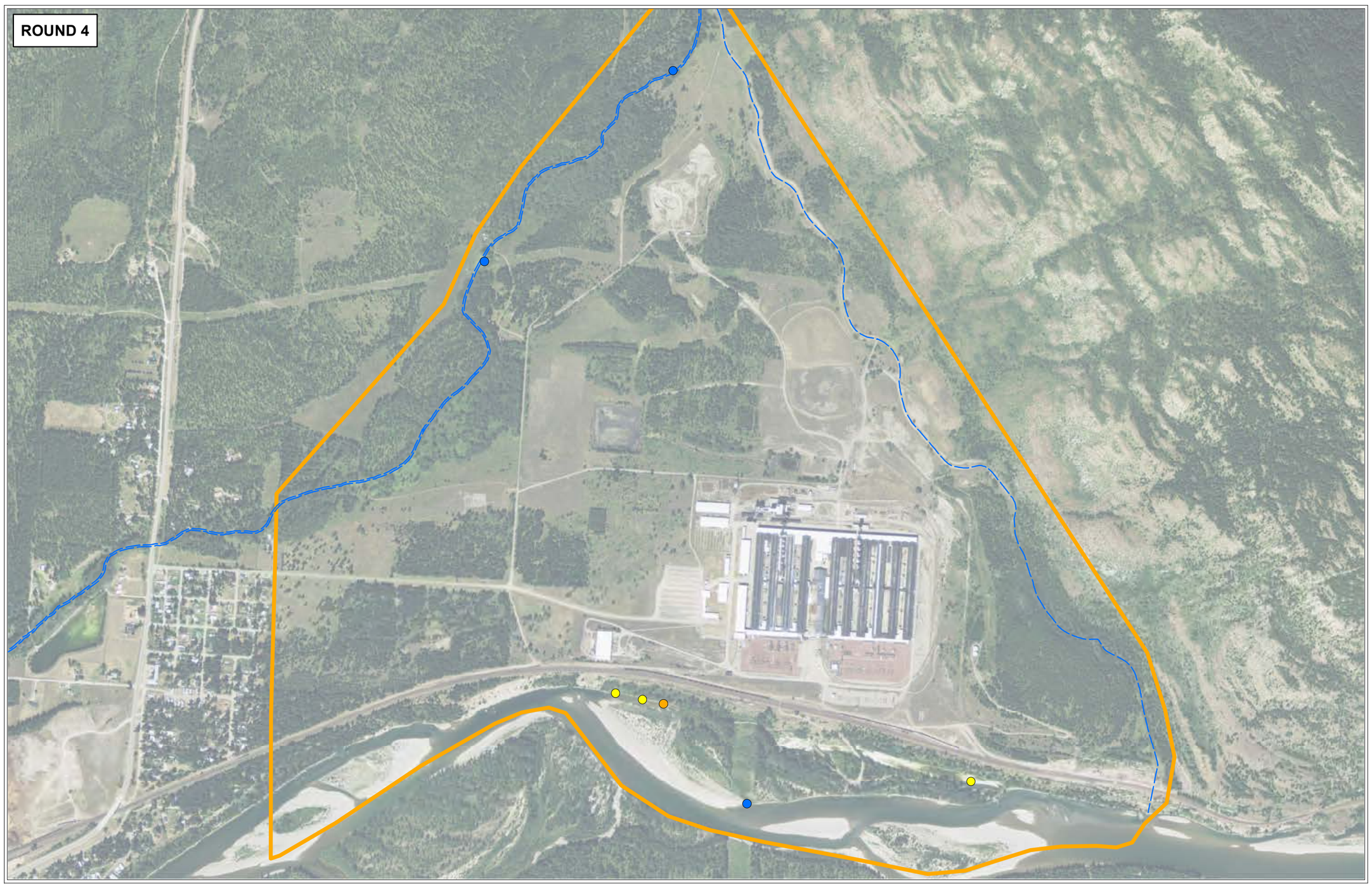

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.5U)
- ND – 0.15
- 0.15 – 140
- 140 – 2,000
- >2,000

NOTES

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EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ND – NON DETECT
1.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

CHEMICAL NAME	DEQ-7 HUMAN HEALTH STANDARDS	EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	EPA RISK BASED SCREENING LEVEL TAPWATER RSL	MINIMUM ESV	DEQ-7 CHRONIC AQUATIC LIFE STANDARDS	DEQ-7 ACUTE AQUATIC LIFE STANDARDS
CYANIDE, FREE	140	200	0.15	5	5.2	22

N

500 0 500 1,000 Feet

Title:

CONCENTRATIONS OF FREE CYANIDE IN ROUNDS 3 AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 22JAN18	APPENDIX
Prepared by: M.S.R.	Scale: AS SHOWN	M2
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File: M2.2476.0001Y170.1.mxd		

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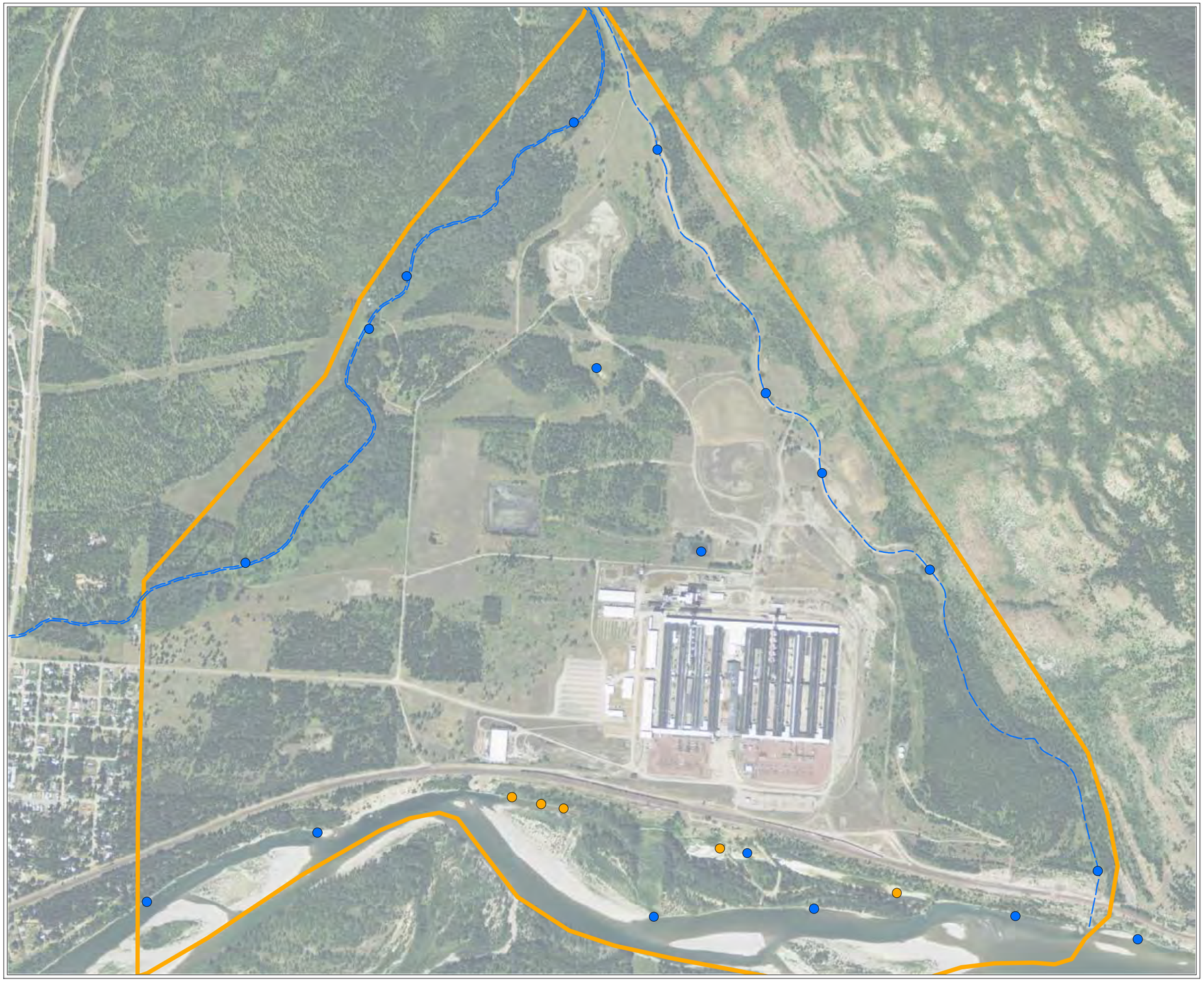

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2U)
- ND – 0.15
- 0.15 – 5
- 5 – 200
- 200 – 2,000
- >2,000

SCREENING LEVEL	CYANIDE, TOTAL
DEQ–7 HUMAN HEALTH STANDARD	140
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	200
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.15
MINIMUM ESV	5
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	5.2
DEQ–7 ACUTE AQUATIC LIFE STANDARD	22

NOTES

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RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title:

CONCENTRATIONS OF DISSOLVED TOTAL CYANIDE IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M3
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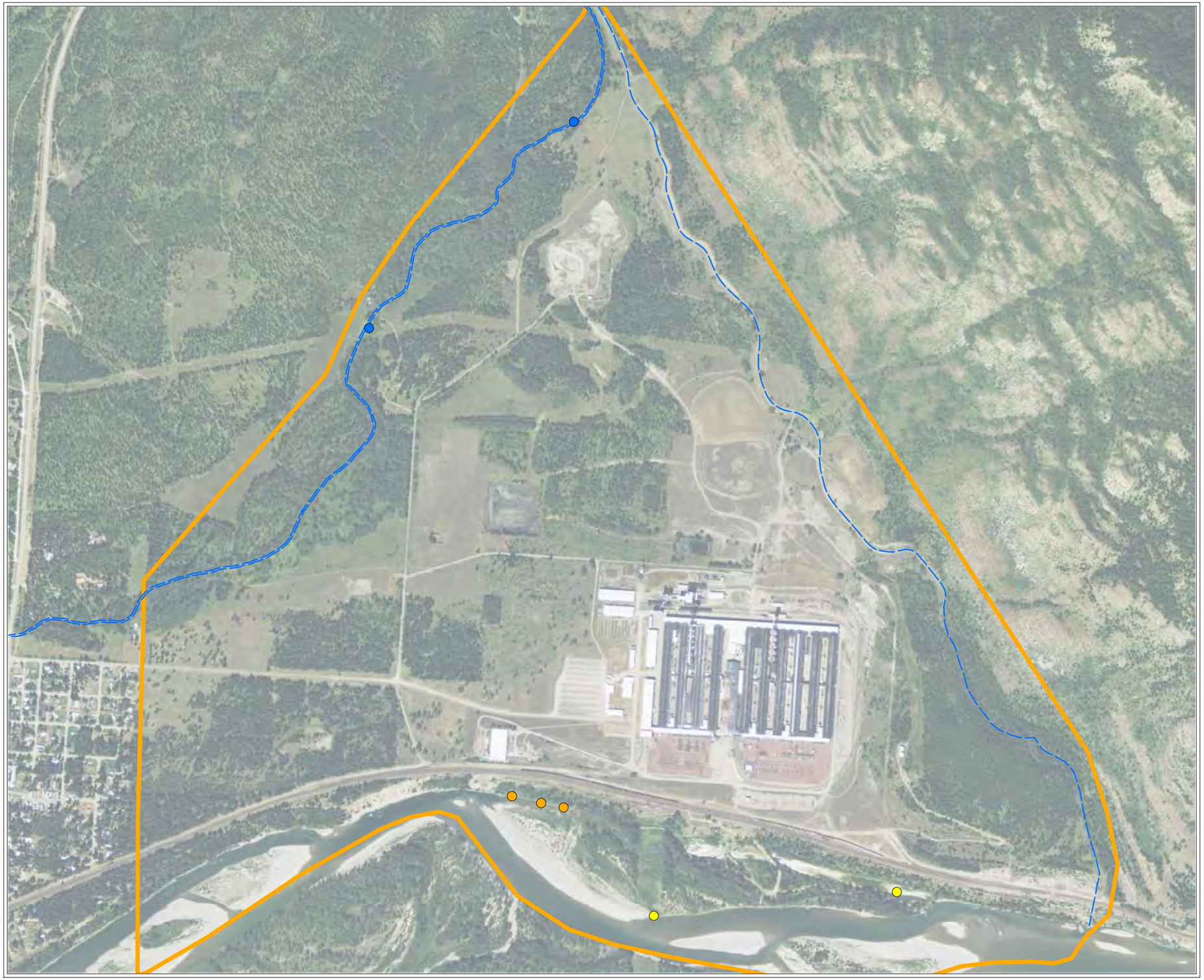

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.5U)
- ND – 0.15
- 0.15 – 140
- 140 – 2,000
- >2,000

SCREENING LEVEL	CYANIDE, FREE
DEQ–7 HUMAN HEALTH STANDARD	140
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	200
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.15
MINIMUM ESV	5
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	5.2
DEQ–7 ACUTE AQUATIC LIFE STANDARD	22

NOTES

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ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
1.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title:

CONCENTRATIONS OF DISSOLVED FREE CYANIDE IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 22JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M4
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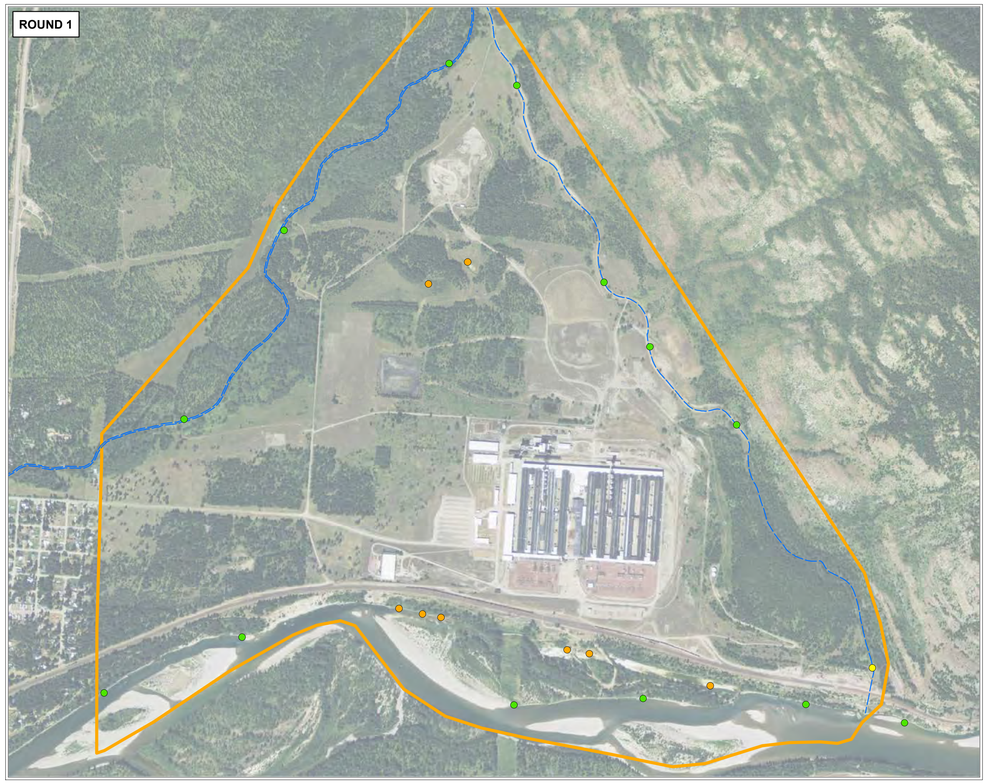

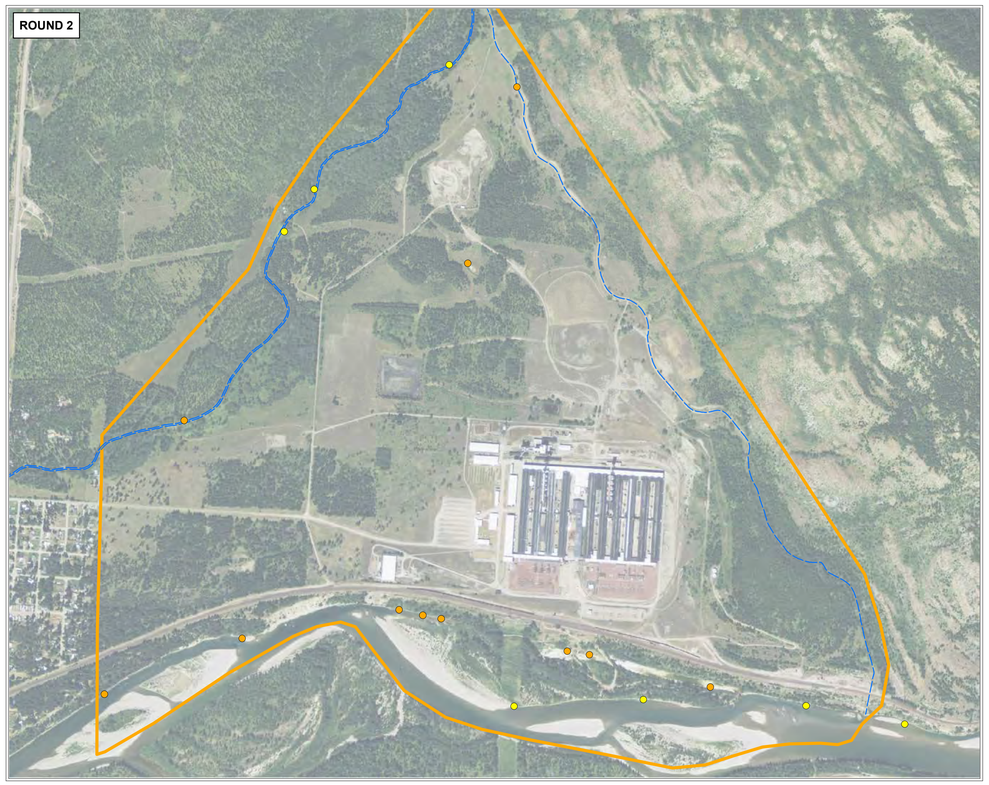

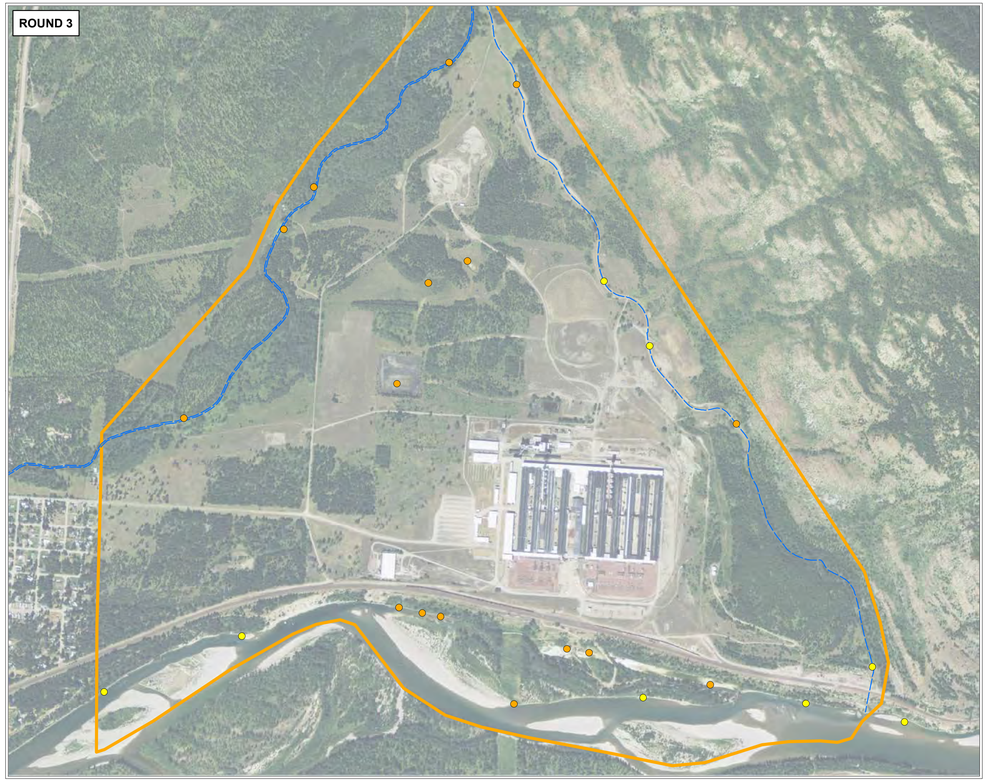

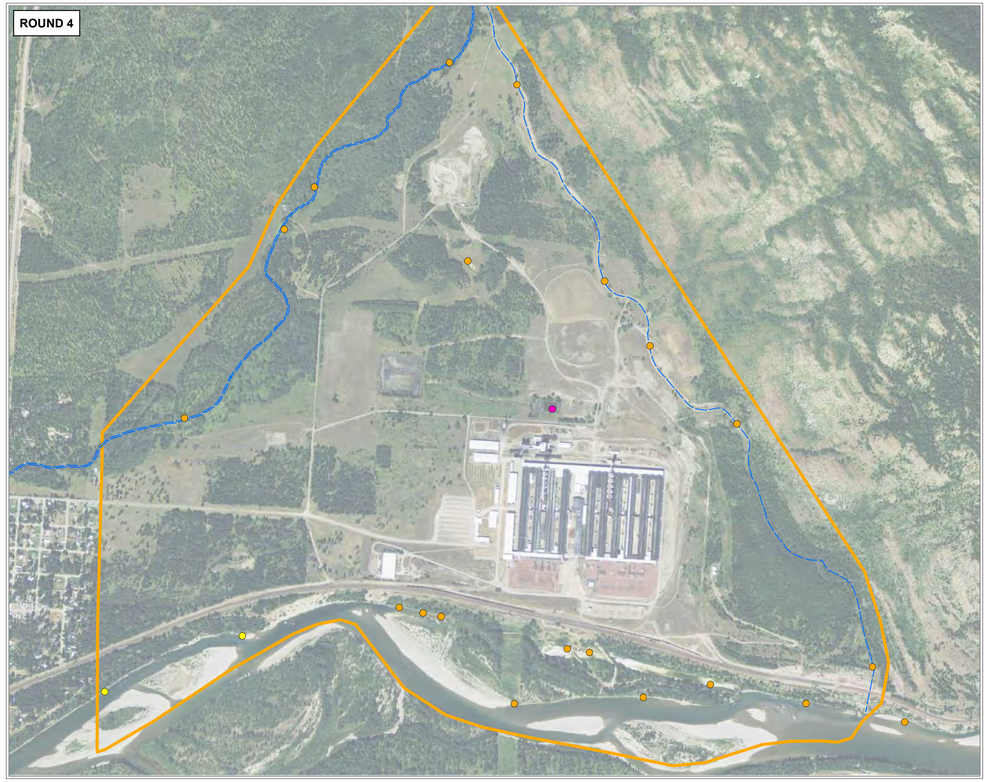

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 80
- 80 – 4,000
- 4,000 – 40,000
- >40,000

SCREENING LEVEL	FLUORIDE
DEQ-7 HUMAN HEALTH STANDARD	4000
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	4000
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	80
MINIMUM ESV	120
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

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RSL – REGIONAL SCREENING LEVELS
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL FLUORIDE IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 22JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M5
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M5.2476.0001Y170.3.mxd		

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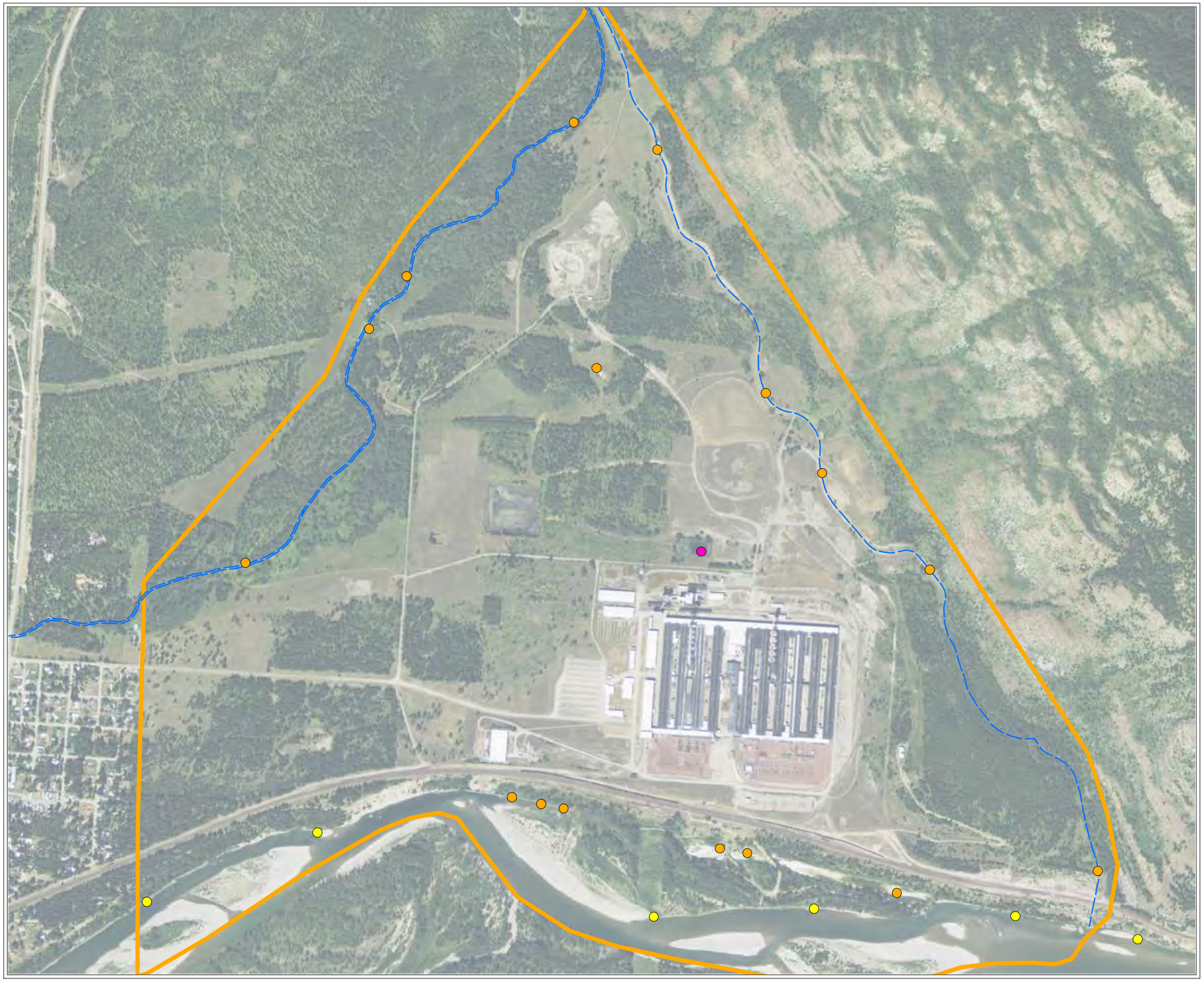

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 80
- 80 – 120
- 120 – 4,000
- 4,000 – 40,000
- >40,000

SCREENING LEVEL	FLUORIDE
DEQ–7 HUMAN HEALTH STANDARD	4000
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	4000
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	80
MINIMUM ESV	120
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ–7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

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EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVELS
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF DISSOLVED FLUORIDE IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18
Prepared by: M.R.	Scale: AS SHOWN
Project Mgr: M.R.	Project: 2476.0001Y002
File: M6.2476.0001Y170.14.mxd	

APPENDIX
M6

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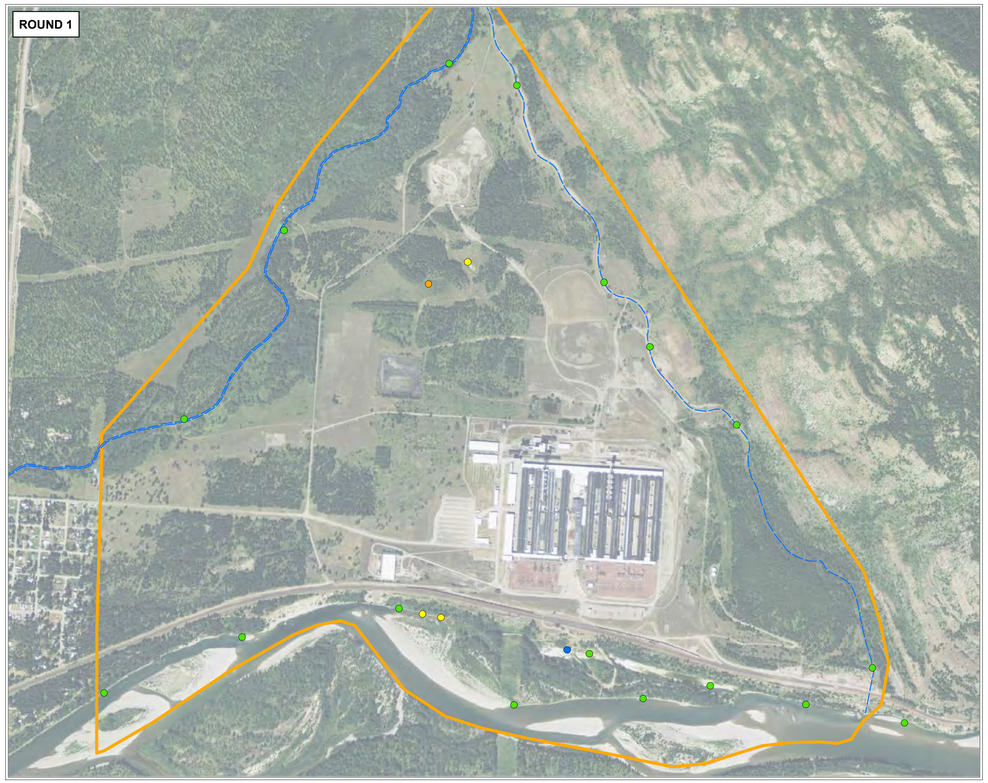

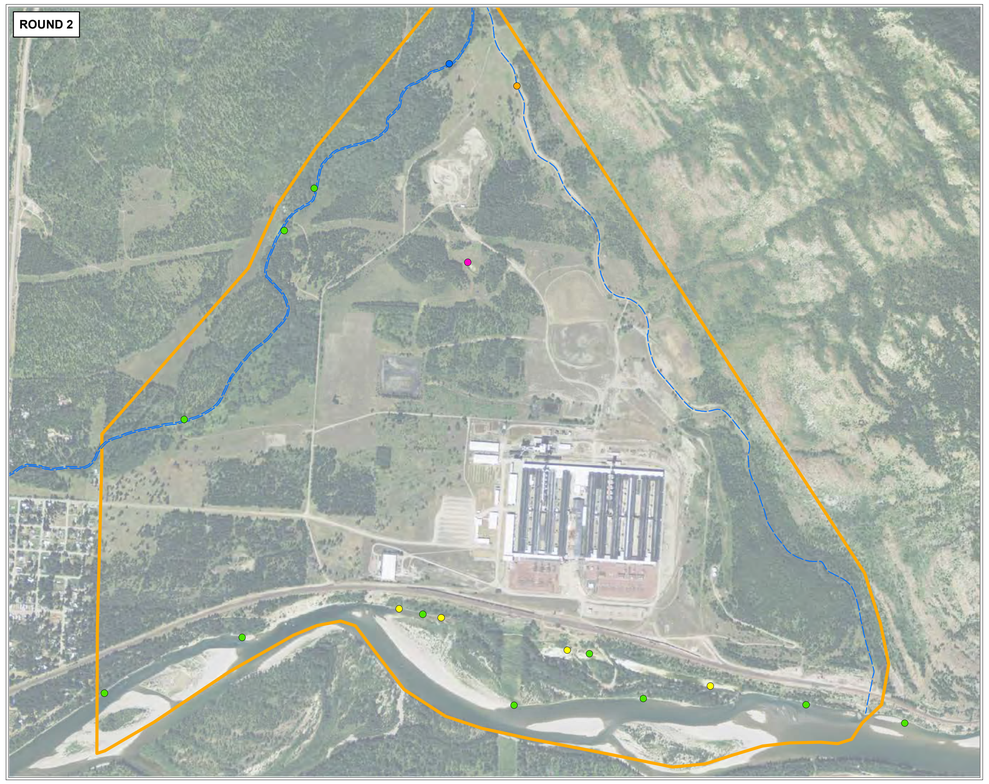

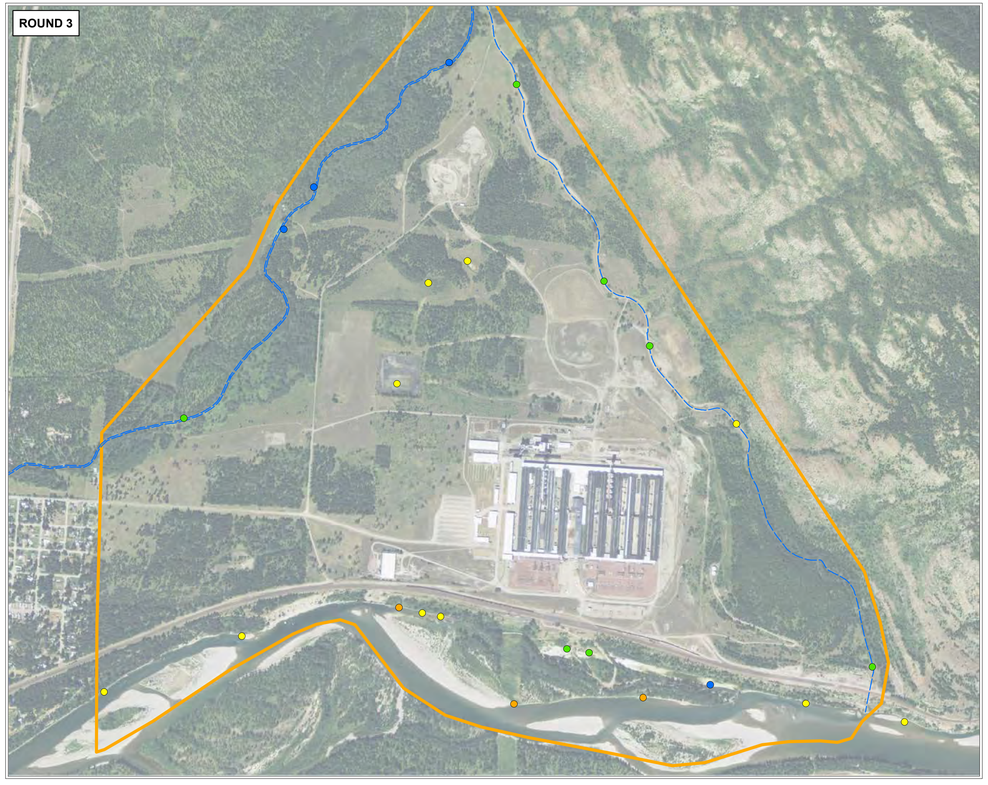

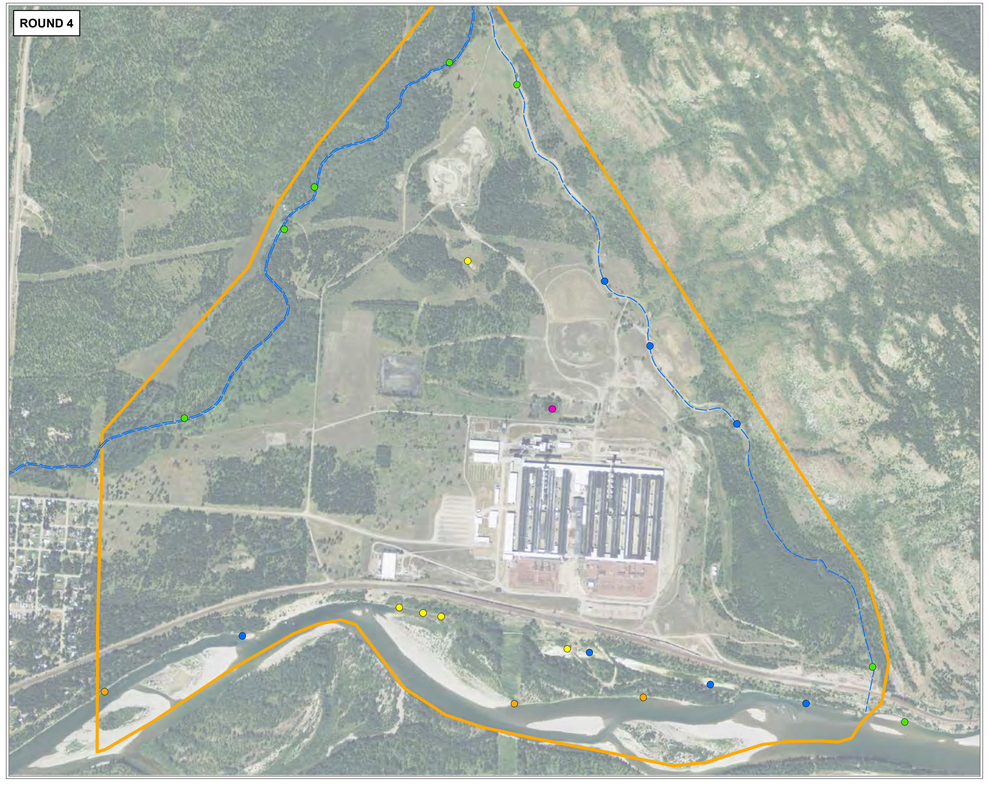

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (18.2U)
- ND – 87
- 87 – 750
- 750 – 2,000
- 2,000 – 20,000
- >20,000

SCREENING LEVEL	ALUMINUM
DEQ-7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	2000
MINIMUM ESV	87
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	87
DEQ-7 ACUTE AQUATIC LIFE STANDARD	750

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
18.2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL ALUMINUM IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M7
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M7.2476.0001Y170.4.mxd		

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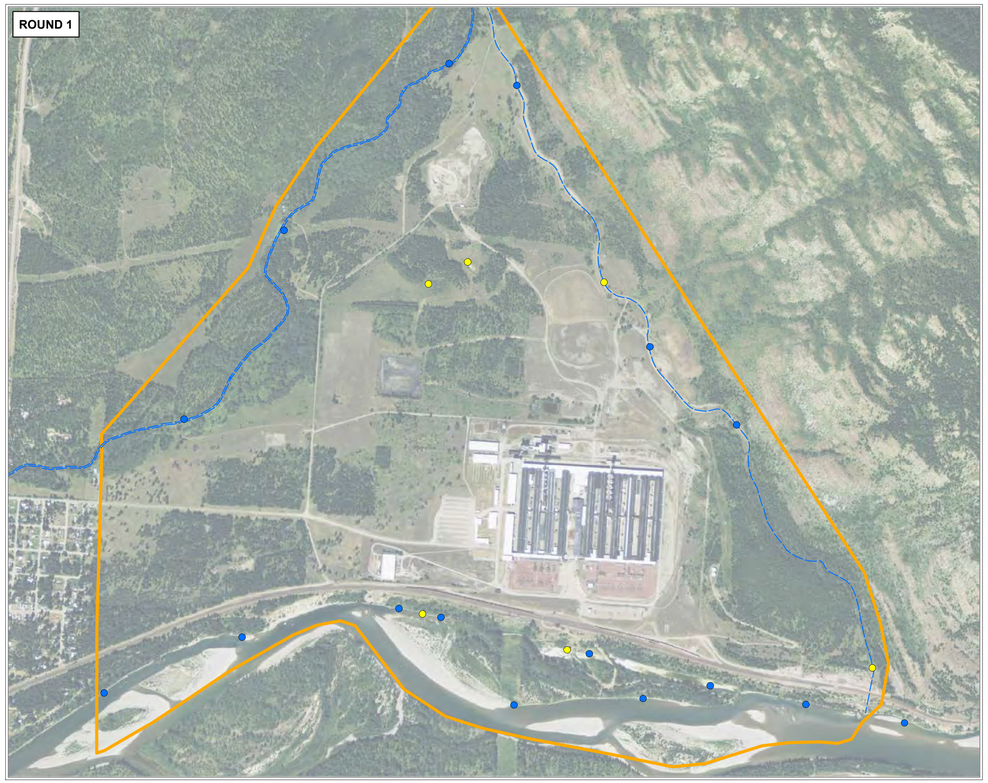

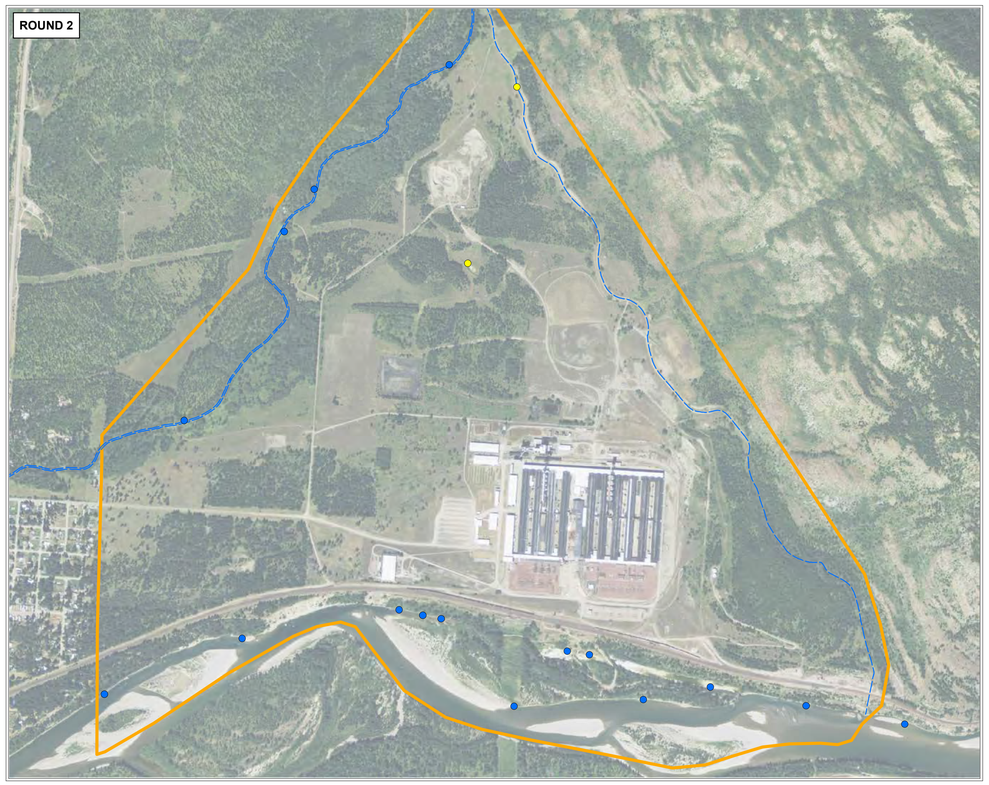

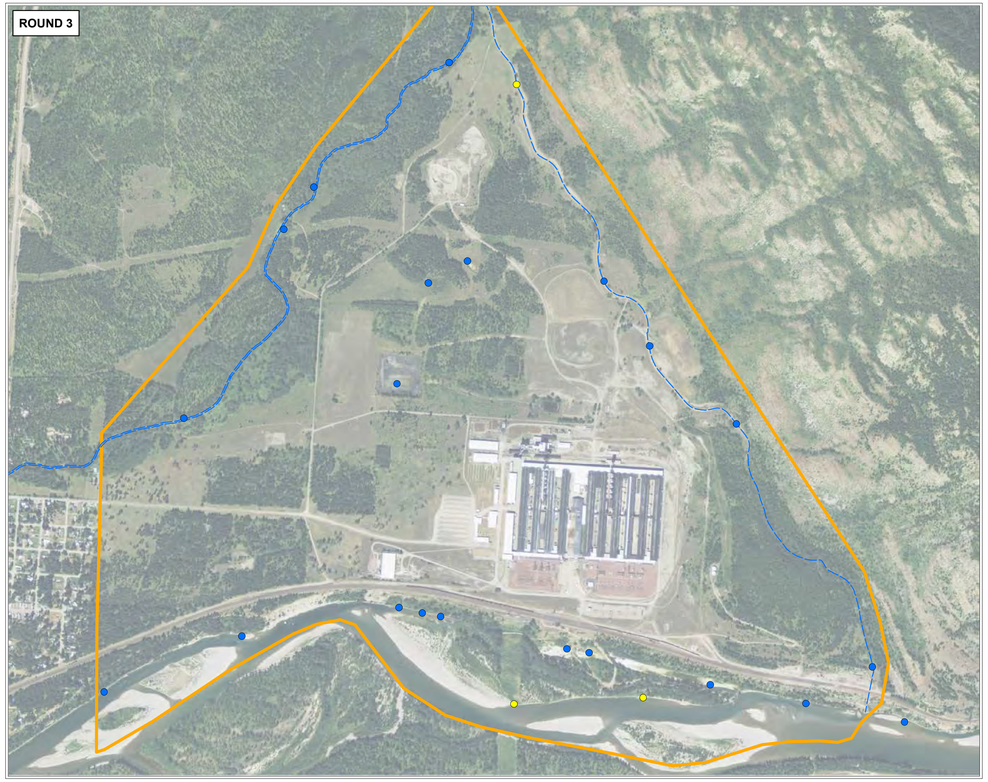

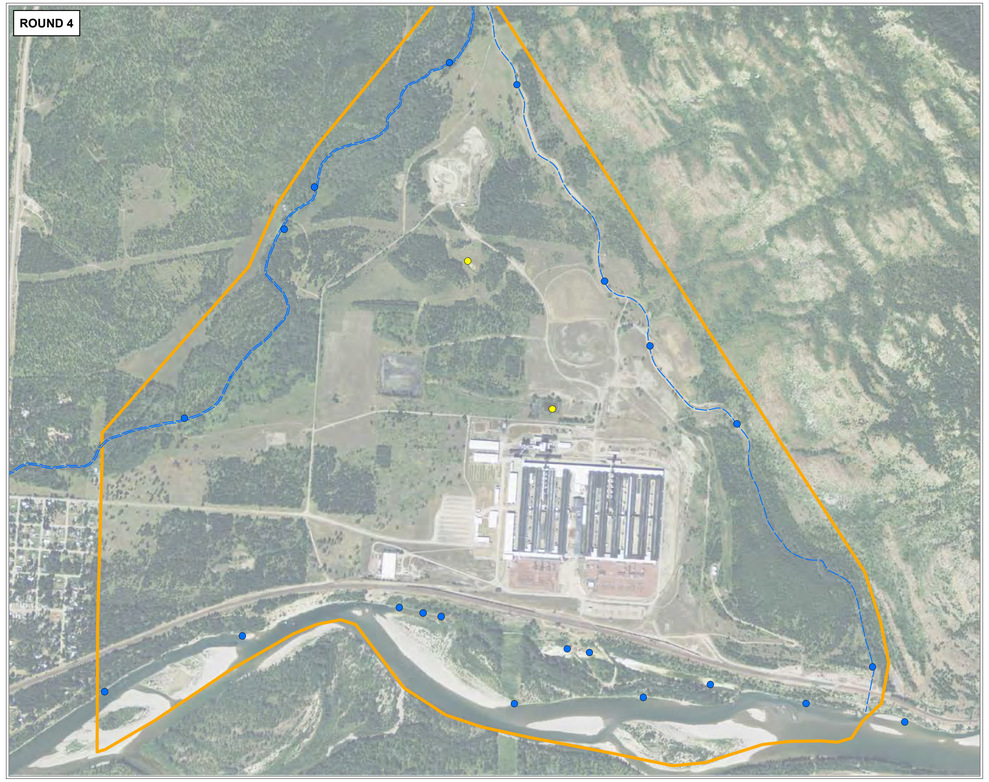

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.64U)
- ND – 0.052
- 0.052 – 10
- 10 – 100
- 100 – 3,400
- >3,400

SCREENING LEVEL	ARSENIC
DEQ-7 HUMAN HEALTH STANDARD	10
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	10
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.052
MINIMUM ESV	3.1
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	150
DEQ-7 ACUTE AQUATIC LIFE STANDARD	340

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
0.64U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL ARSENIC IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M8
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M8.2476.0001Y170.5.mxd		

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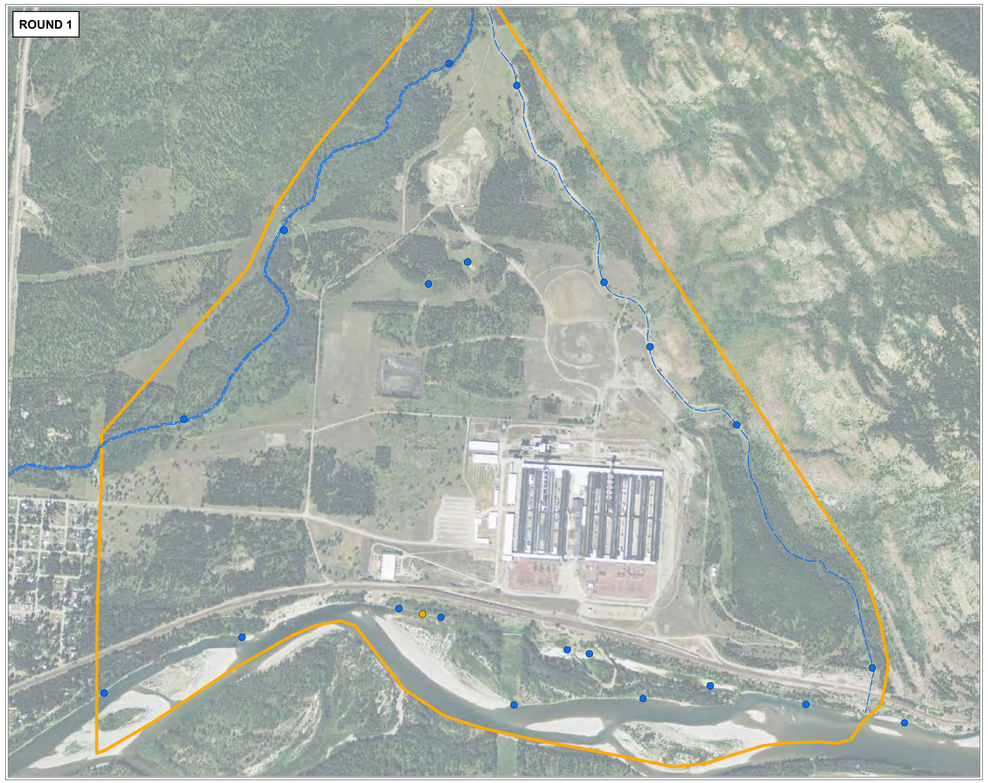

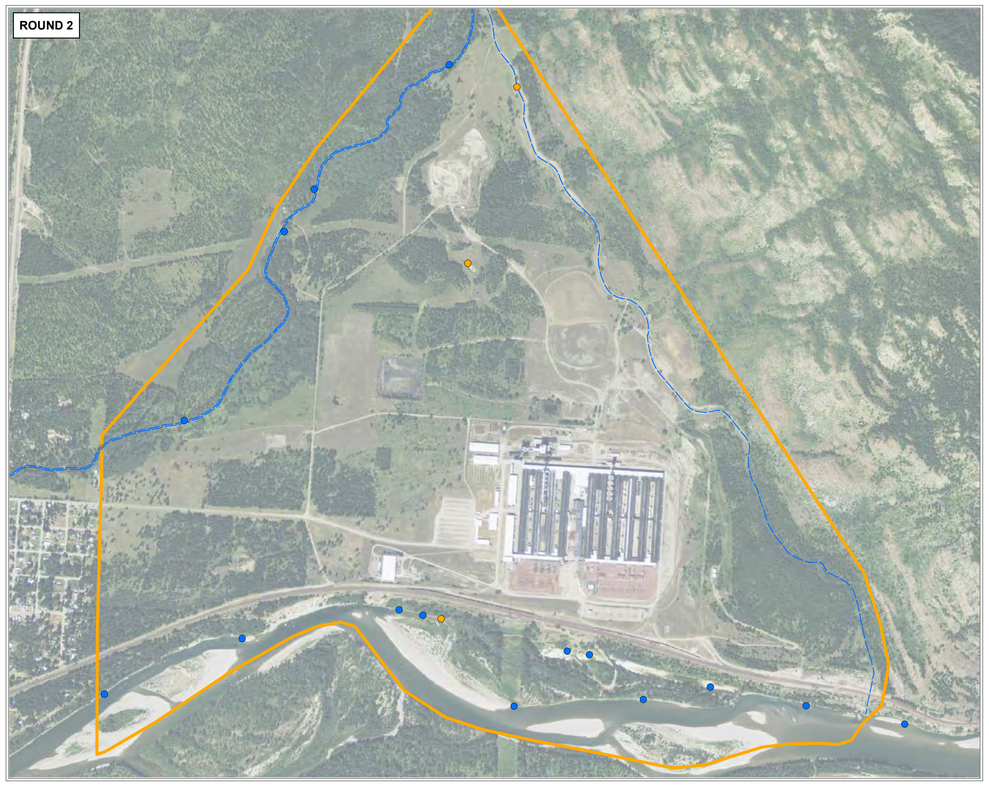

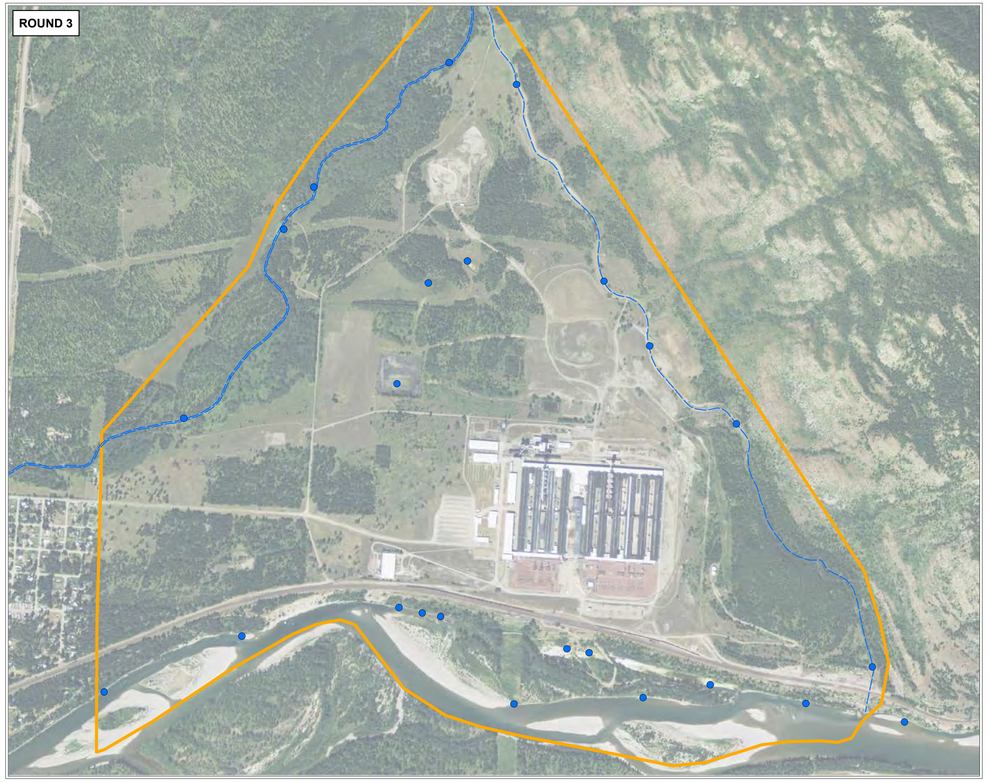

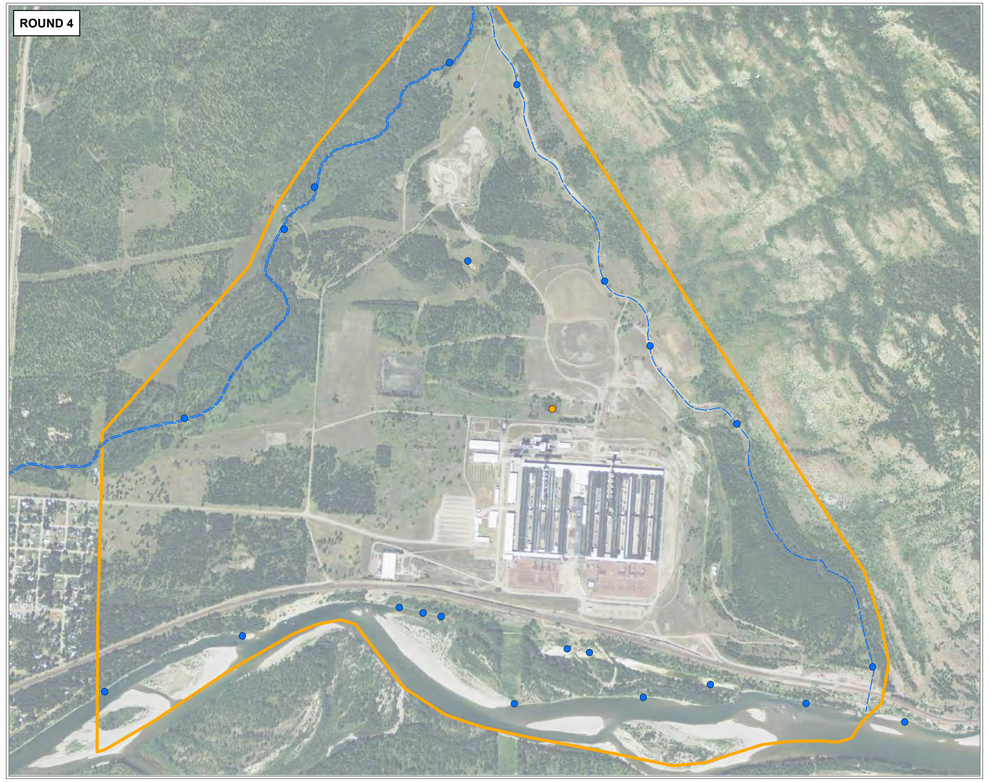

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.3U)
- ND – 0.6
- 0.6 – 1.2
- 1.2 – 5.1
- 5.1 – 51
- >51

SCREENING LEVEL	COBALT
DEQ-7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.6
MINIMUM ESV	5.1
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
1.3U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL COBALT IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M9
Project Mgr: M.R.	Project: 2476.0001Y004	
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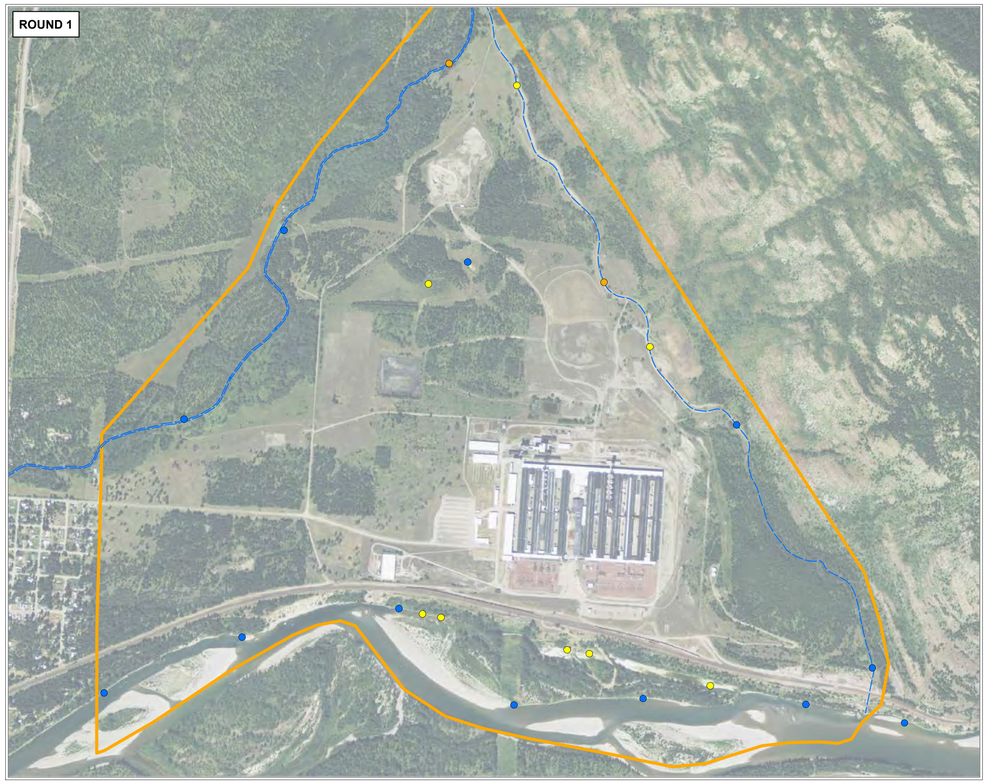
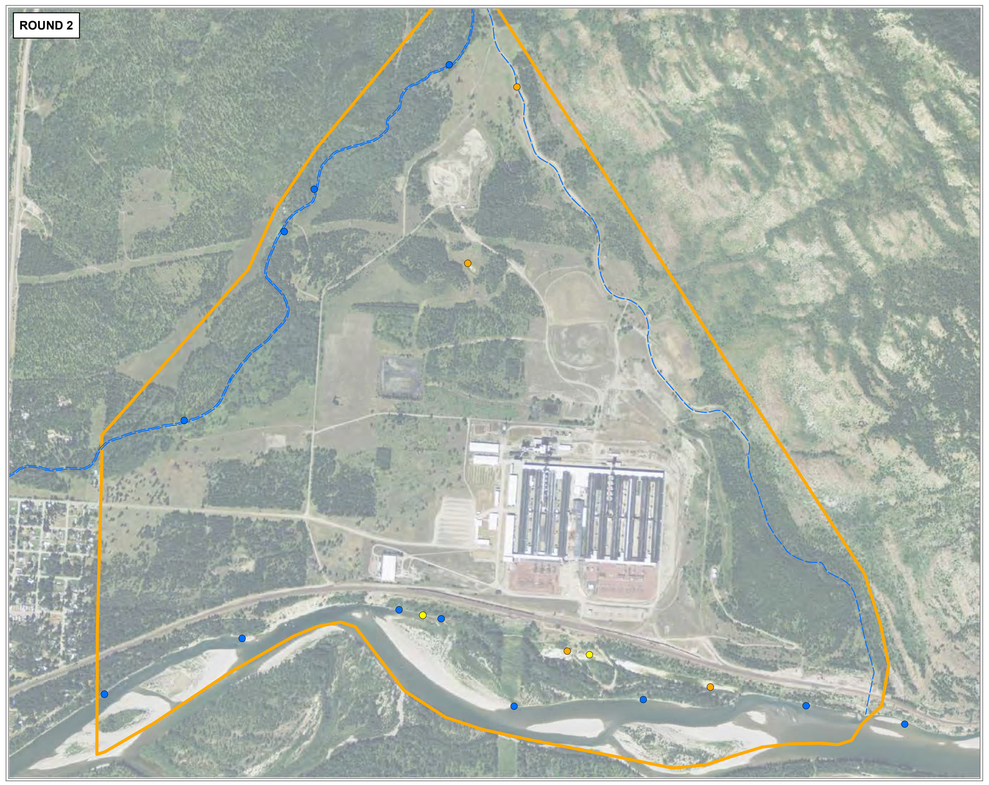
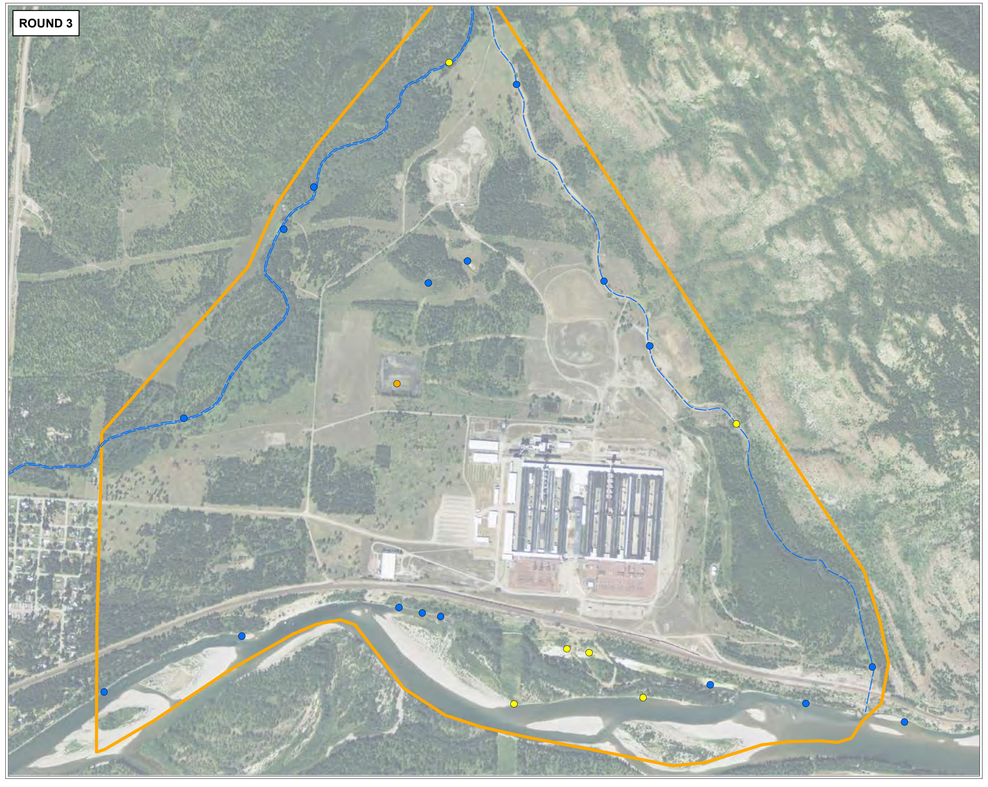
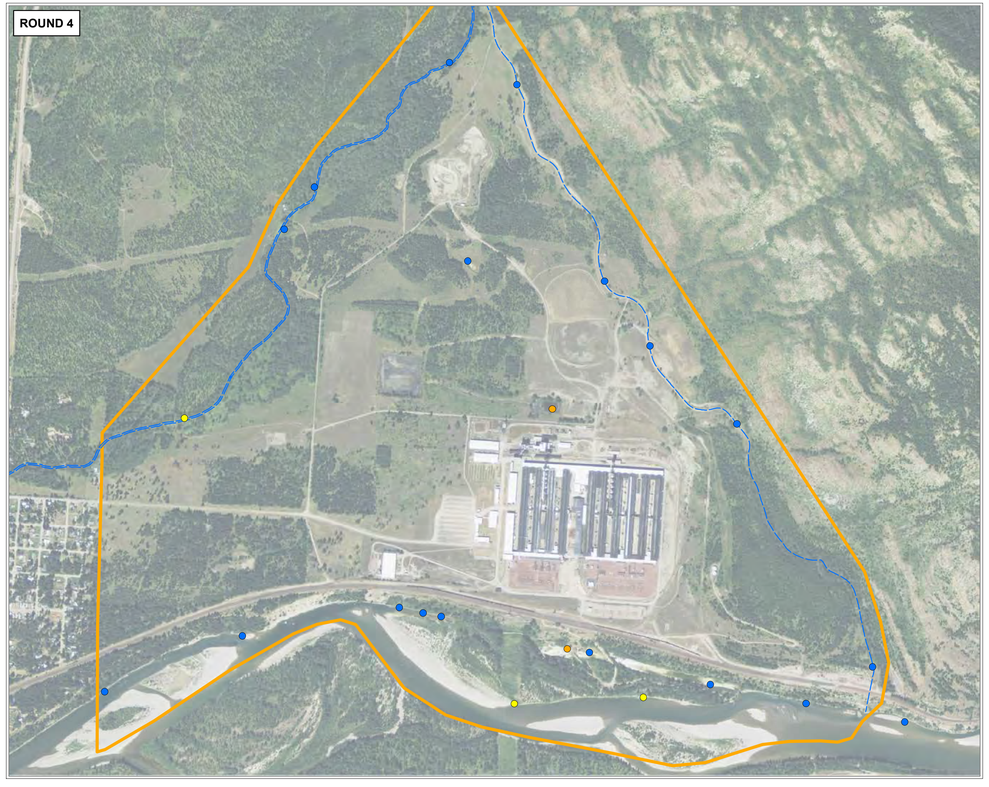








N

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.4U)
- ND – 0.23
- 0.23 – 3.79
- 3.79 – 1,300
- 1,300 – 13,000
- >13,000

SCREENING LEVEL	COPPER
DEQ-7 HUMAN HEALTH STANDARD	1300
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	1300
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	80
MINIMUM ESV	0.23
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	8.038
DEQ-7 ACUTE AQUATIC LIFE STANDARD	3.79

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
1.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL COPPER IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

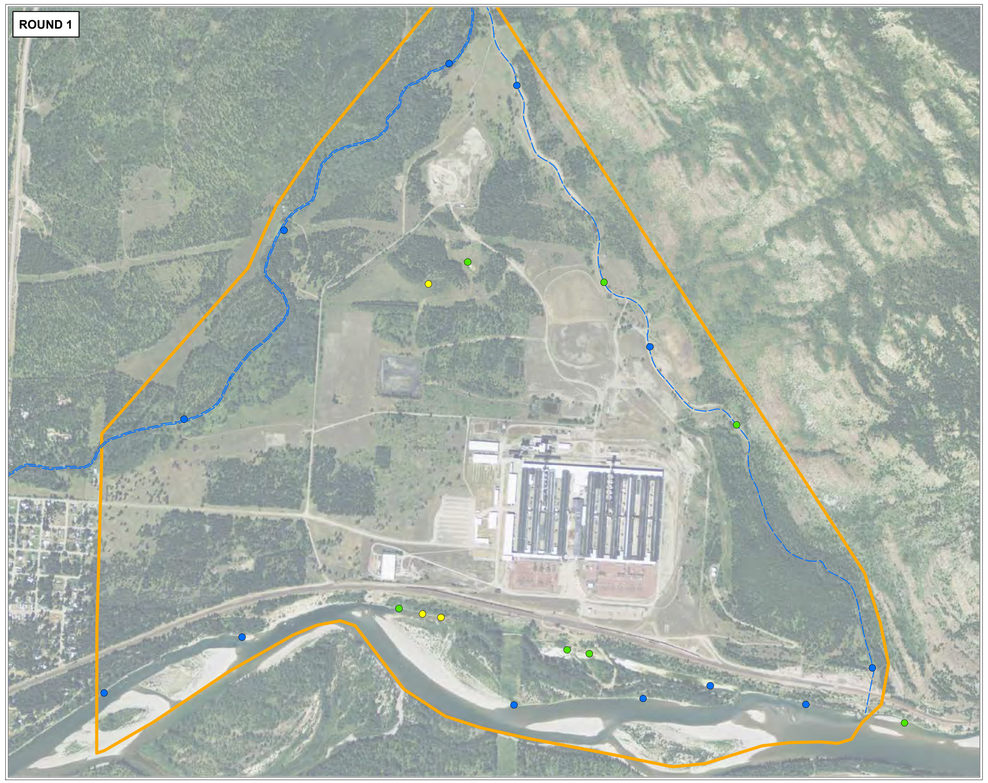
2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

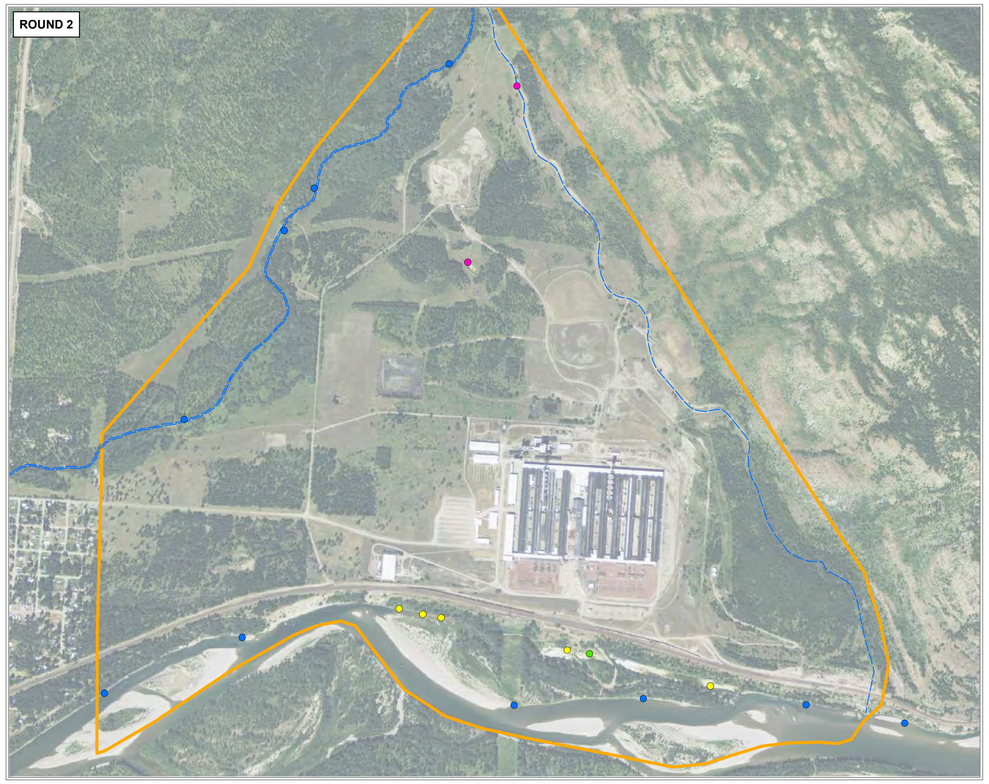
Prepared For:

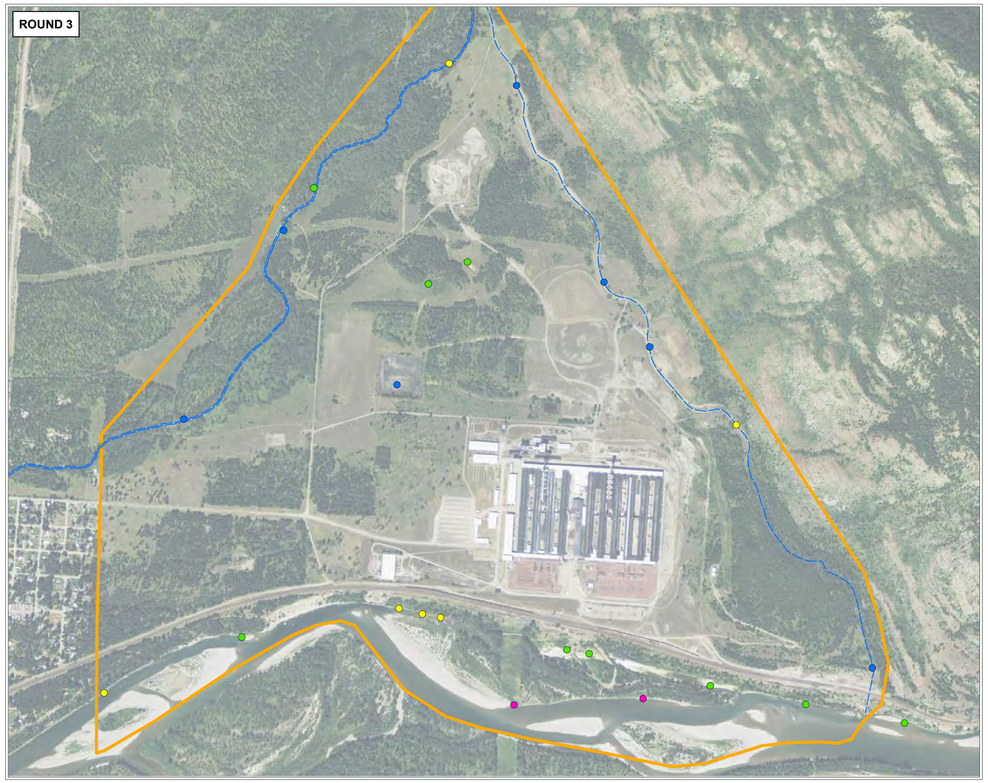
COLUMBIA FALLS ALUMINUM COMPANY, LLC

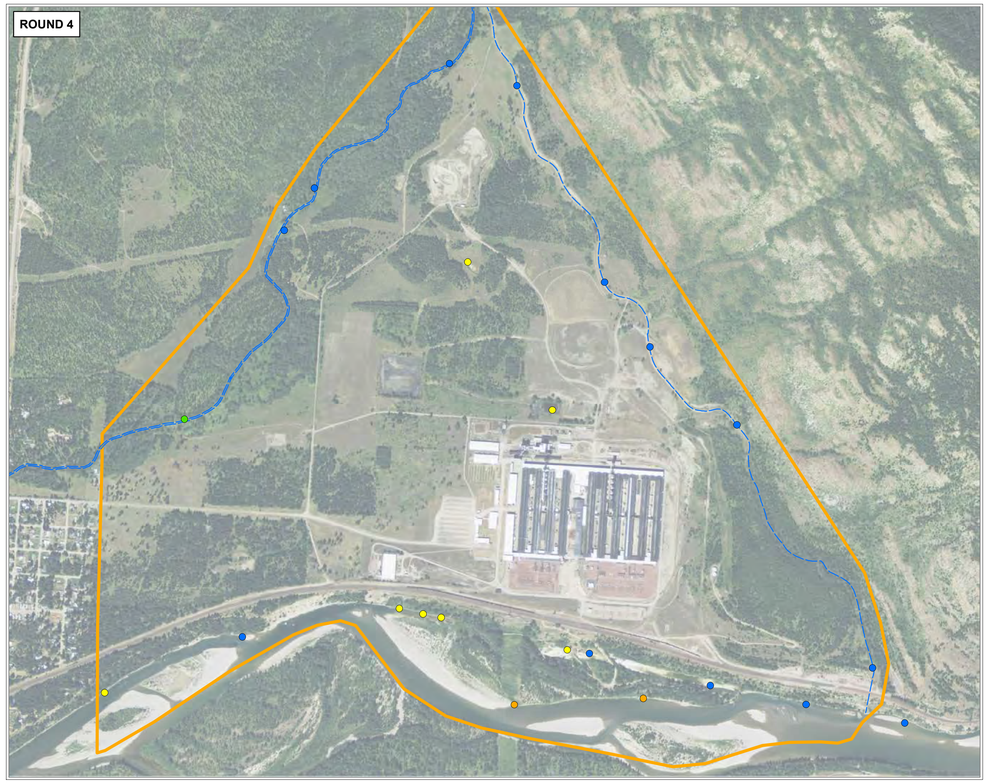
ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M10
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M10.2476.0001Y170.7.mxd		









CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42.4U)
- ND – 158
- 158 – 1,000
- 1,000 – 1,400
- 1,400 – 14,000
- >14,000

SCREENING LEVEL	IRON
DEQ-7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	1400
MINIMUM ESV	158
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	1000
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
42.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL IRON IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M11
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M11_2476.0001Y170_8.mxd		

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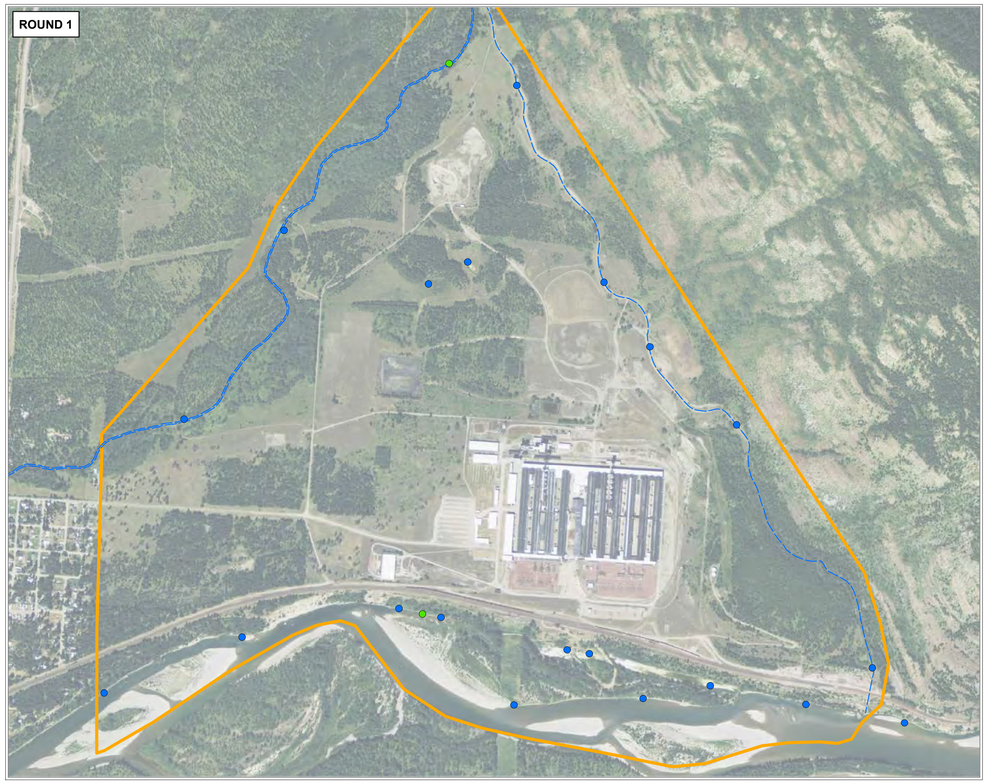

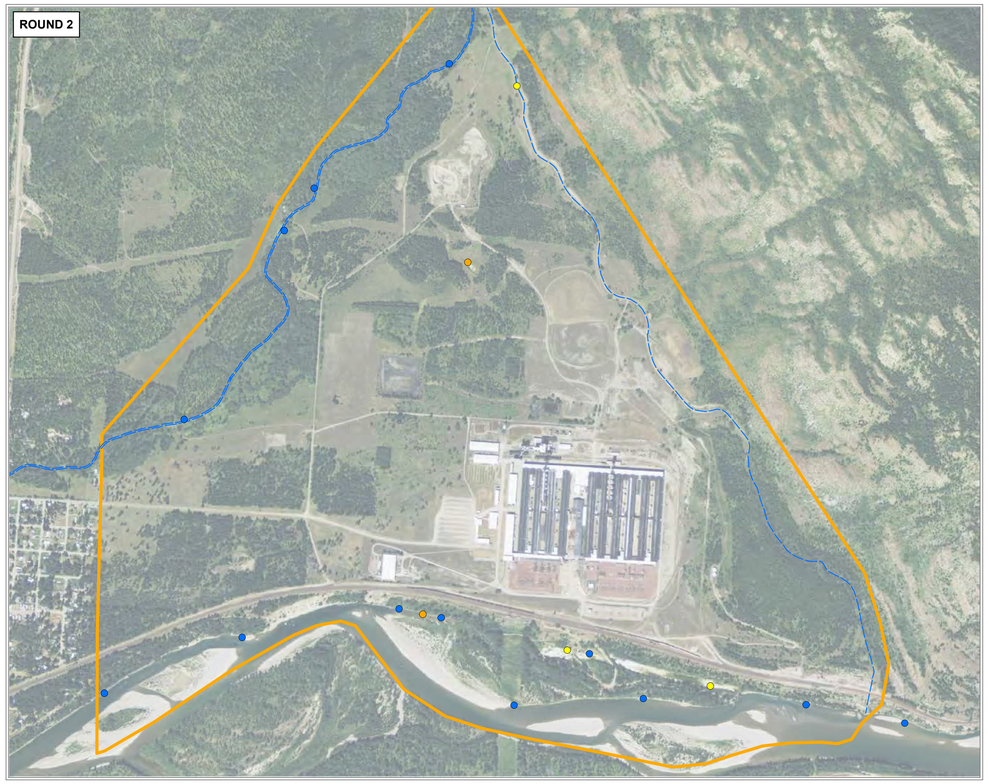

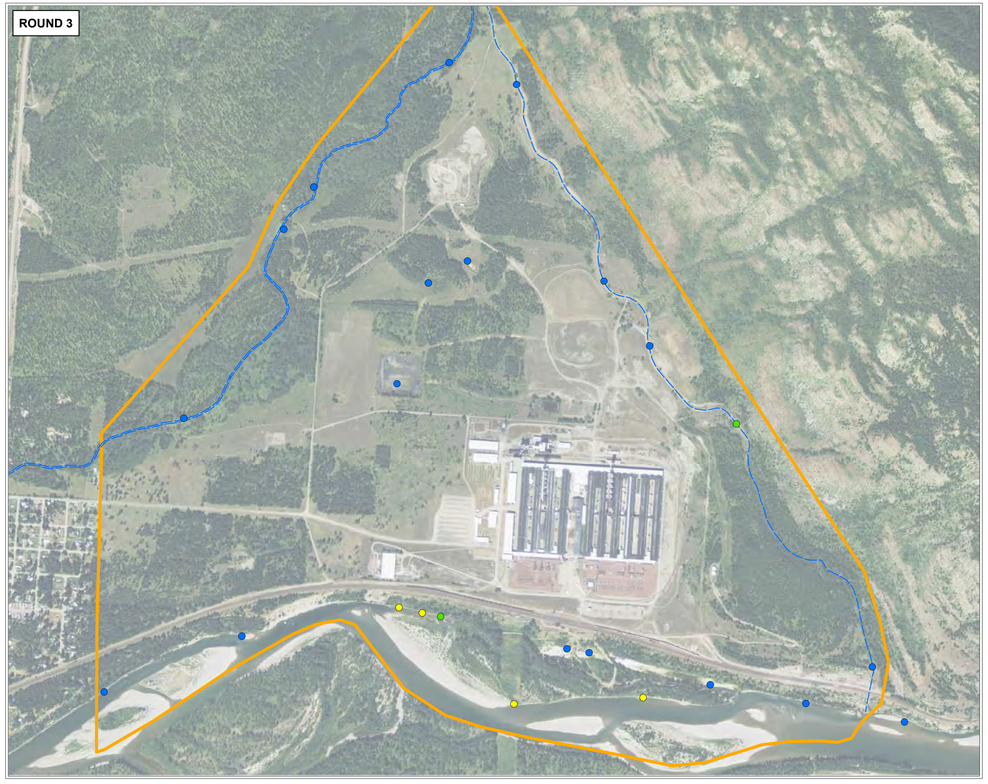

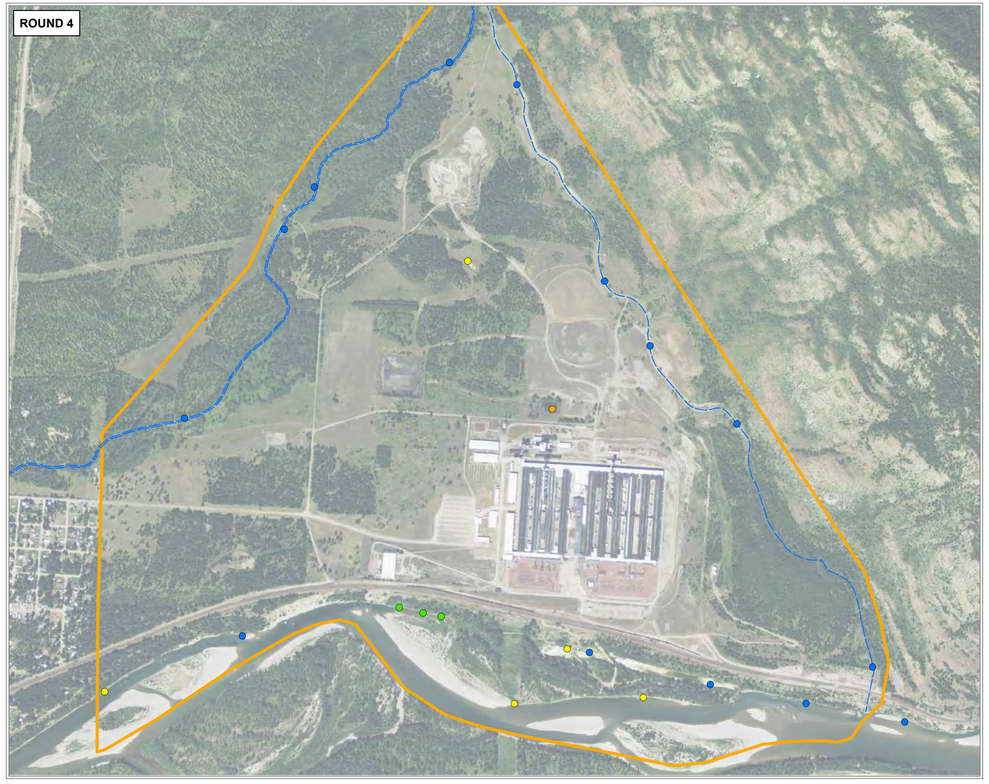

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.38U)
- ND – 0.54
- 0.54 – 2.548
- 2.548 – 15
- 15 – 150
- >150

SCREENING LEVEL	LEAD
DEQ-7 HUMAN HEALTH STANDARD	15
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	15
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	15
MINIMUM ESV	0.54
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	2.548
DEQ-7 ACUTE AQUATIC LIFE STANDARD	13.98

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
0.38U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL LEAD IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M12
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M12.2476.0001Y170.9.mxd		

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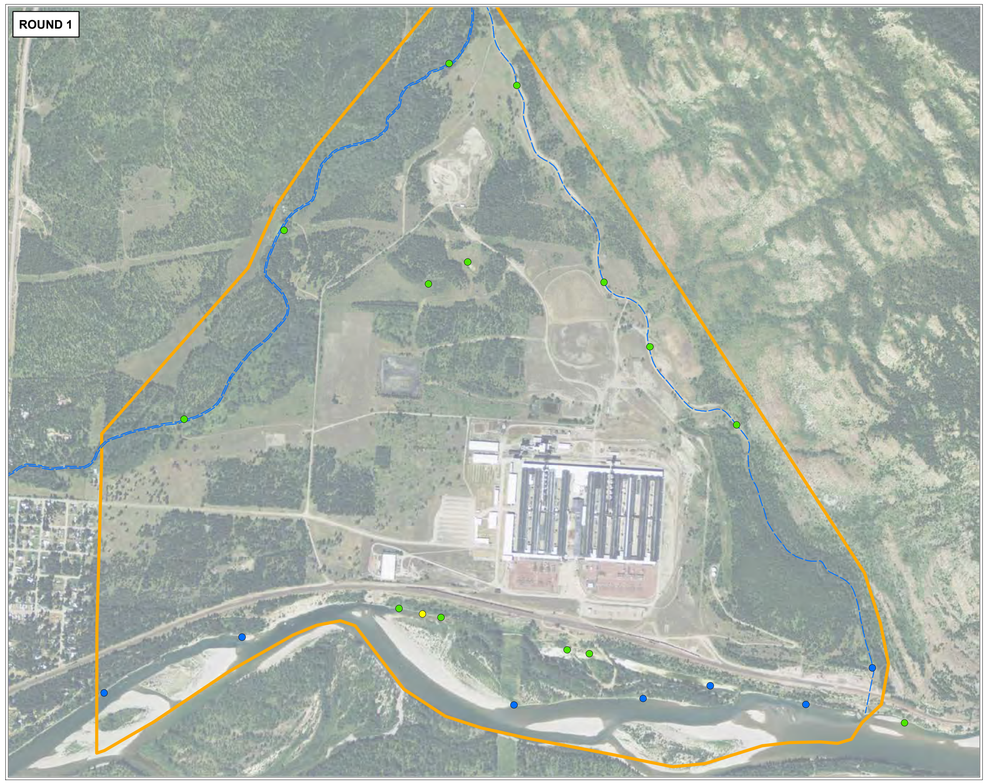
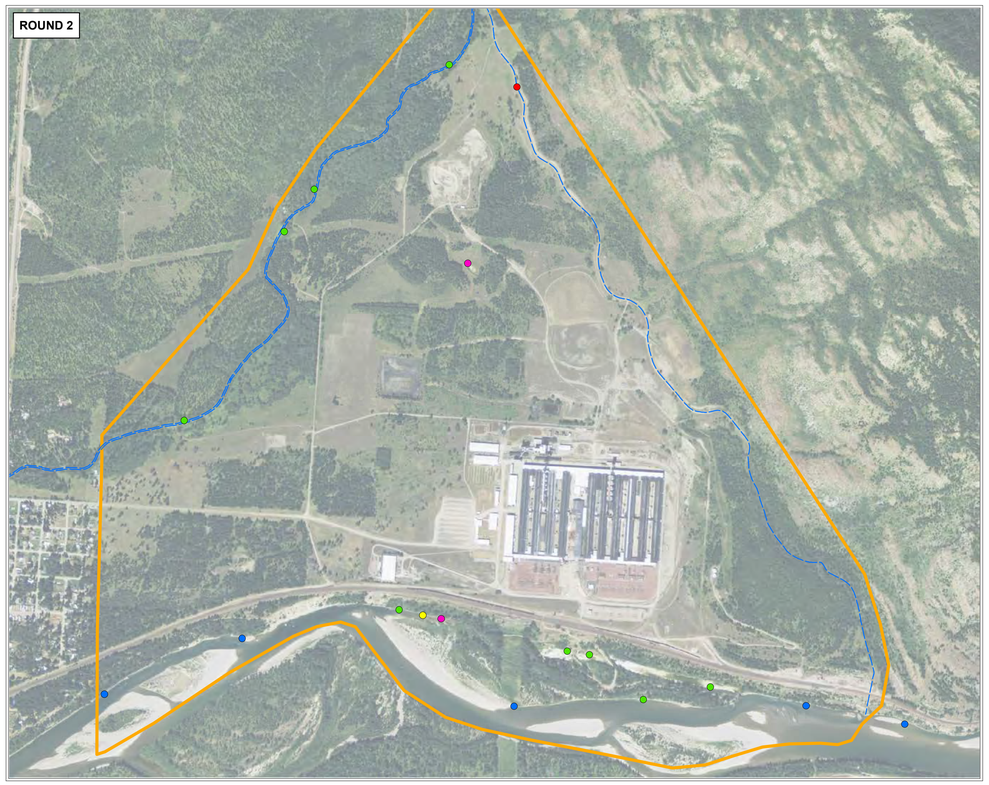
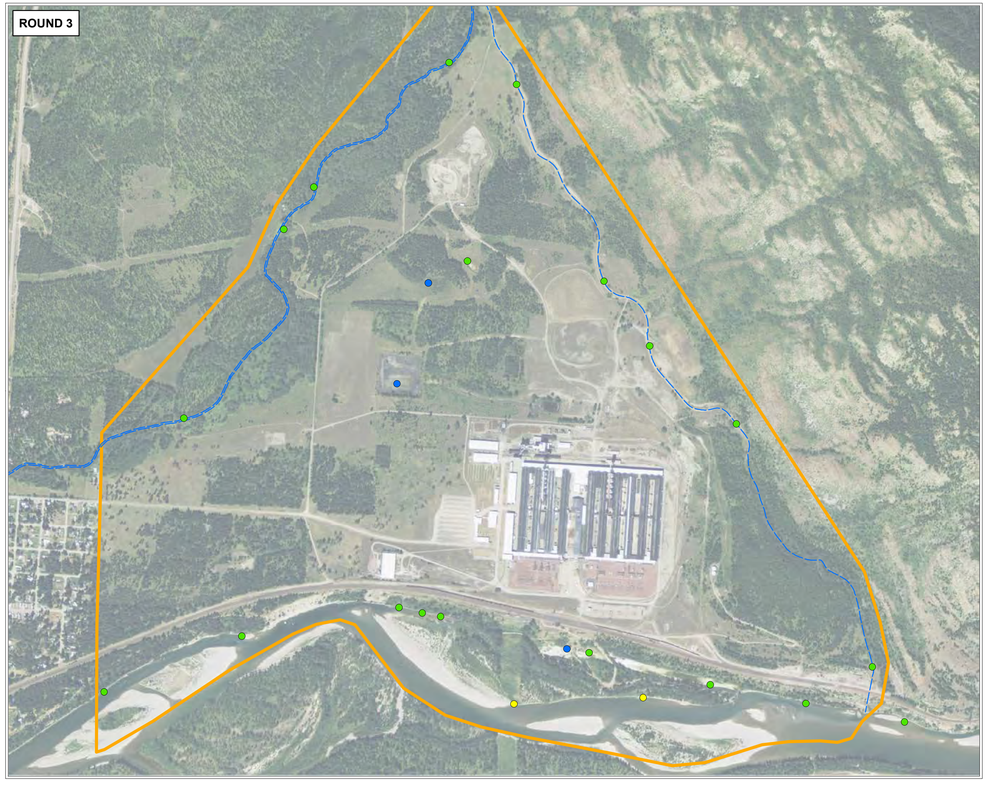
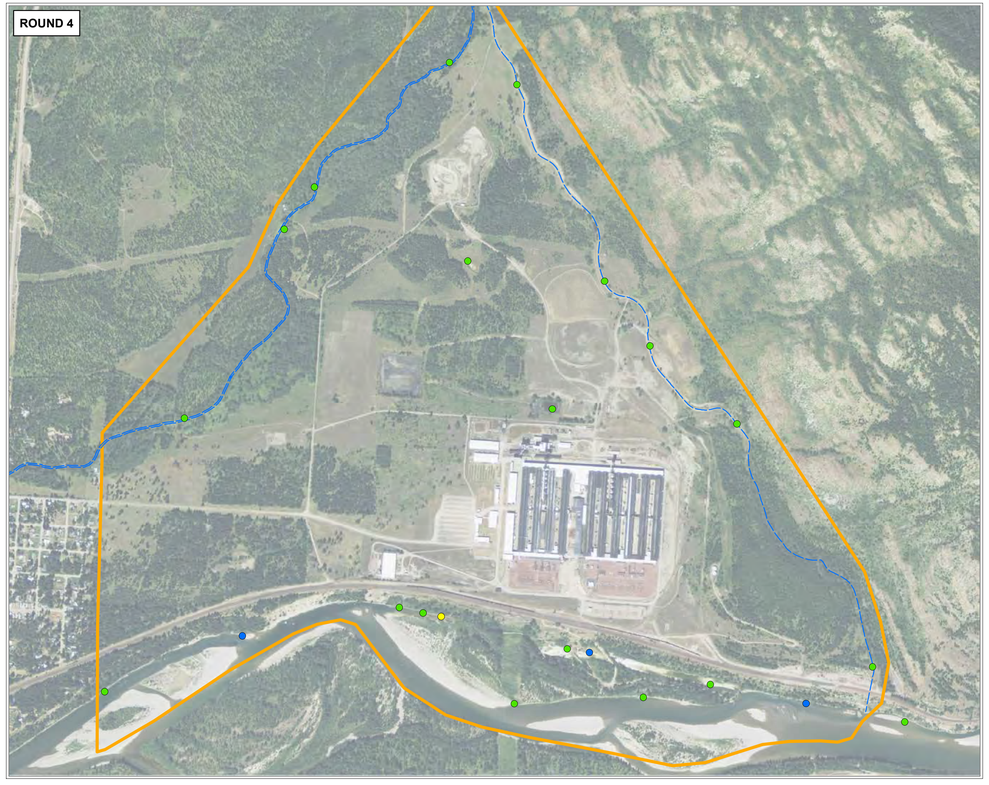








N

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2.5U)
- ND – 43
- 43 – 86
- 86 – 120
- 120 – 1,200
- >1,200

SCREENING LEVEL	MANGANESE
DEQ–7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	43
MINIMUM ESV	120
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ–7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
2.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL MANGANESE IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

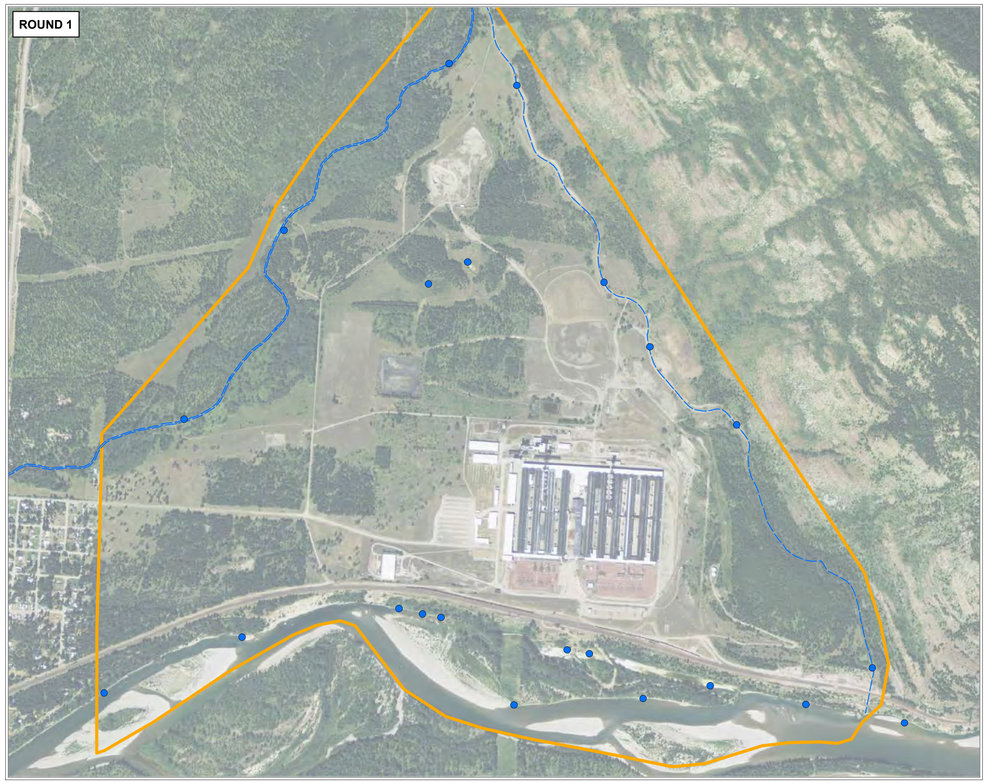
2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

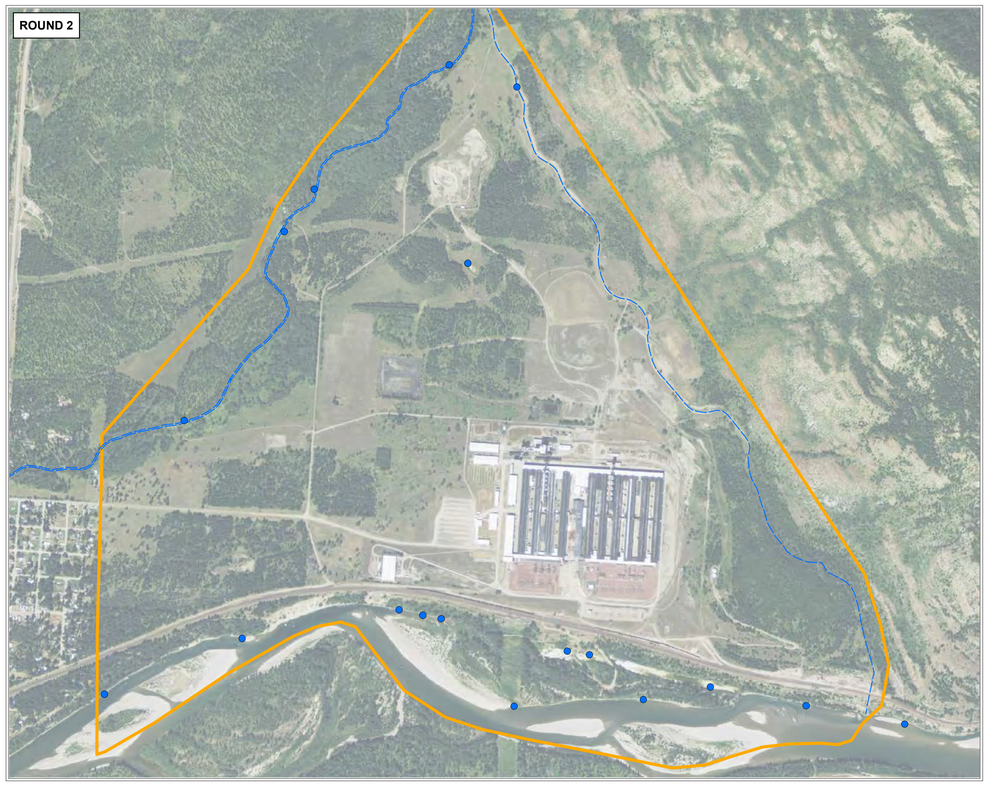
Prepared For:

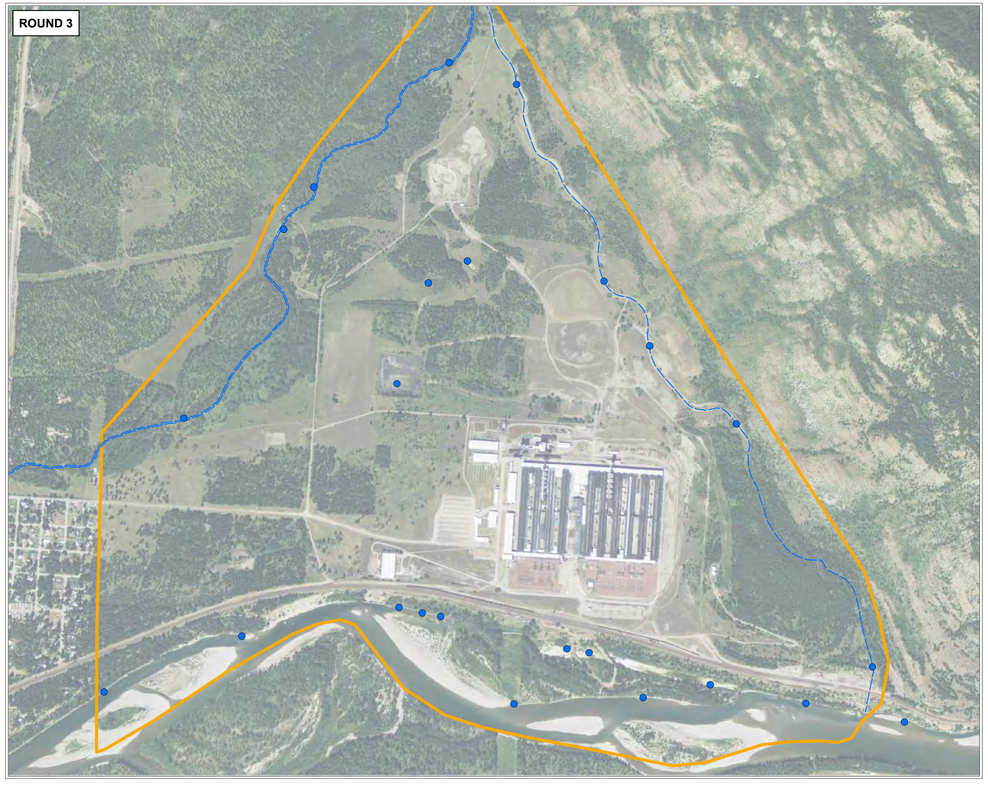
COLUMBIA FALLS ALUMINUM COMPANY, LLC

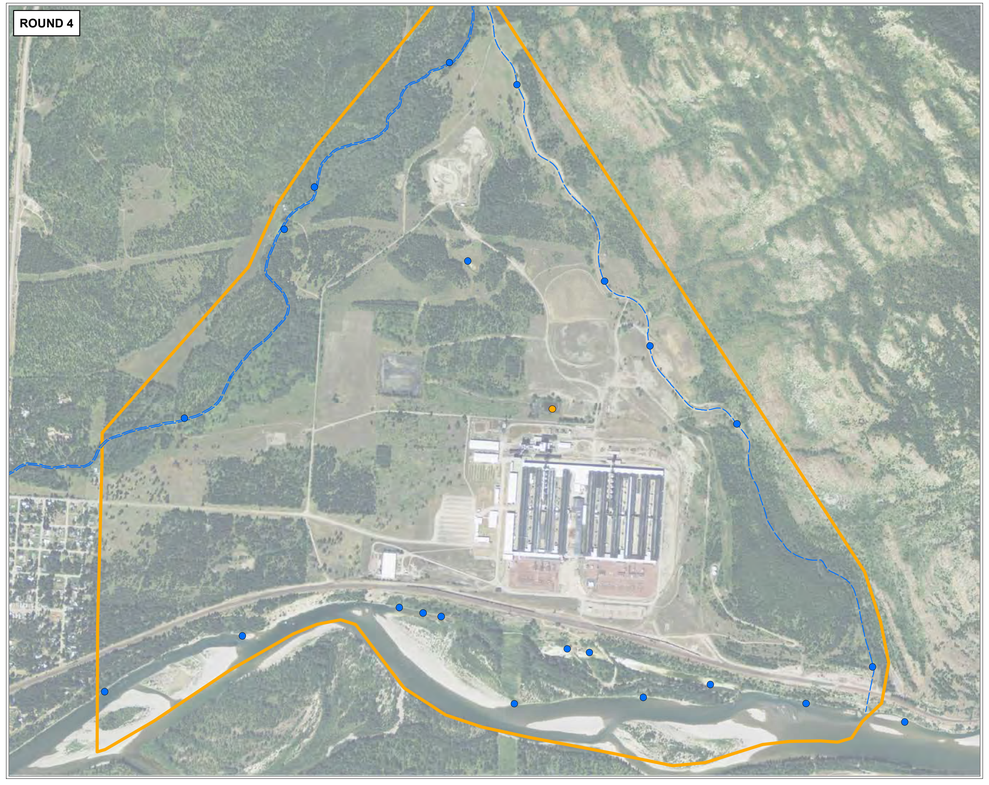
ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M13
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M13.2476.0001Y170.10.mxd		









CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.26U)
- ND – 0.02
- 0.02 – 0.24
- 0.24 – 2
- 2 – 20
- >20

SCREENING LEVEL	THALLIUM
DEQ-7 HUMAN HEALTH STANDARD	0.24
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	2
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.02
MINIMUM ESV	0.8
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
0.26U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF TOTAL THALLIUM IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M14
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M14.2476.0001Y170.11.mxd		

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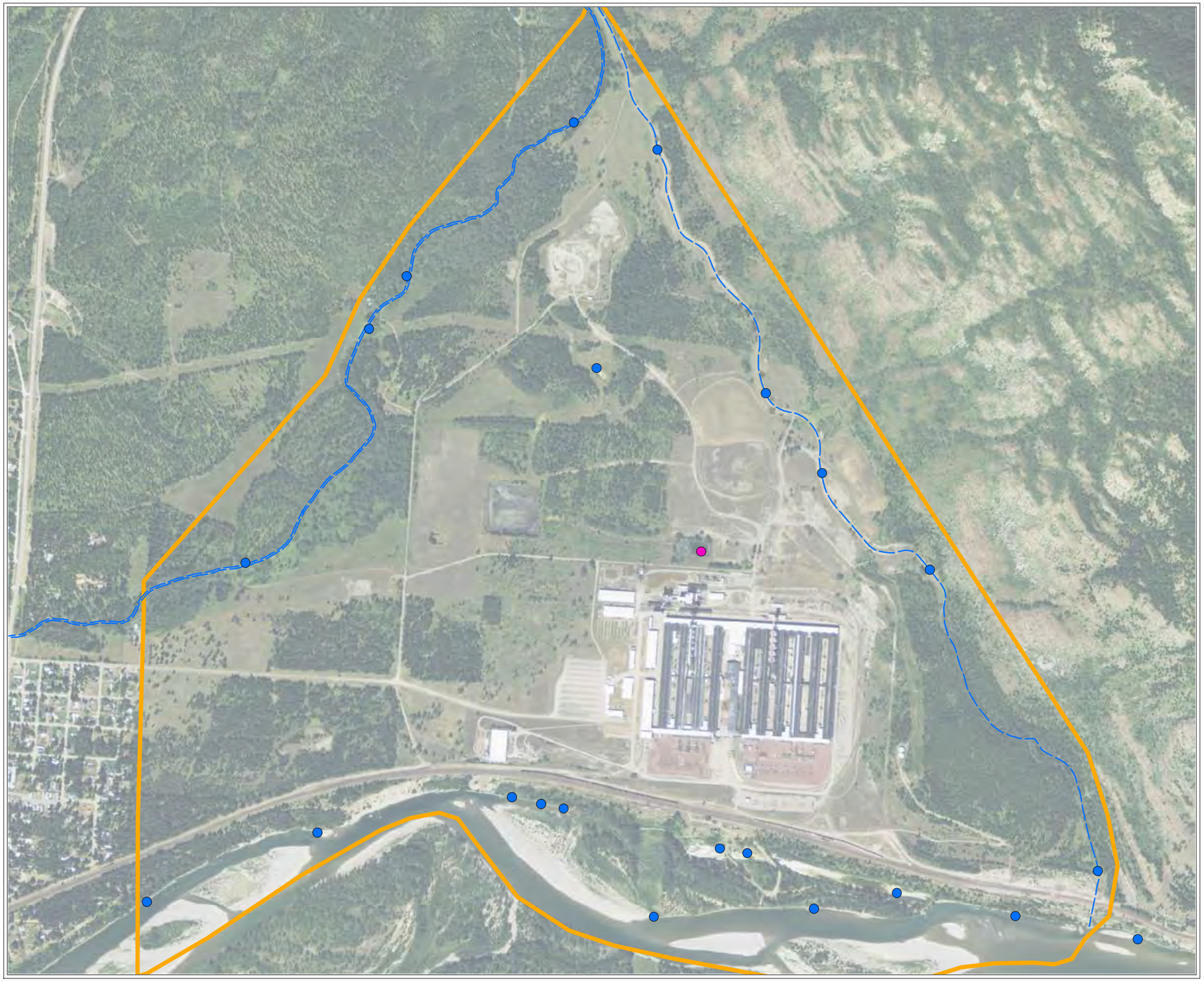

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (18.2U)
- ND – 87
- 87 – 750
- 750 – 2,000
- 2,000 – 20,000
- >20,000

SCREENING LEVEL	ALUMINUM
DEQ–7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	2000
MINIMUM ESV	87
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	87
DEQ–7 ACUTE AQUATIC LIFE STANDARD	750

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
18.2U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF DISSOLVED ALUMINUM IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M15
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M15.2476.0001Y170.15.mxd		

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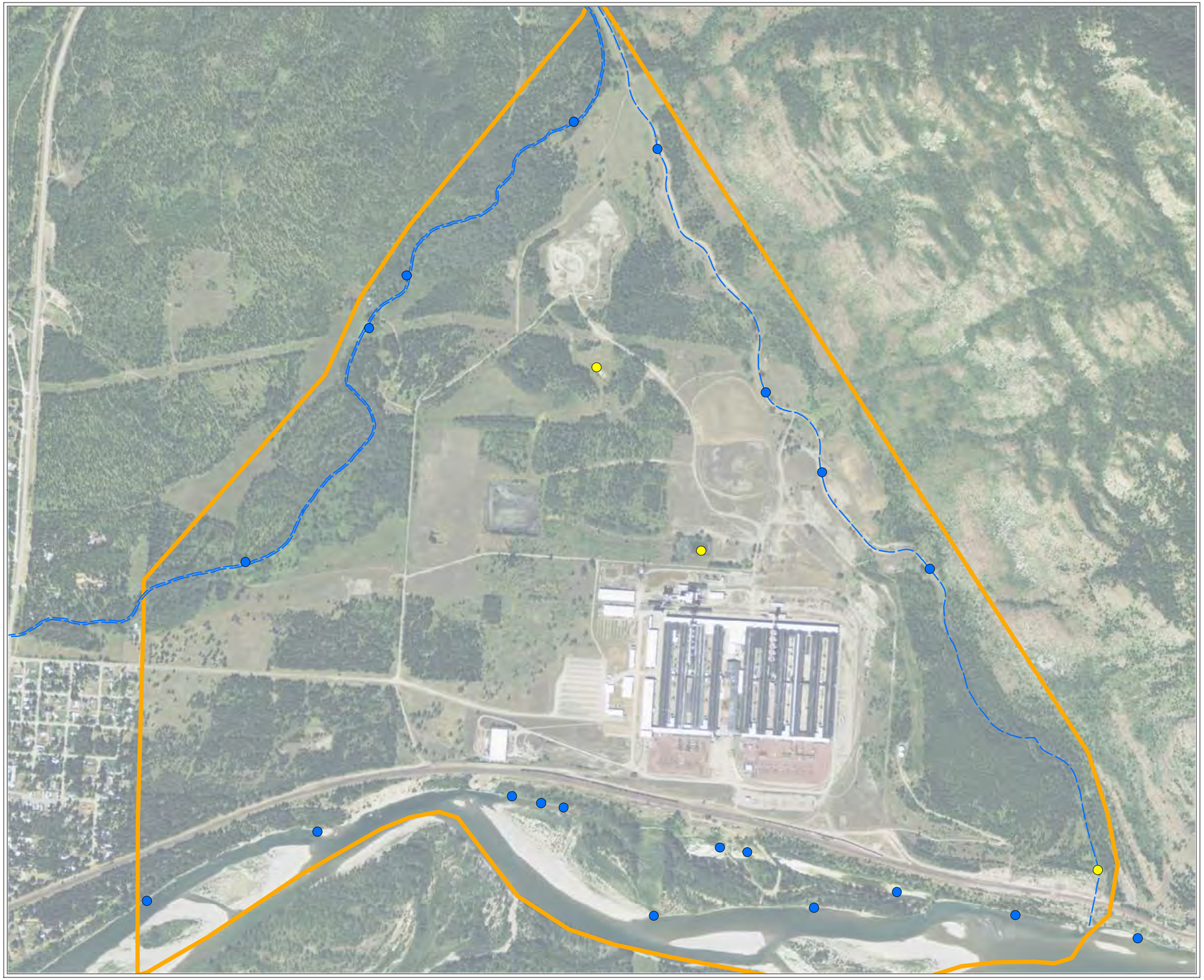

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.64U)
- ND – 0.052
- 0.052 – 10
- 10 – 100
- 100 – 3,400
- >3,400

SCREENING LEVEL	ARSENIC
DEQ–7 HUMAN HEALTH STANDARD	10
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	10
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.052
MINIMUM ESV	3.1
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	150
DEQ–7 ACUTE AQUATIC LIFE STANDARD	340

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
0.64U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title:
CONCENTRATIONS OF DISSOLVED ARSENIC IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M16
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M16.2476.0001Y170.16.mxd		

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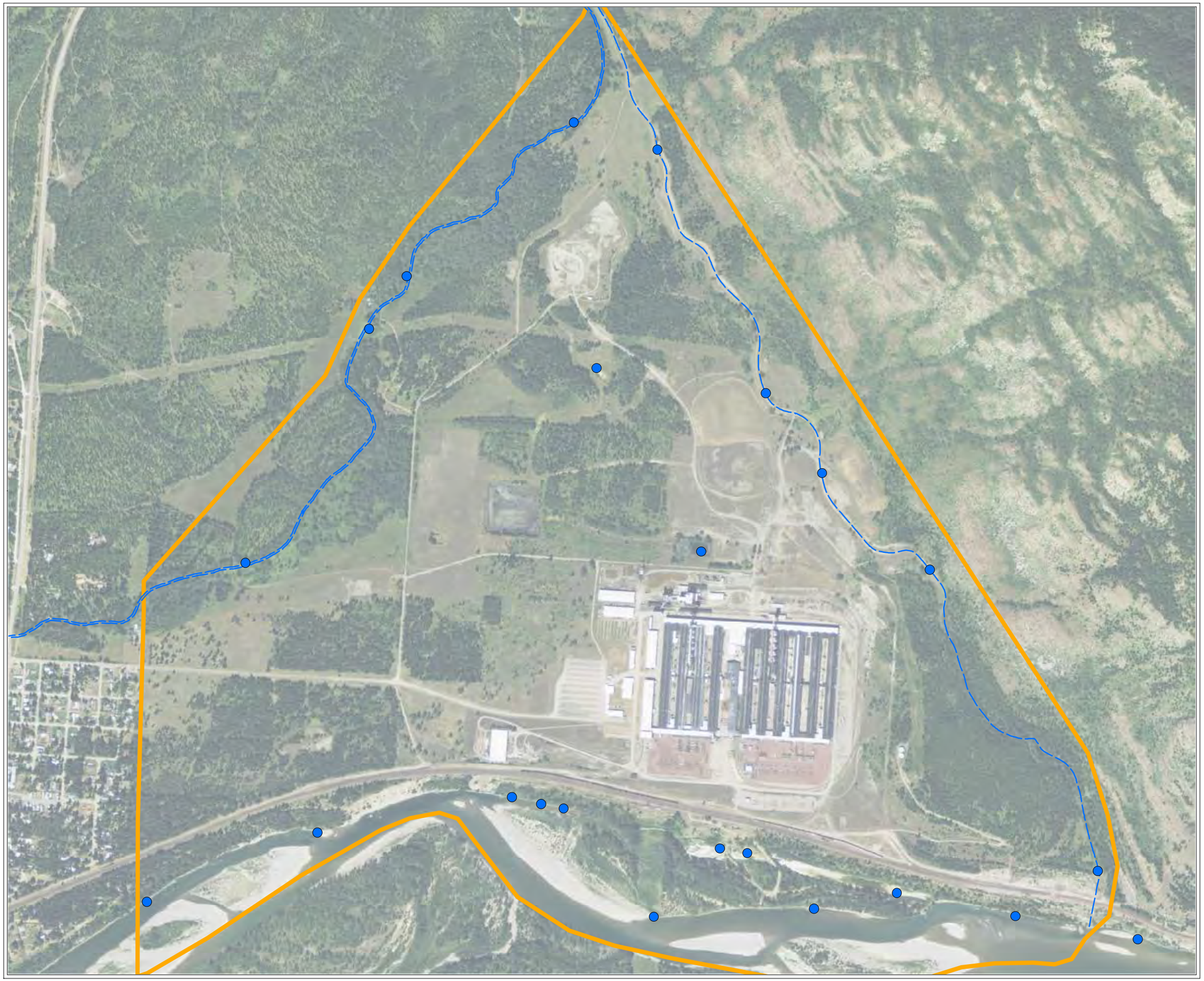

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.3U)
- ND – 0.6
- 0.6 – 1.2
- 1.2 – 5.1
- 5.1 – 51
- >51

SCREENING LEVEL	COBALT
DEQ–7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.6
MINIMUM ESV	5.1
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ–7 ACUTE AQUATIC LIFE STANDARDS	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
1.3U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:

CONCENTRATIONS OF DISSOLVED COBALT IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M17
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M17.2476.0001Y170.17.mxd		

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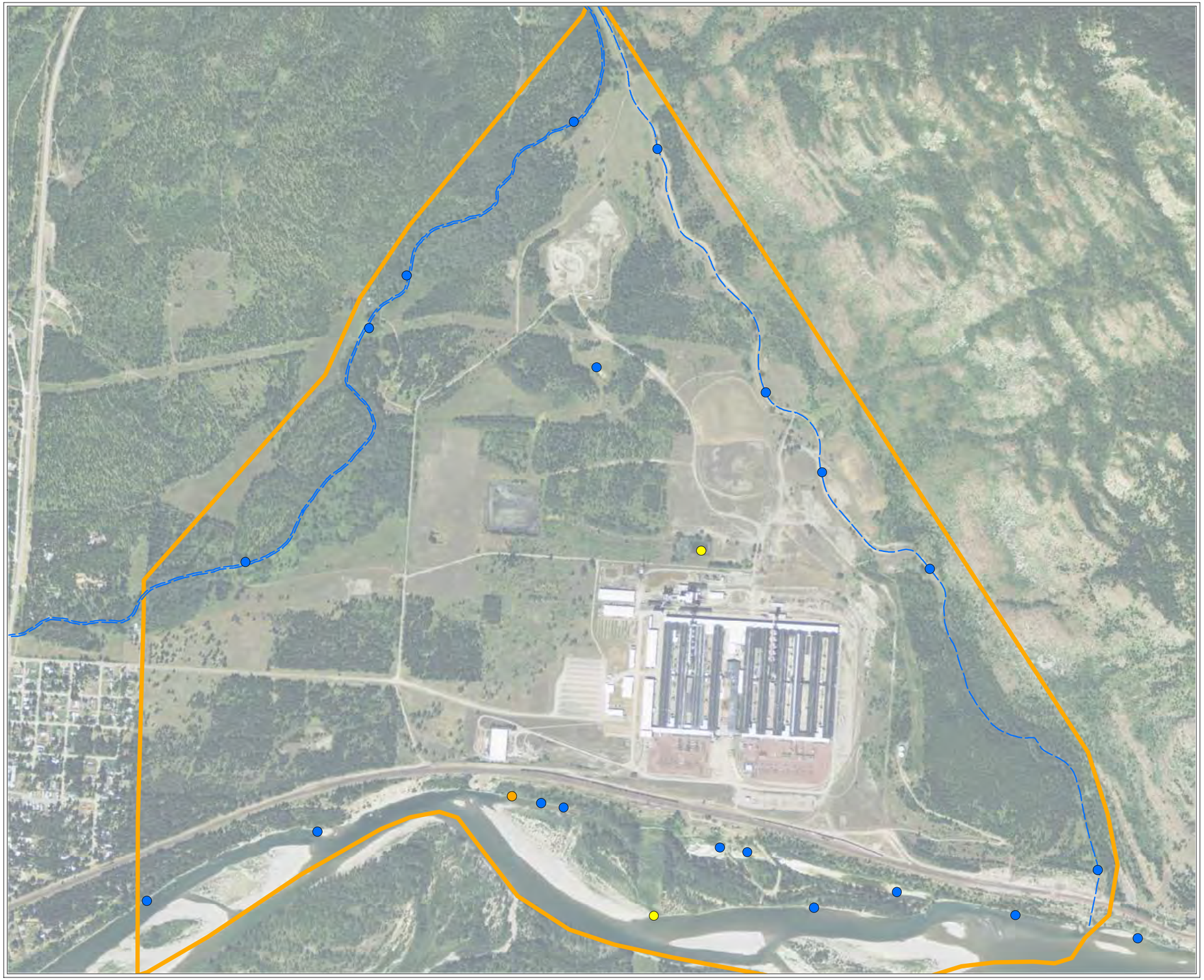

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (1.4U)
- ND – 0.23
- 0.23 – 3.79
- 3.79 – 1,300
- 1,300 – 13,000
- >13,000

SCREENING LEVEL	COPPER
DEQ–7 HUMAN HEALTH STANDARD	1300
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	1300
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	80
MINIMUM ESV	0.23
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	8.038
DEQ–7 ACUTE AQUATIC LIFE STANDARD	3.79

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
1.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title:
CONCENTRATIONS OF DISSOLVED COPPER IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18
Prepared by: M.R.	Scale: AS SHOWN
Project Mgr: M.R.	Project: 2476.0001Y004
File: M18.2476.0001Y170.18.mxd	

APPENDIX
M18

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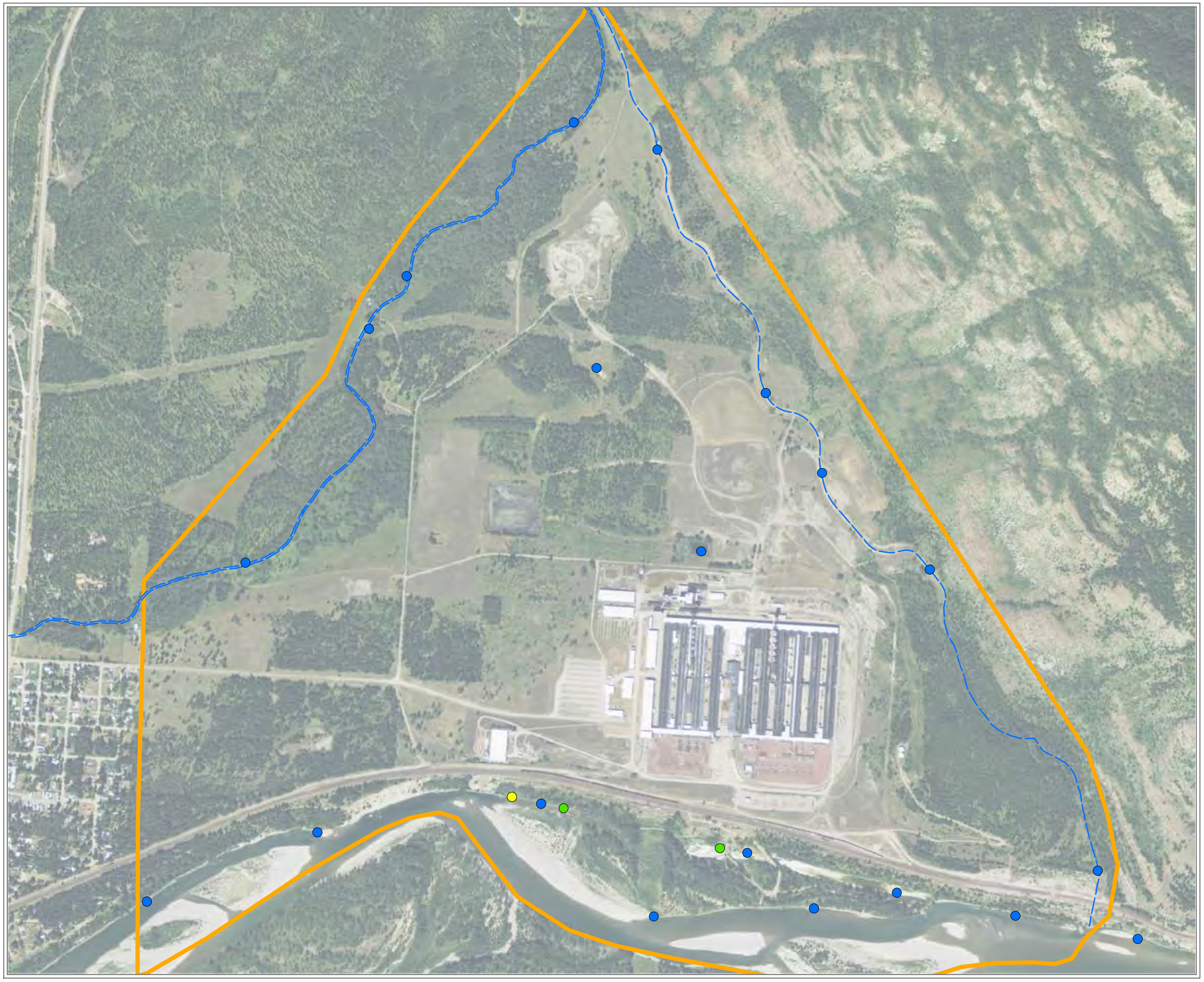

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42.4U)
- ND – 158
- 158 – 1,000
- 1,000 – 1,400
- 1,400 – 14,000
- >14,000

SCREENING LEVEL	IRON
DEQ–7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	1400
MINIMUM ESV	158
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	1000
DEQ–7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
42.4U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:

CONCENTRATIONS OF DISSOLVED IRON IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M19
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M19.2476.0001Y170.19.mxd		

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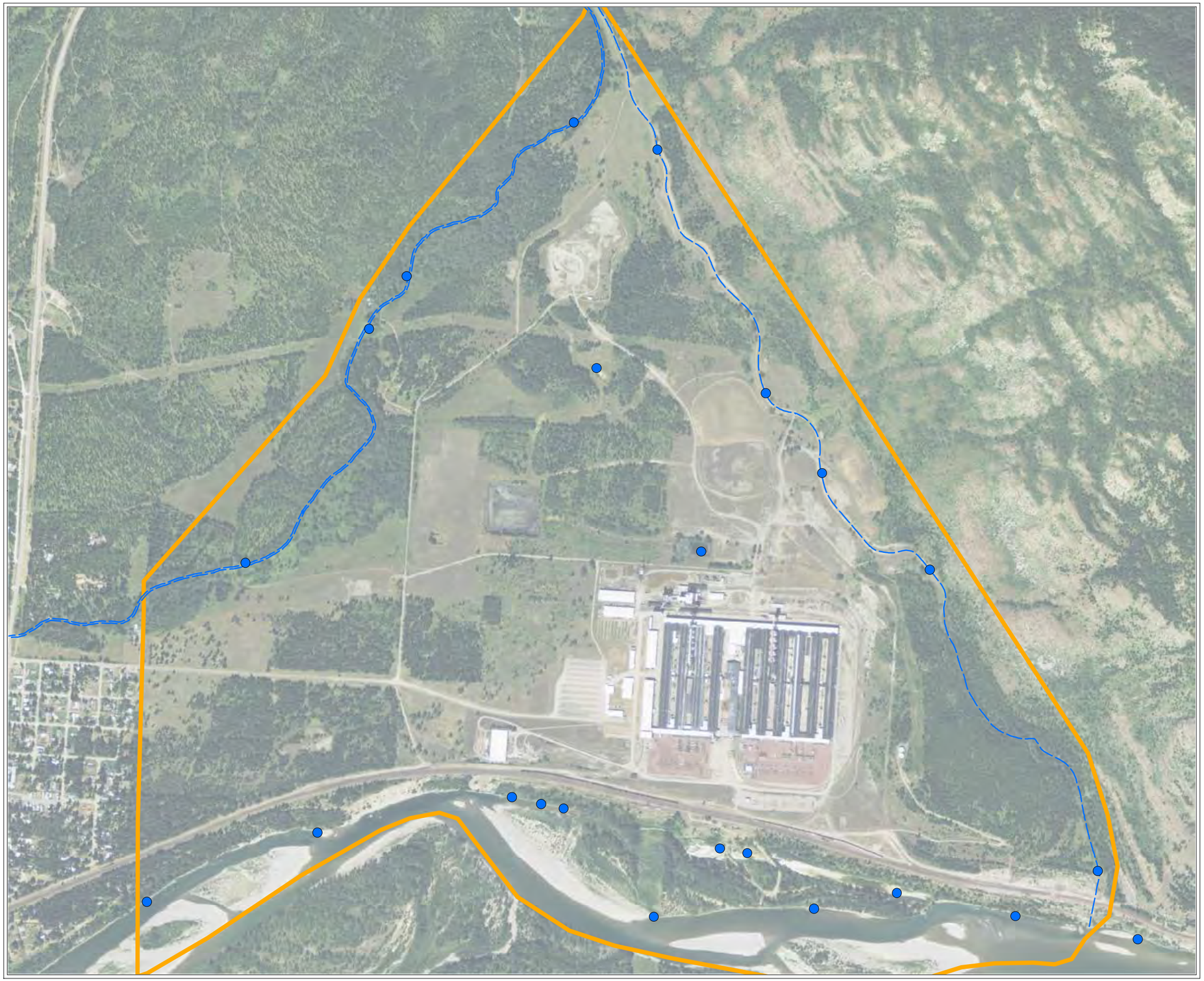

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.38U)
- ND – 0.54
- 0.54 – 2.548
- 2.548 – 15
- 15 – 150
- >150

SCREENING LEVEL	LEAD
DEQ–7 HUMAN HEALTH STANDARD	15
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	15
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	15
MINIMUM ESV	0.54
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	2.548
DEQ–7 ACUTE AQUATIC LIFE STANDARD	13.98

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
0.38U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:

CONCENTRATIONS OF DISSOLVED LEAD IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M20
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M20.2476.0001Y170.20.mxd		

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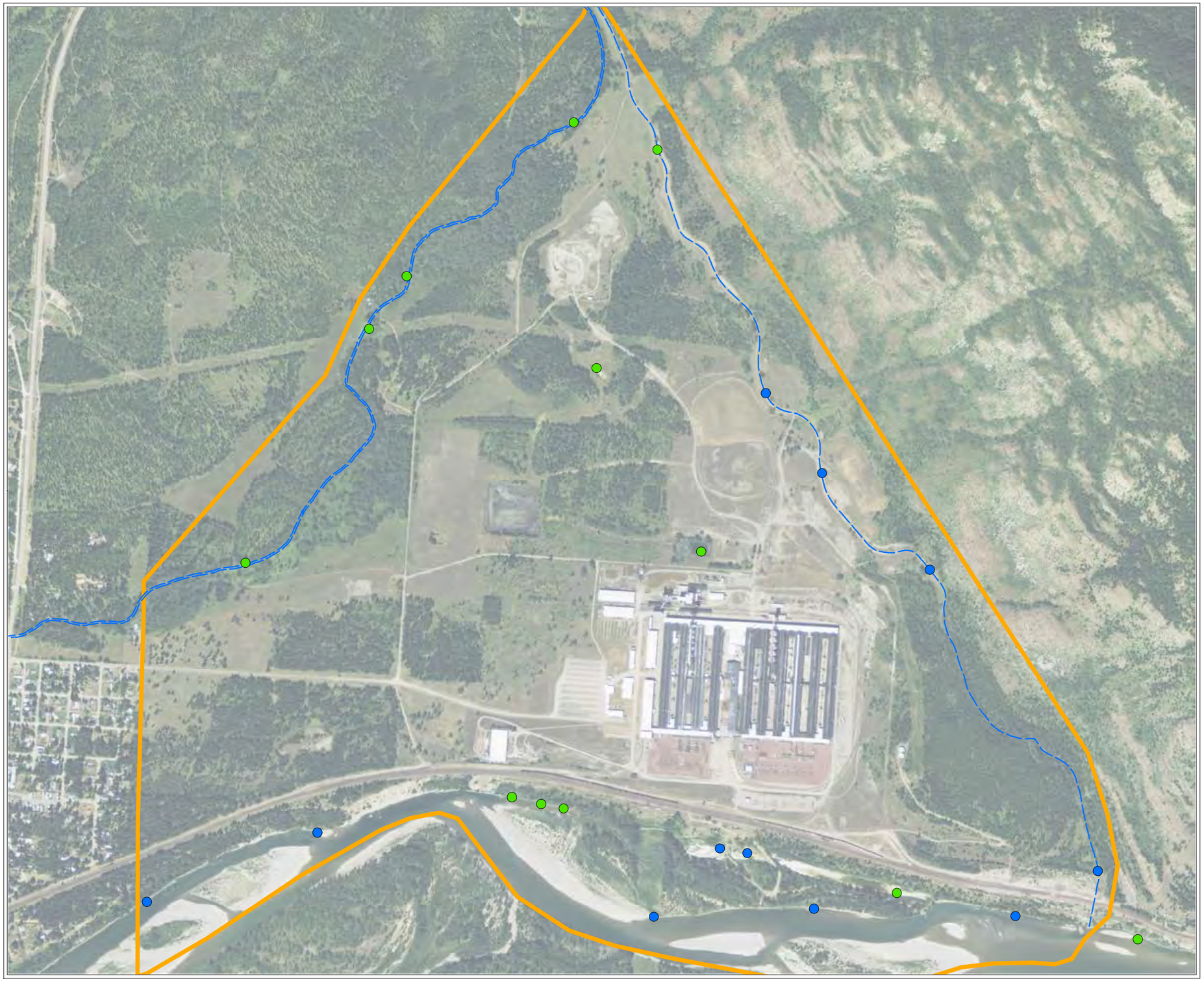

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (2.5U)
- ND – 43
- 43 – 86
- 86 – 120
- 120 – 1,200
- >1,200

SCREENING LEVEL	MANGANESE
DEQ–7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	43
MINIMUM ESV	120
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ–7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
2.5U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000 Feet

Title:

CONCENTRATIONS OF DISSOLVED MANGANESE IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M21
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M21.2476.0001Y170.21.mxd		

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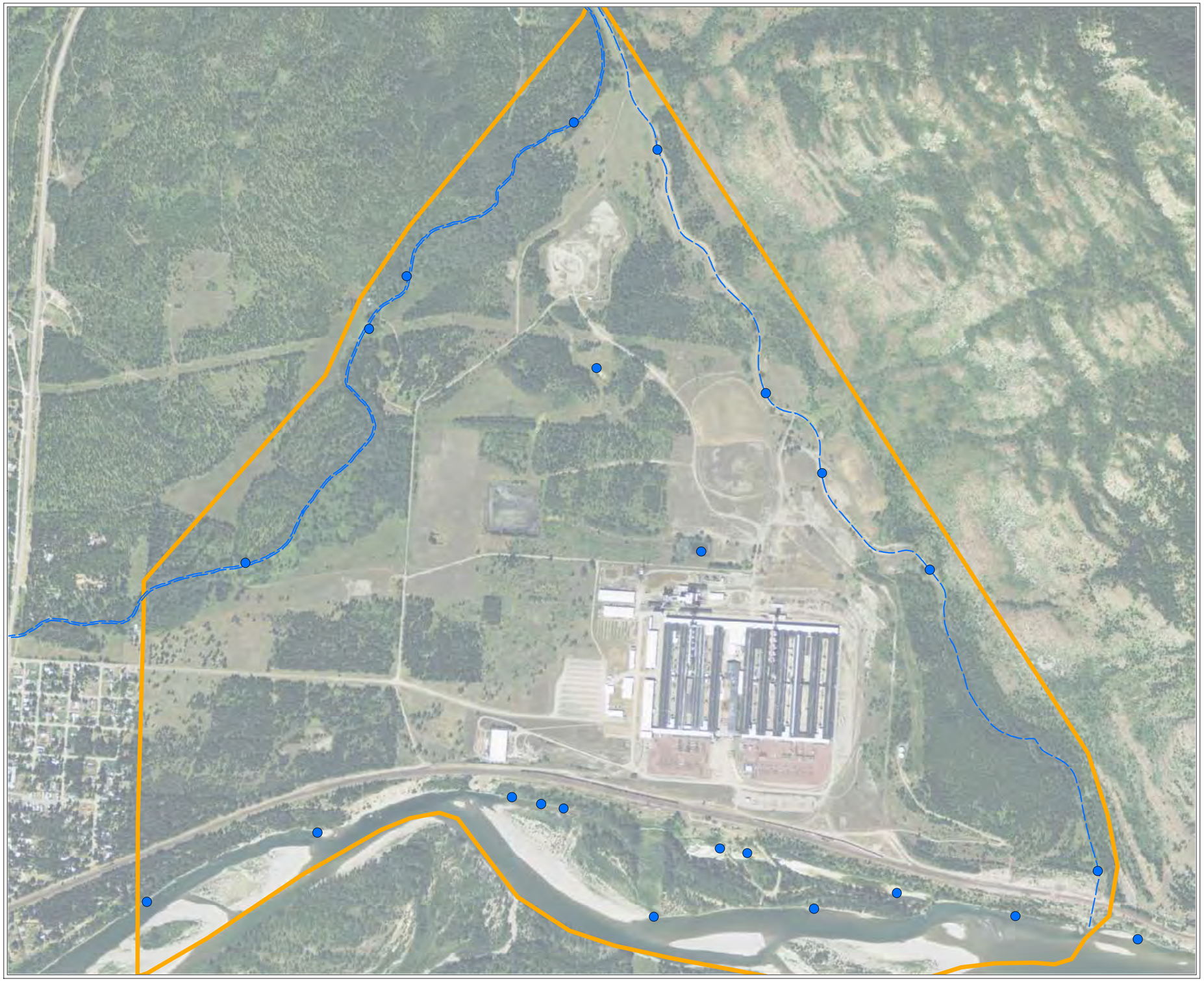

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (0.26U)
- ND – 0.02
- 0.02 – 0.24
- 0.24 – 2
- 2 – 20
- >20

SCREENING LEVEL	THALLIUM
DEQ–7 HUMAN HEALTH STANDARD	0.24
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	2
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	0.02
MINIMUM ESV	0.8
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ–7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ESV – ENVIRONMENTAL SCREENING LEVEL
ND – NON DETECT
0.26U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:
CONCENTRATIONS OF DISSOLVED THALLIUM IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 16JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M22
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M22.2476.0001Y170.22.mxd		

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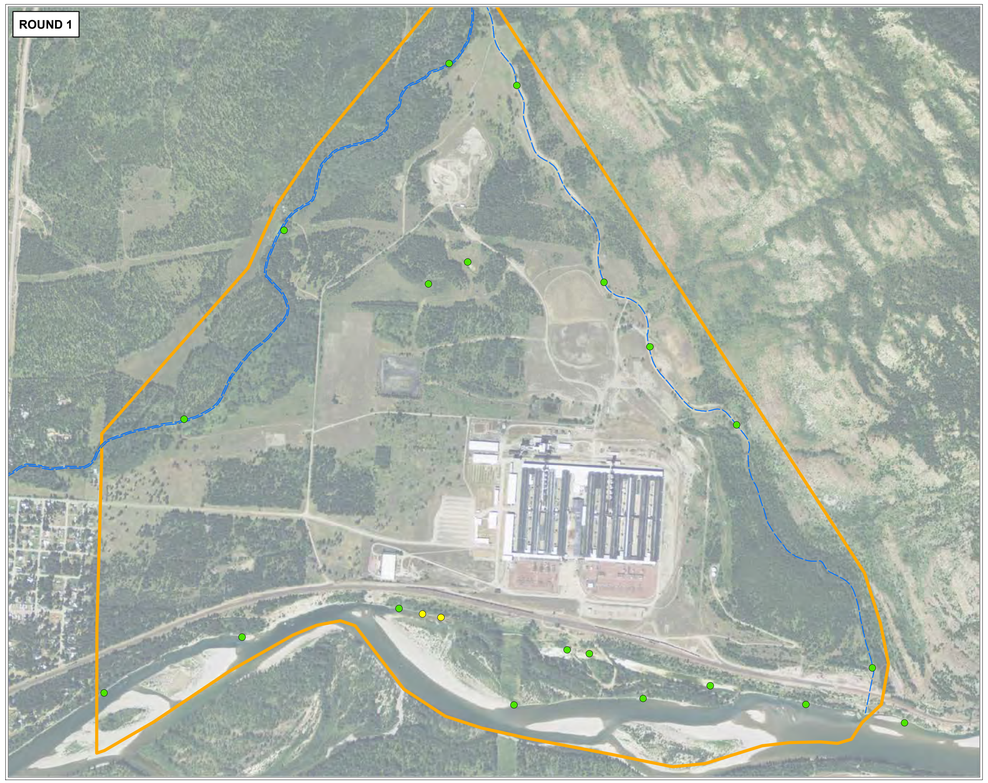

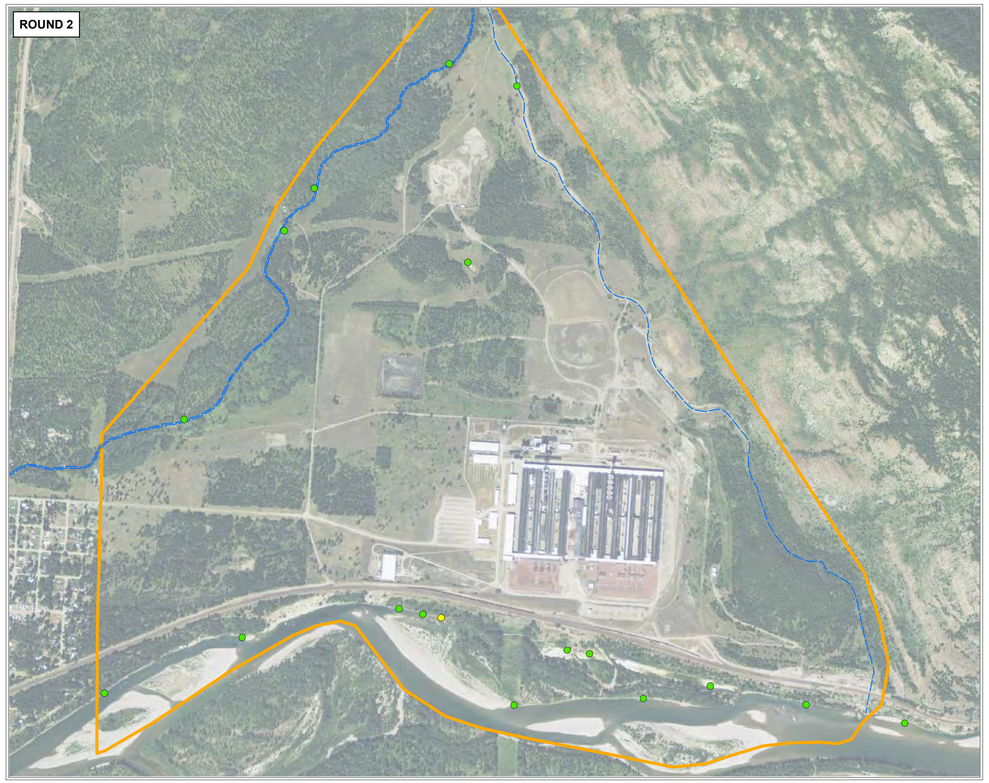

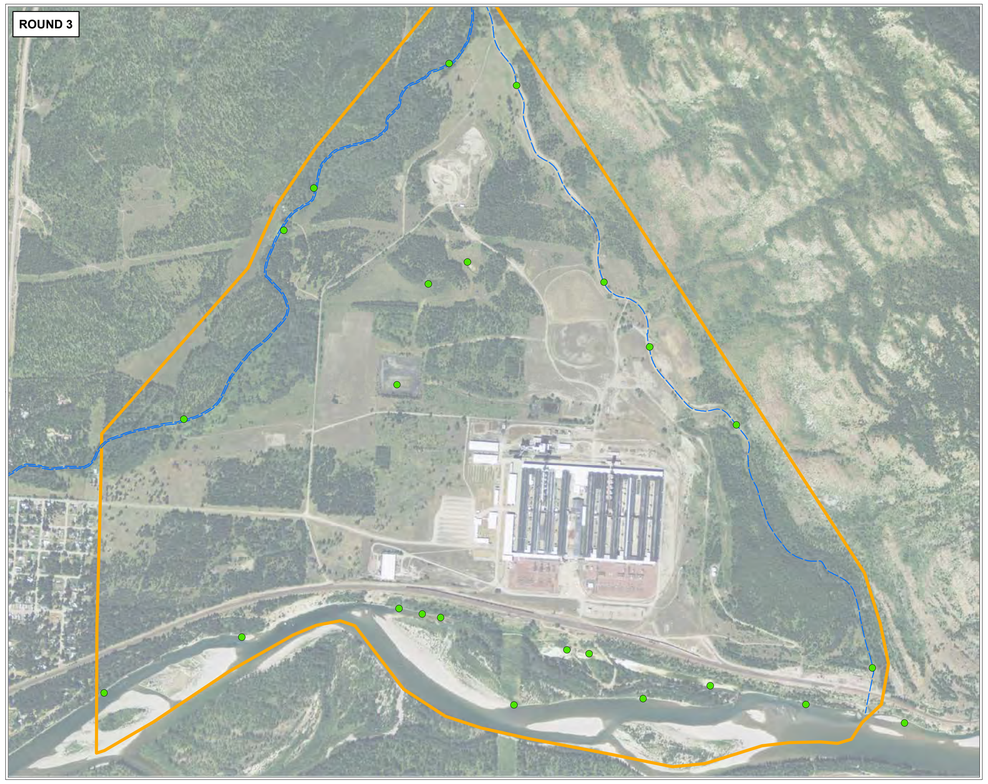

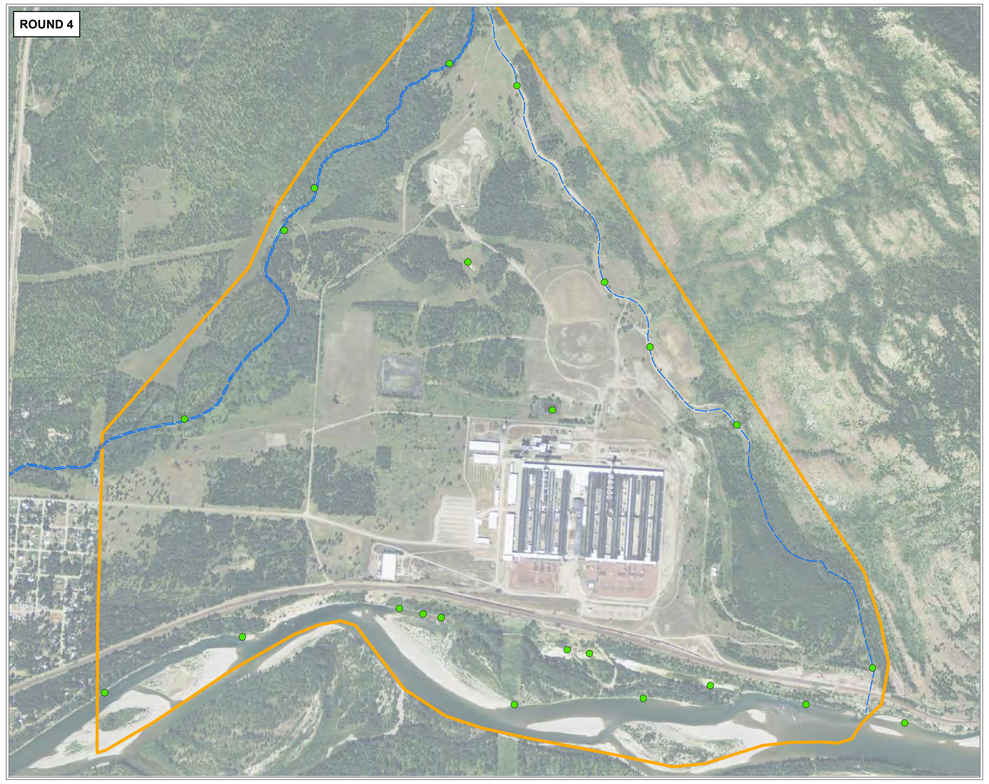

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 250,000
- 250,000 – 500,000
- 500,000 – 750,000
- 750,000 – 1,000,000
- >1,000,000

SCREENING LEVEL	ALKALINITY
DEQ-7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	43
MINIMUM ESV	--
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF ALKALITIY IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M23
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M23.2476.0001Y170.88.mxd		

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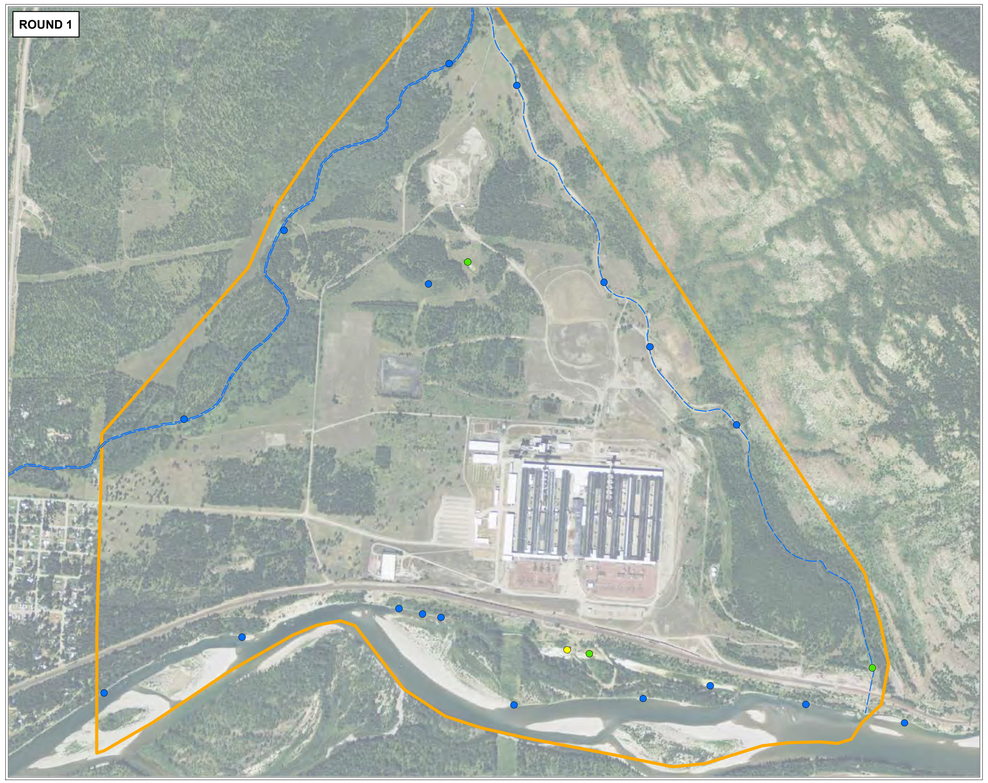

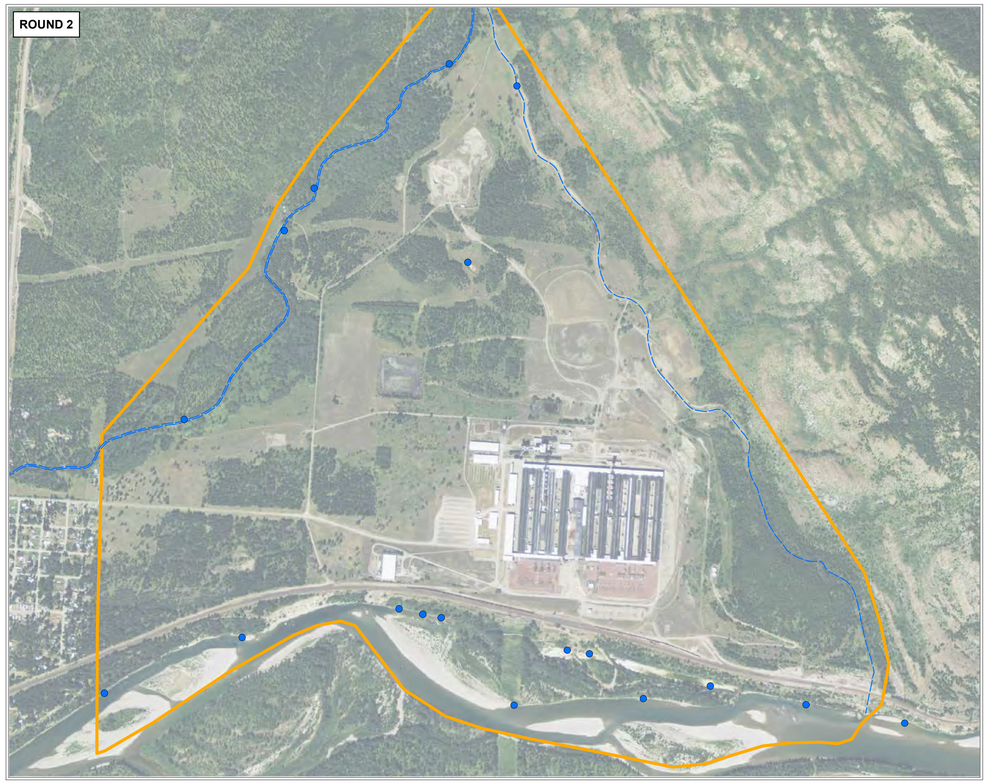

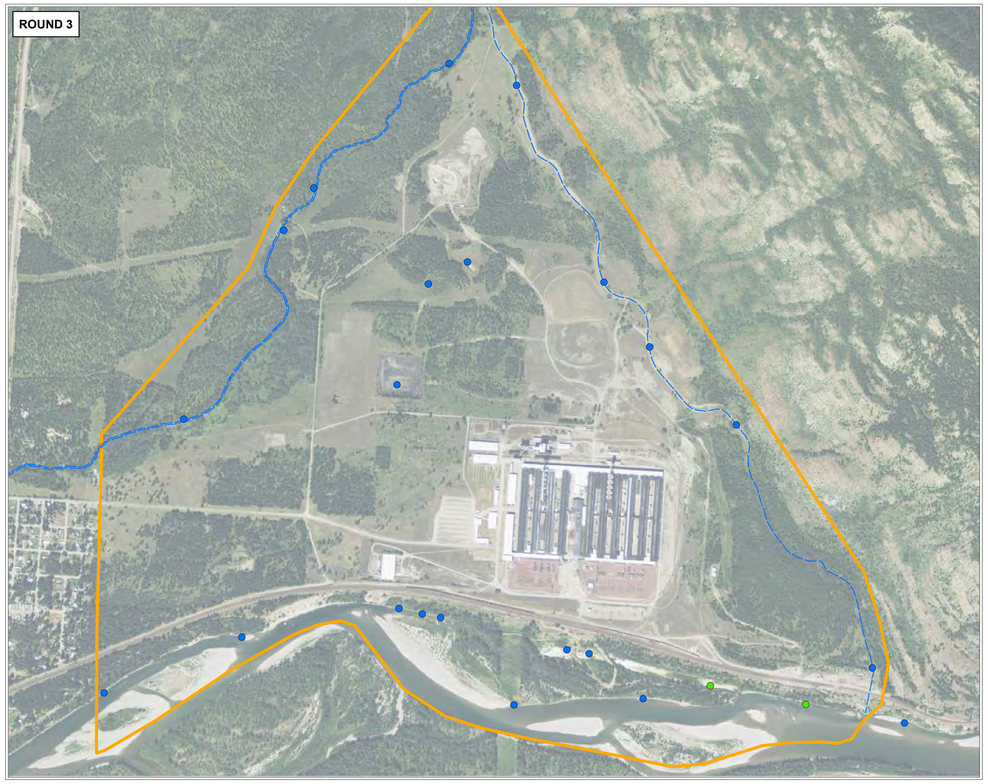

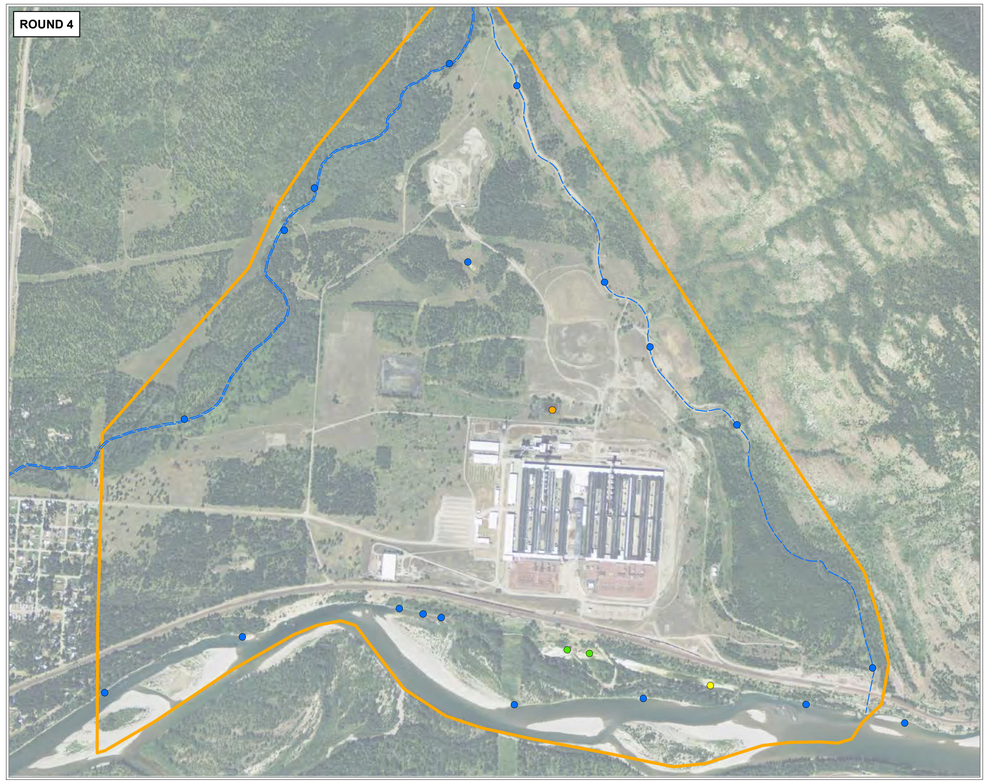

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (72U)
- ND – 100
- 100 – 500
- 500 – 2,500
- 2,500 – 5,000
- >5,000

SCREENING LEVEL	AMMONIA
DEQ-7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	--
MINIMUM ESV	--
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ND – NON DETECT
72U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF AMMONIA IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M24
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M24.2476.0001Y170.79.mxd		

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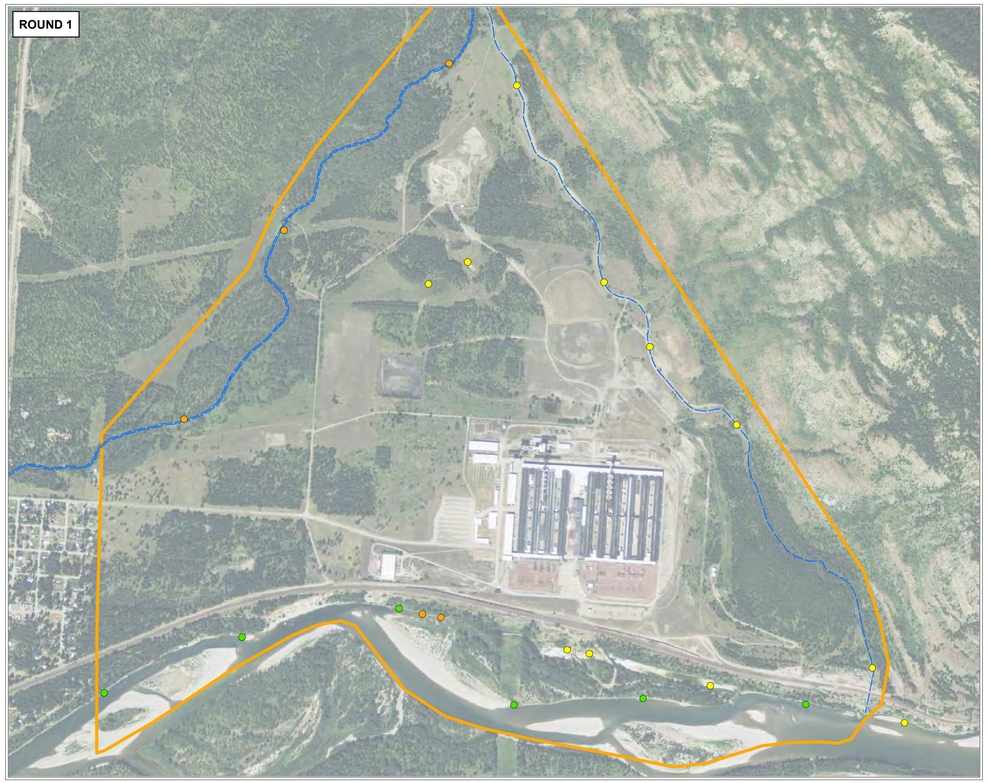

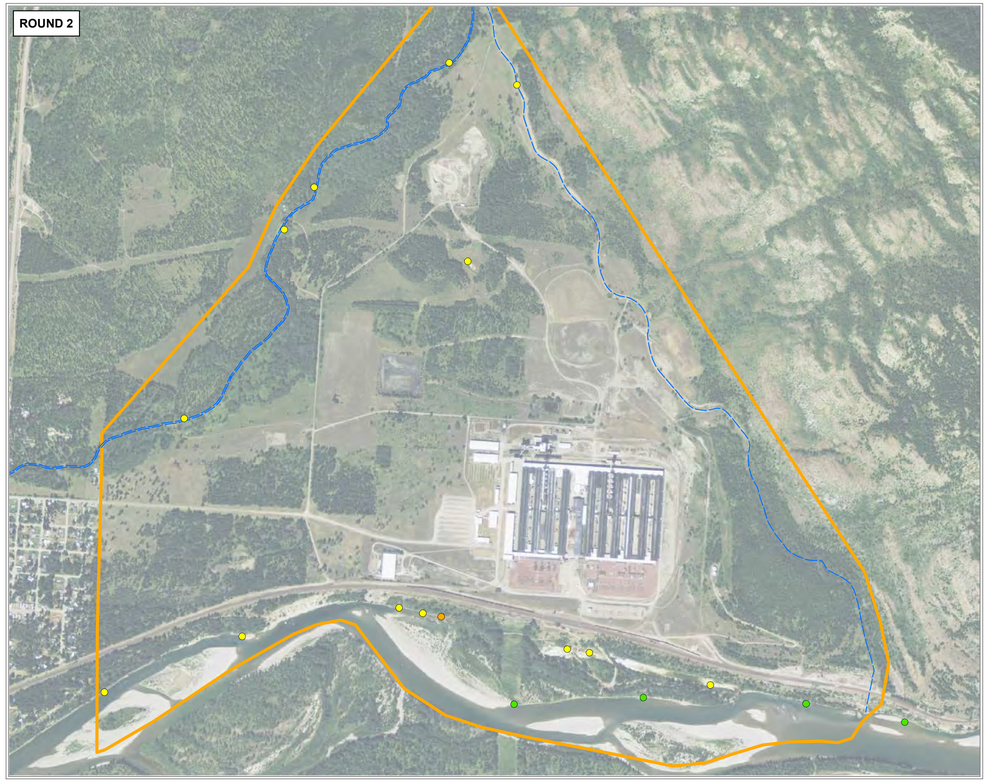

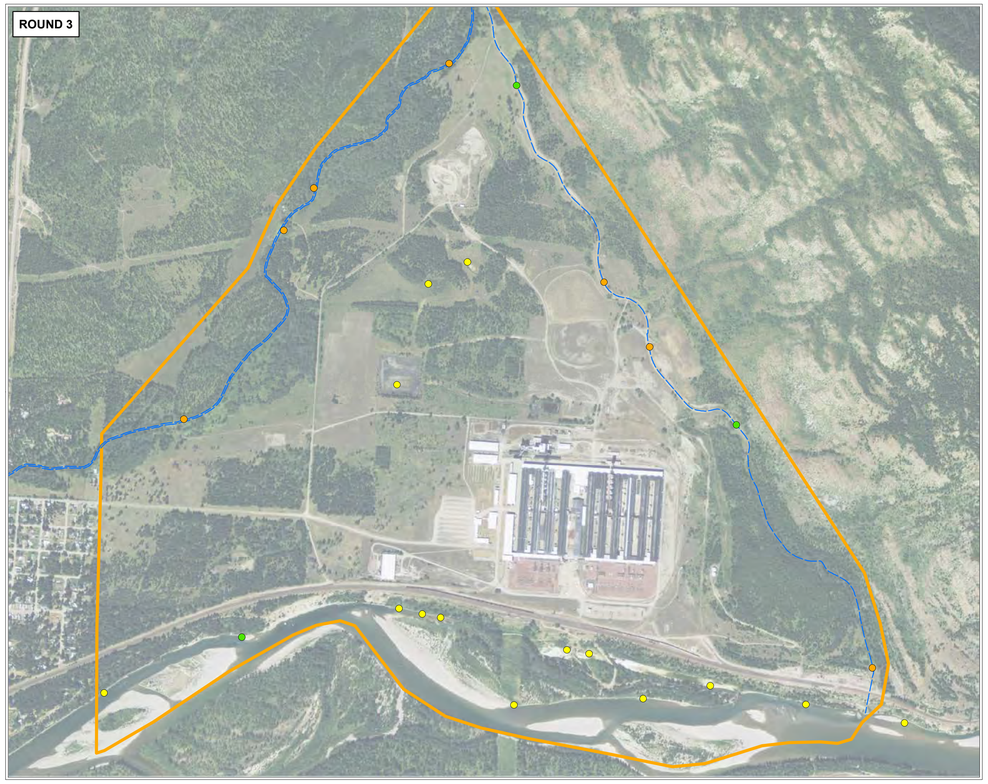

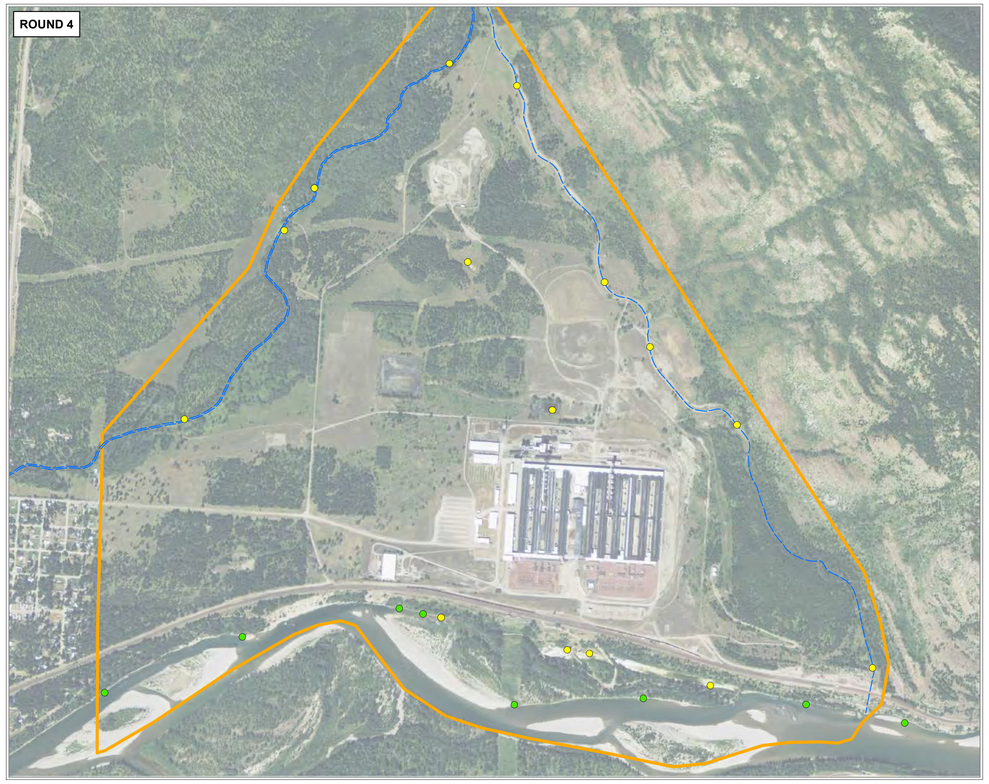

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 150,000
- 150,000– 500,000
- 500,000 – 750,000
- 750,000 – 1,000,000
- >1,000,000

SCREENING LEVEL	CHLORIDE
DEQ–7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	--
MINIMUM ESV	--
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ–7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF CHLORIDE IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M25
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M25.2476.0001Y170.80.mxd		

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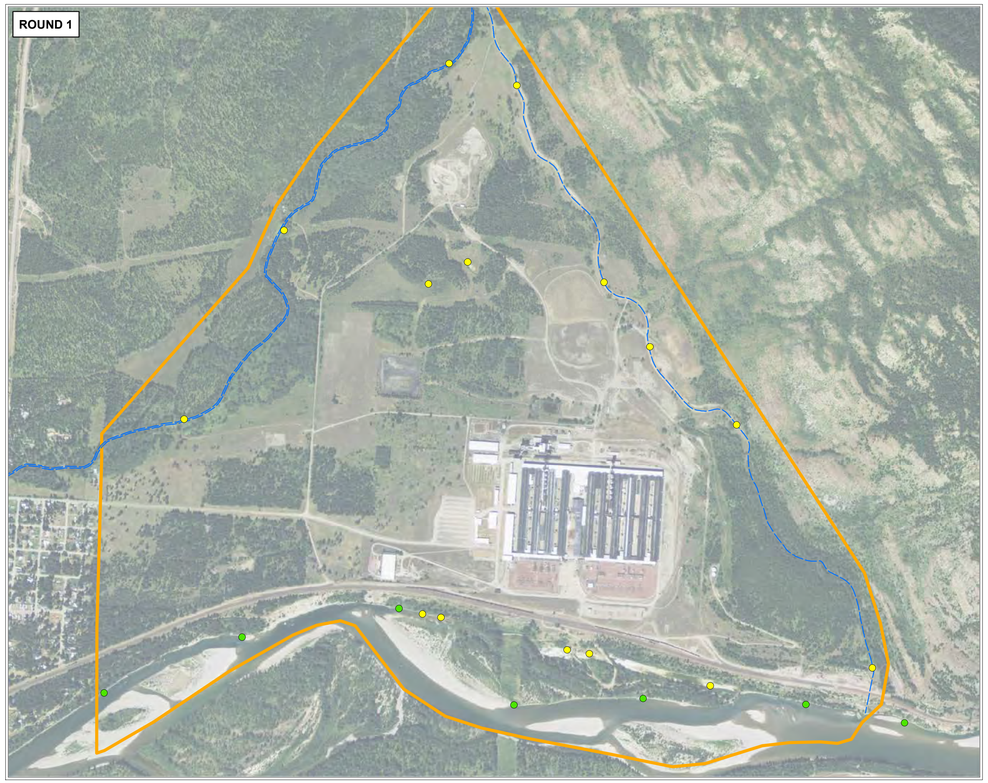

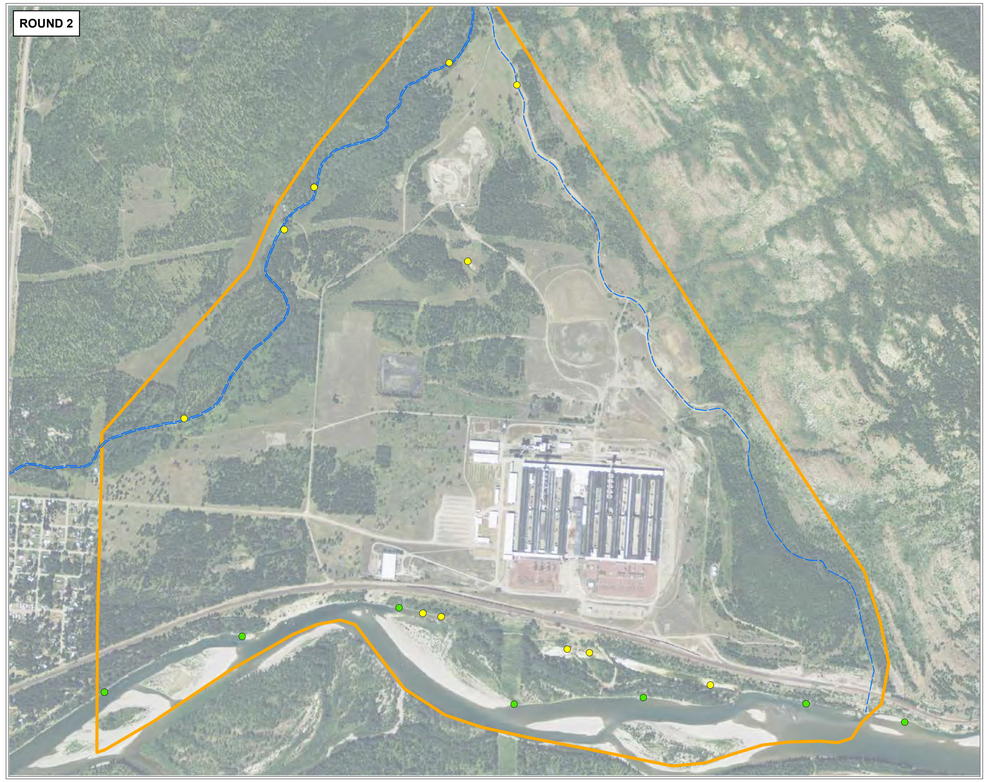

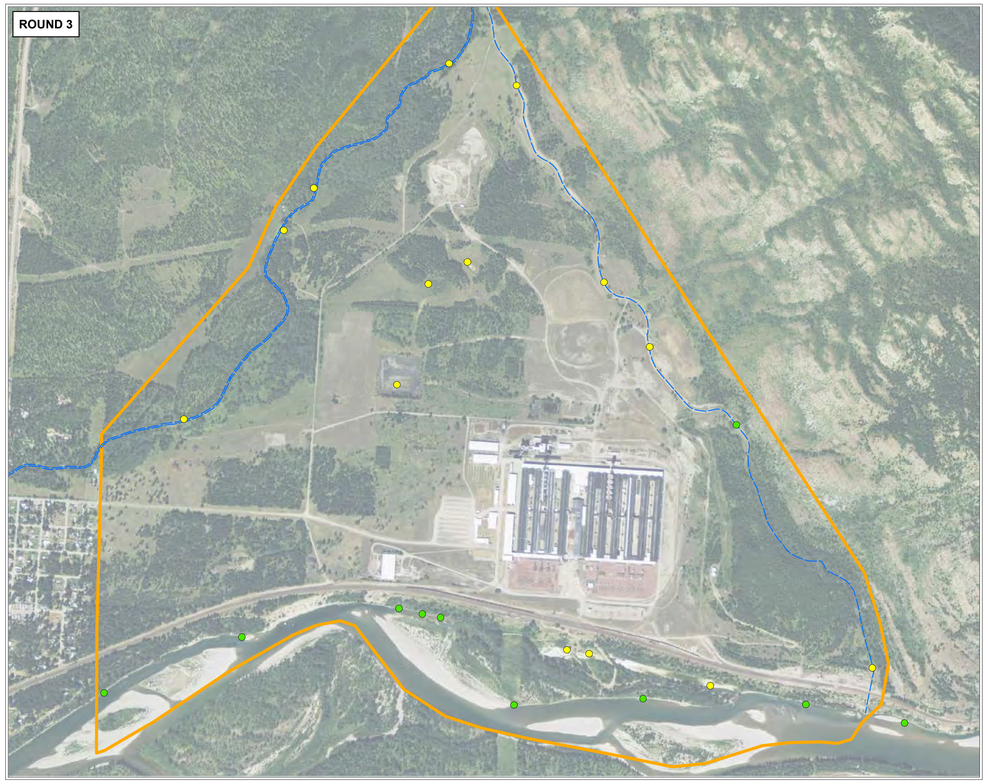

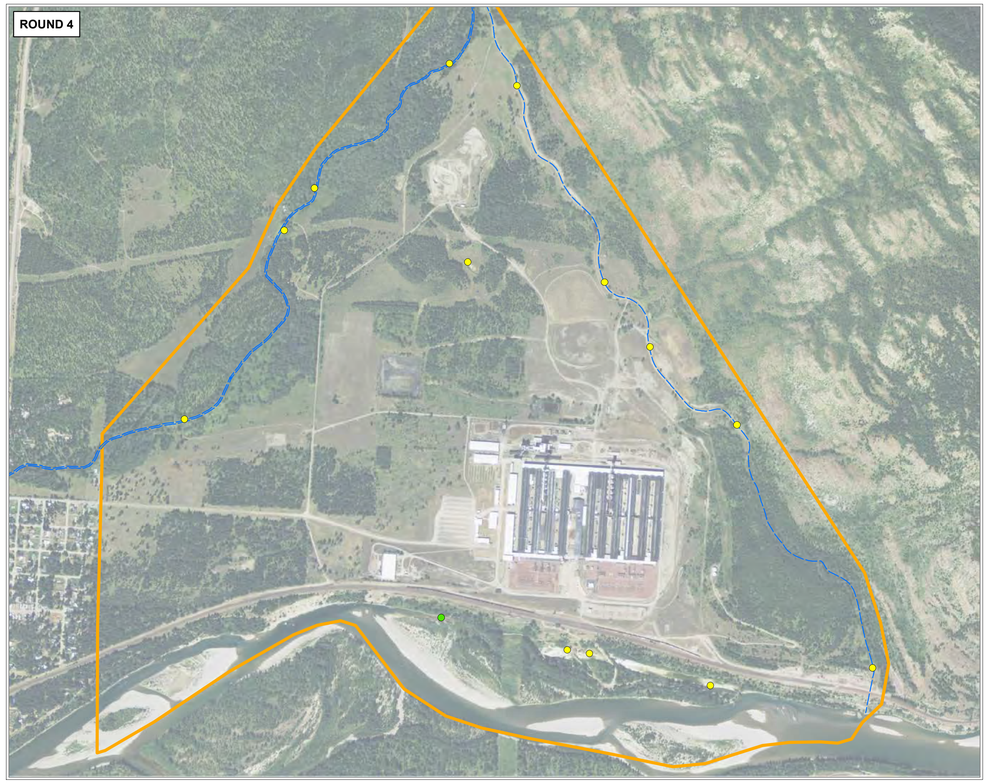

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED
- ND – 150,000
- 150,000– 500,000
- 500,000 – 750,000
- 750,000 – 1,000,000
- >1,000,000

SCREENING LEVEL	HARDNESS AS CALCIUM CARBONATE
DEQ–7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	--
MINIMUM ESV	--
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ–7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ND – NON DETECT
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF HARDNESS AS CALCIUM CARBONATE IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M26
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M26.2476.0001Y170.81.mxd		

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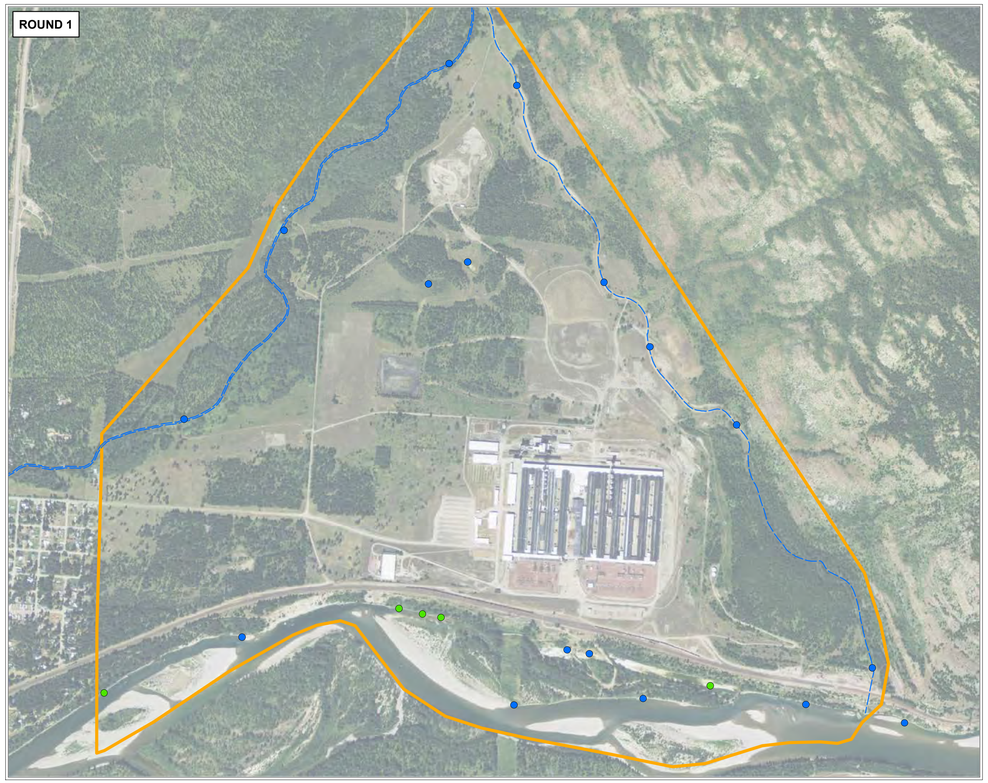

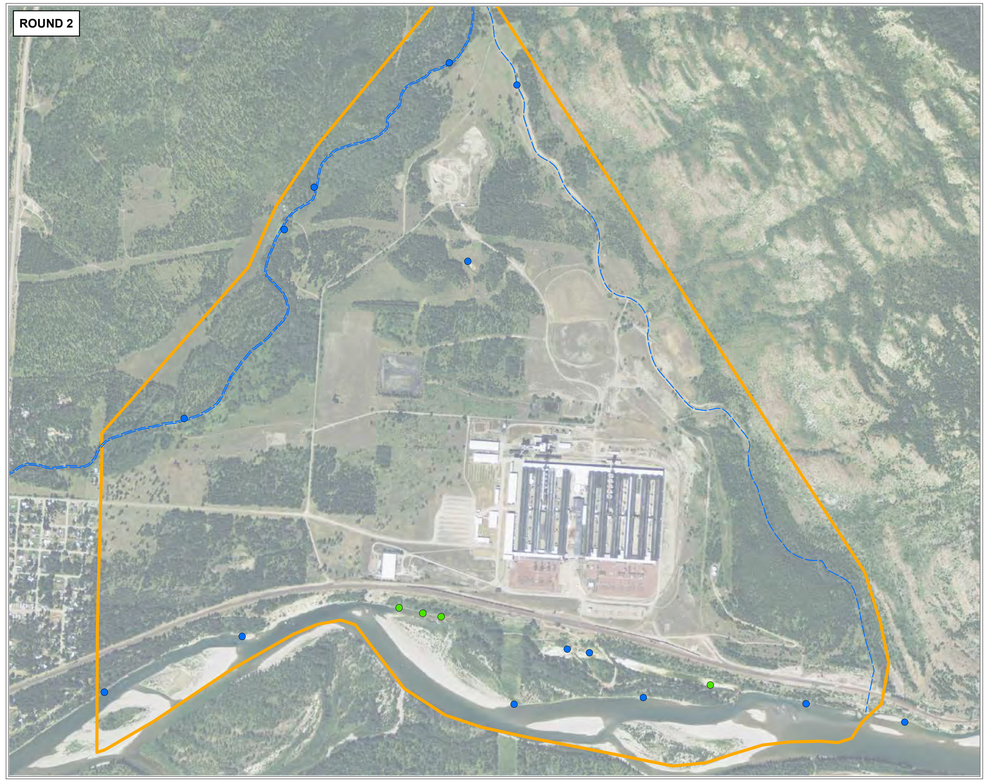

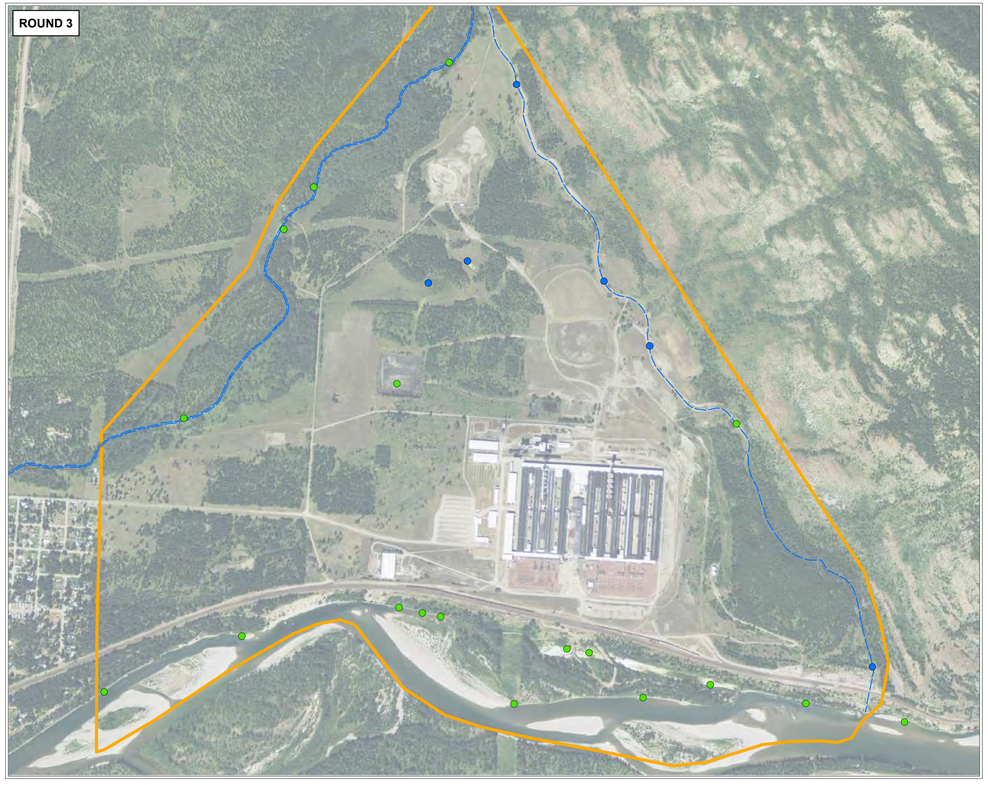

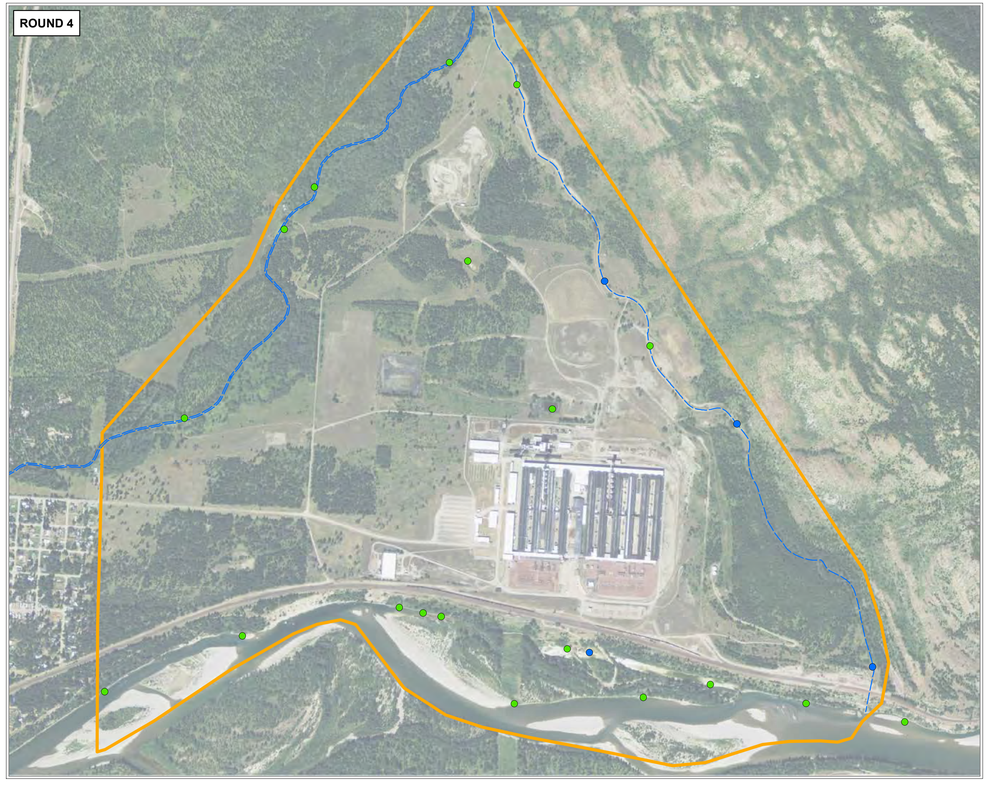

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (100U)
- ND – 5,000
- 5,000 – 10,000
- 10,000 – 50,000
- 50,000 – 100,000
- >100,000

SCREENING LEVEL	NITRATE + NITRAE
DEQ-7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	--
MINIMUM ESV	--
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ND – NON DETECT
100U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF NITRATE + NITRITE IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M27
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M27.2476.0001Y170.82.mxd		

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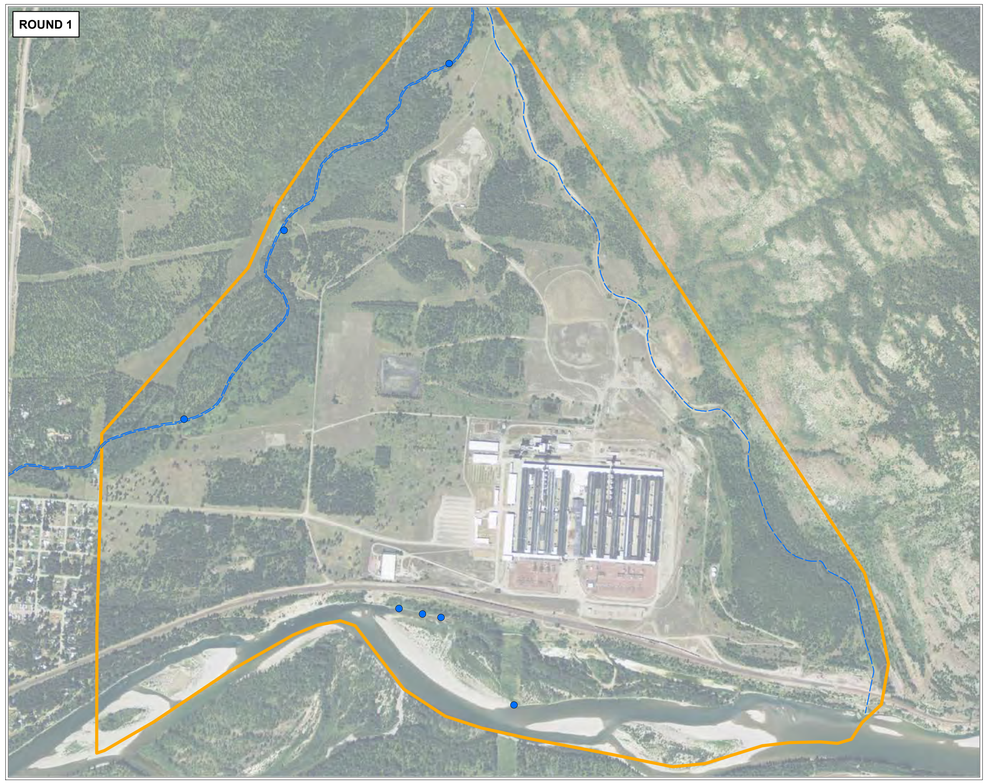

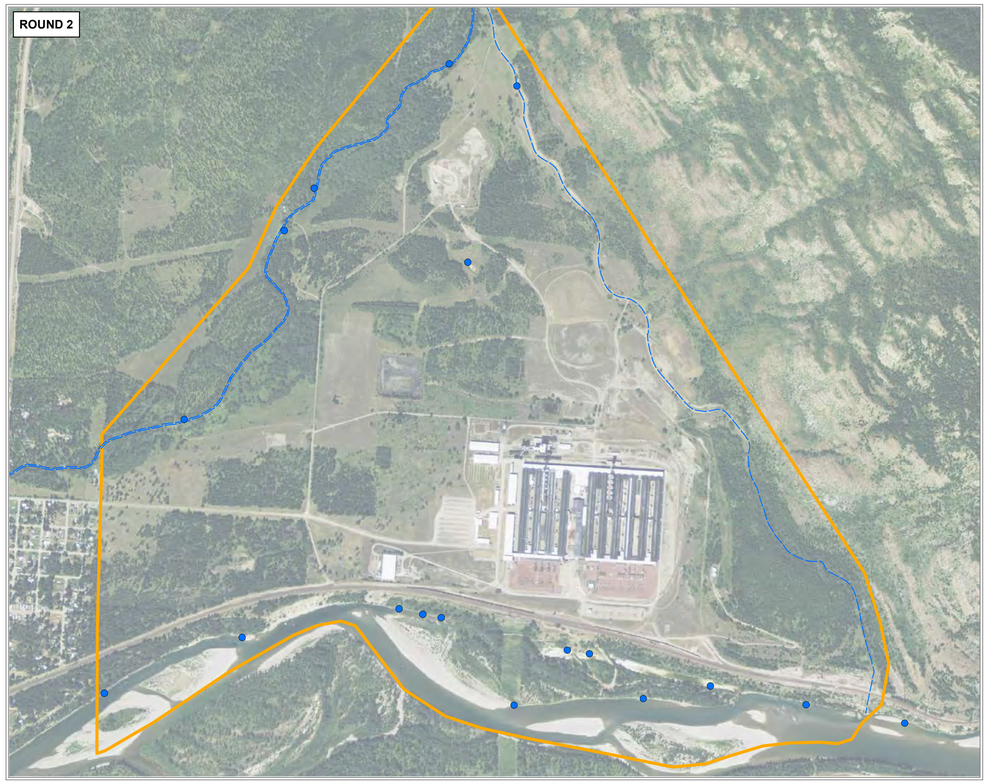

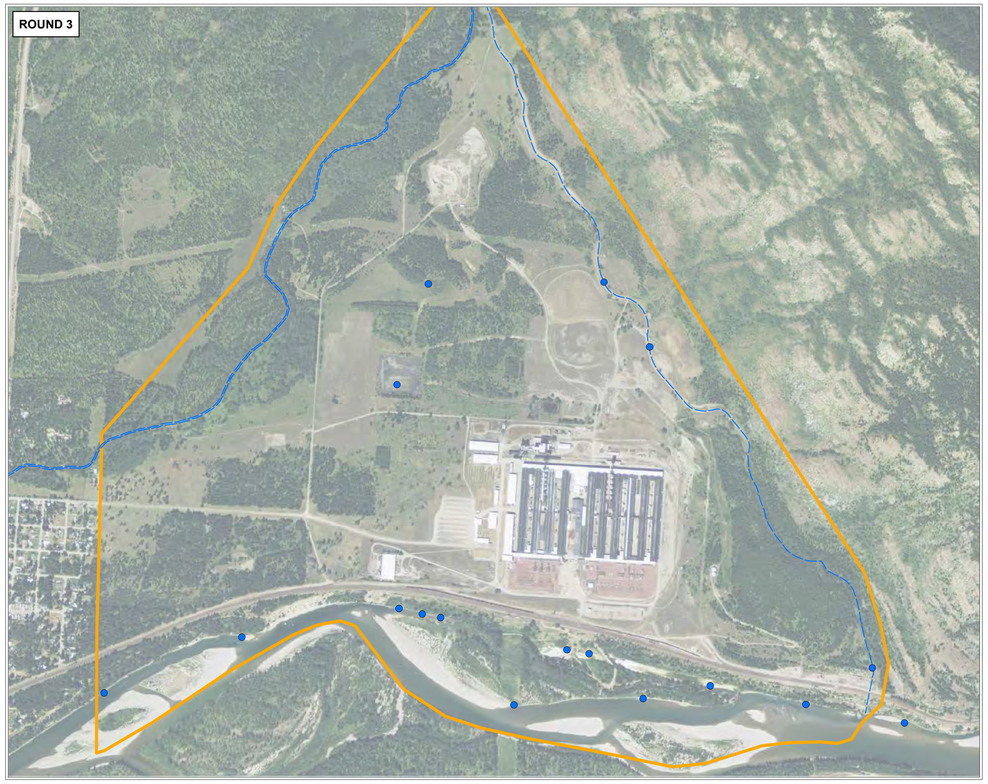

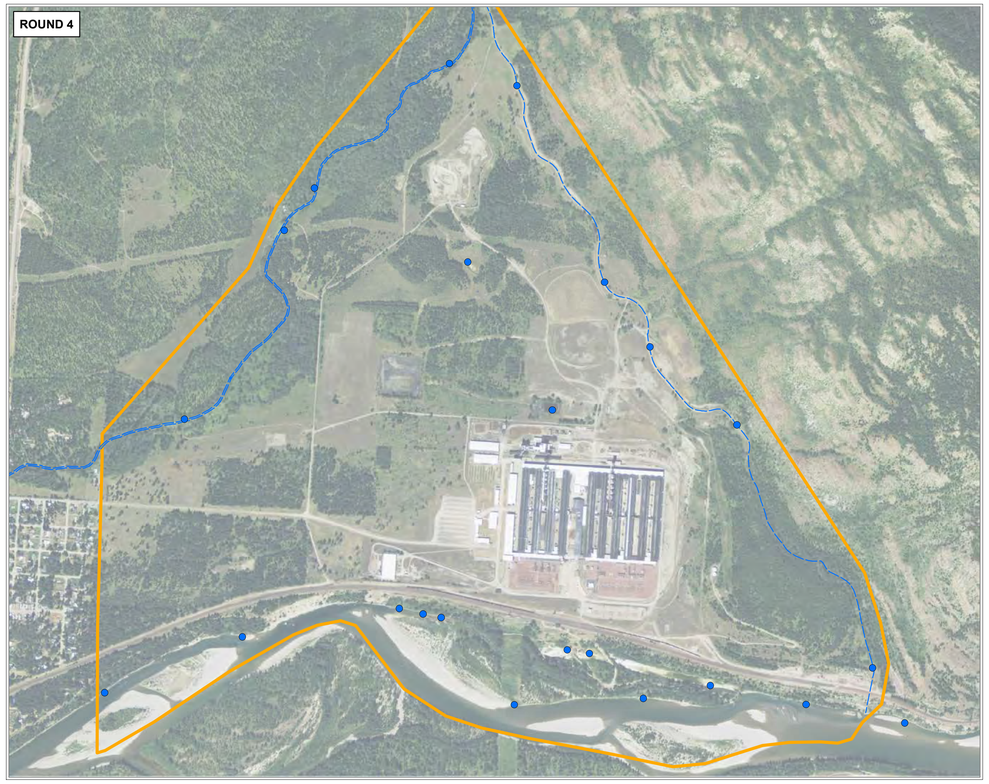

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (72U)
- ND – 100
- 100 – 500
- 500 – 2,500
- 2,500 – 5,000
- >5,000

SCREENING LEVEL	ORTHOPHOSPHATE AS P
DEQ-7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	--
MINIMUM ESV	--
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ND – NON DETECT
42U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF ORTHOPHOSPHATE IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M28
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M28.2476.0001Y170.83.mxd		

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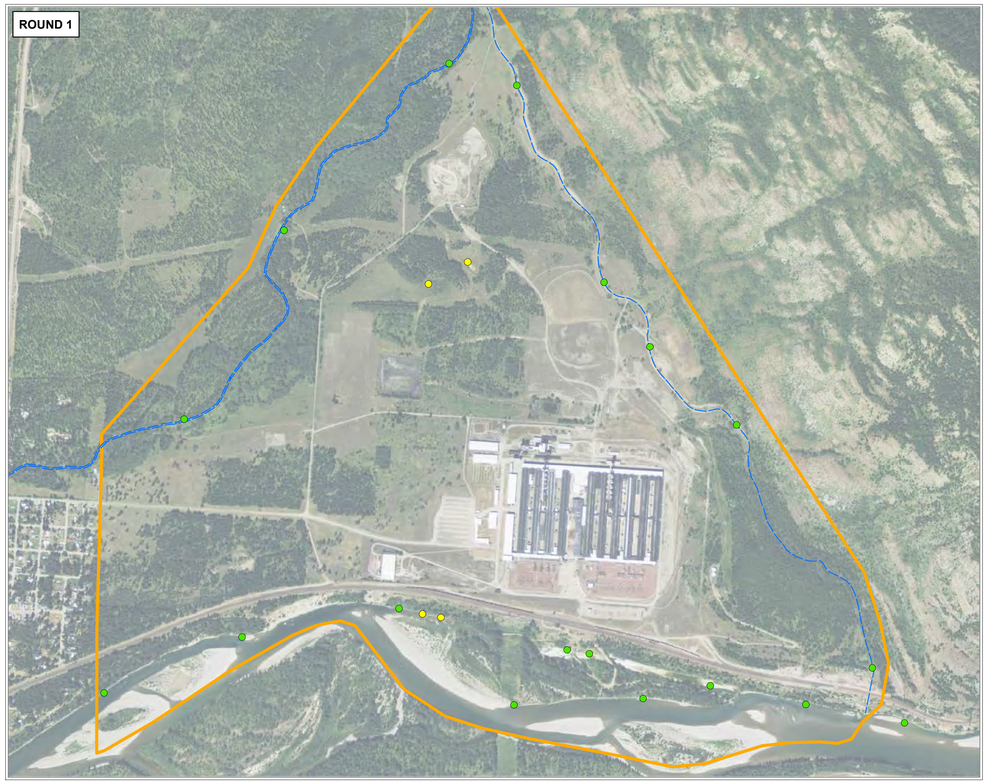

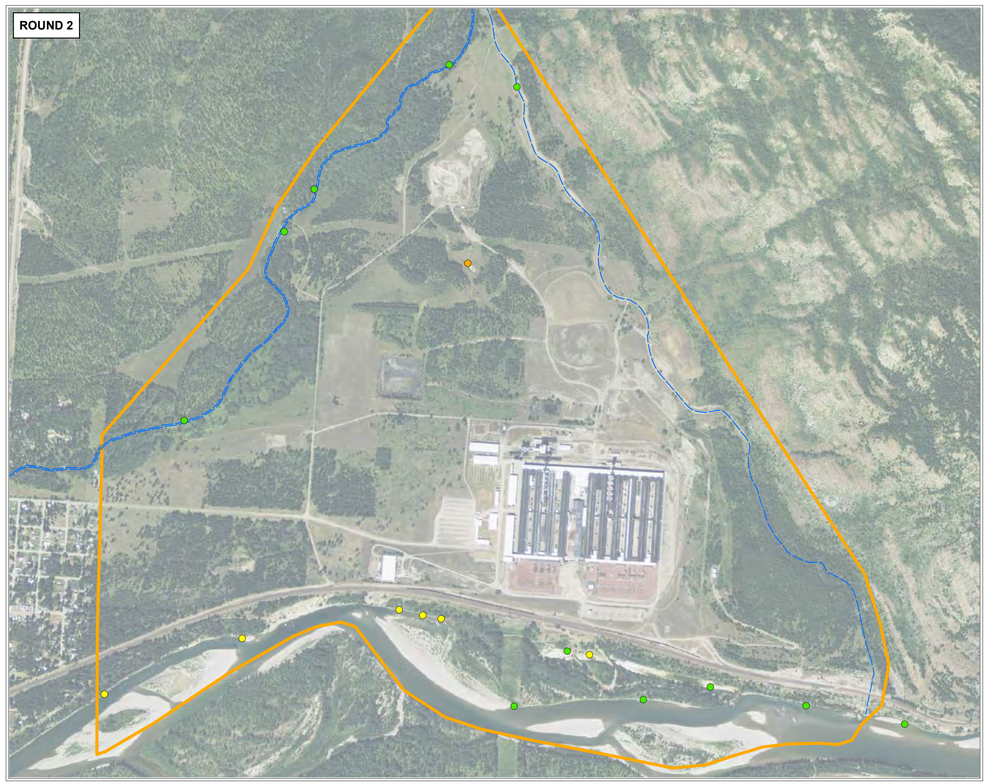

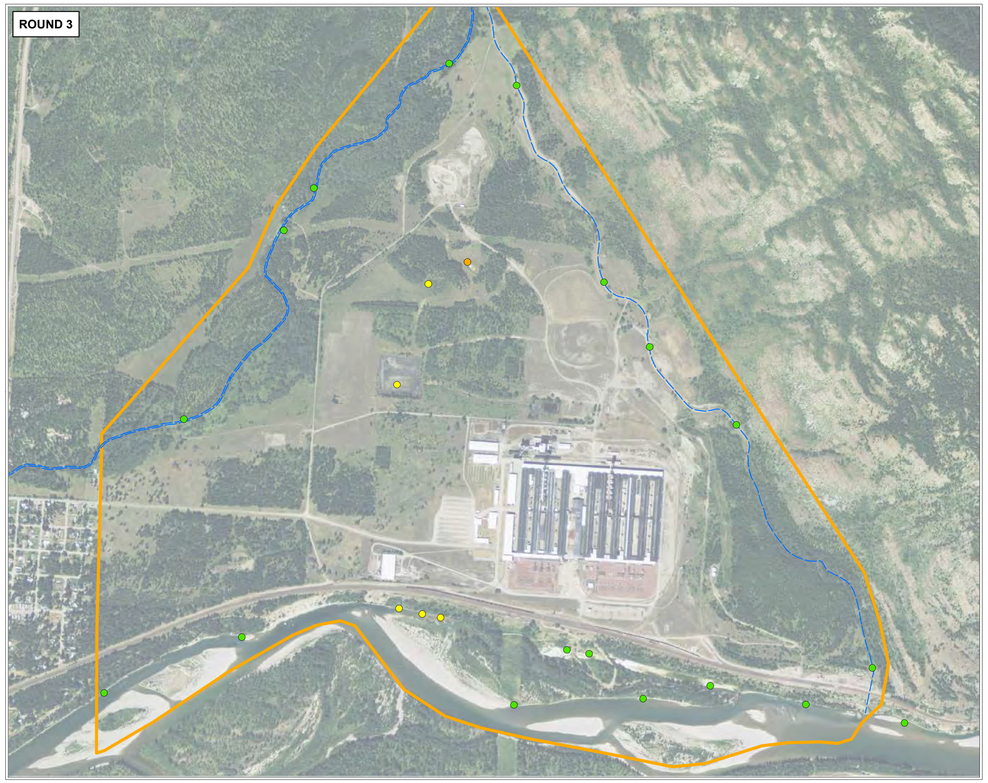

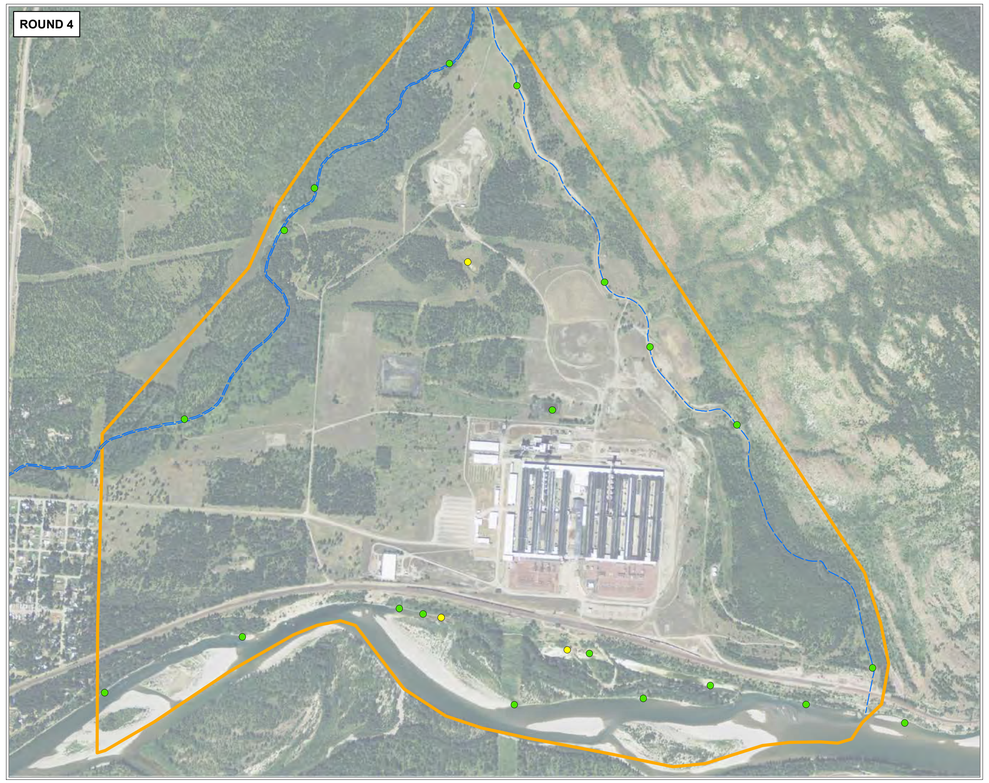

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (42U)
- ND – 5,000
- 5,000 – 50,000
- 50,000 – 100,000
- 100,000 – 200,000
- >200,000

SCREENING LEVEL	SULFATE
DEQ-7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	--
MINIMUM ESV	--
DEQ-7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ-7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ND – NON DETECT
42U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

900 0 900 1,800 Feet

Title:

CONCENTRATIONS OF SULFATE IN ROUNDS 1, 2, 3, AND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M29
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M29.2476.0001Y170.84.mxd		

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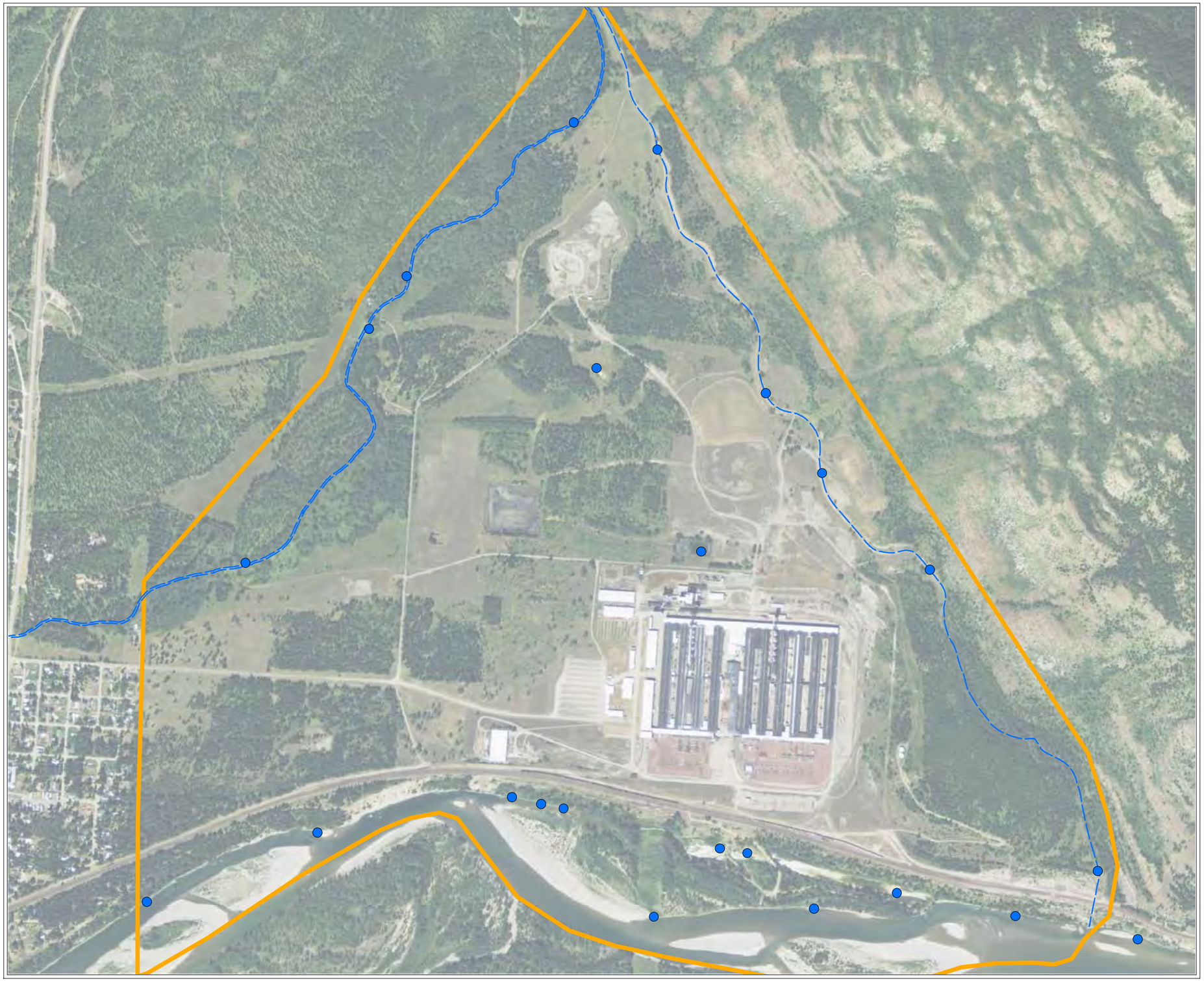

CONCENTRATION LEGEND

- ANALYTE NOT DETECTED (579U)
- ND – 1,000
- 1,000 – 5,000
- 5,000 – 10,000
- 10,000 – 20,000
- >20,000

SCREENING LEVEL	SULFIDE
DEQ–7 HUMAN HEALTH STANDARD	--
EPA RISK BASED SCREENING LEVEL DRINKING WATER MCL	--
EPA RISK BASED SCREENING LEVEL TAPWATER RSL	--
MINIMUM ESV	--
DEQ–7 CHRONIC AQUATIC LIFE STANDARD	--
DEQ–7 ACUTE AQUATIC LIFE STANDARD	--

NOTES

DEQ – DEPARTMENT OF ENVIRONMENTAL QUALITY
EPA – ENVIRONMENTAL PROTECTION AGENCY
MCL – MAXIMUM CONTAMINANT LEVEL
RSL – REGIONAL SCREENING LEVEL
ND – NON DETECT
579U – HIGHEST METHOD DETECTION LIMIT (MDL) IN SAMPLE SET
ALL SAMPLES ARE IN MICROGRAMS PER LITRES (UG/L)

1,000 0 1,000
Feet

Title:

CONCENTRATIONS OF SULFIDE IN ROUND 4 SURFACE WATER

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:
COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 29JAN18	APPENDIX
Prepared by: M.R.	Scale: AS SHOWN	M30
Project Mgr: M.R.	Project: 2476.0001Y004	
File: M30.2476.0001Y170.85.mxd		

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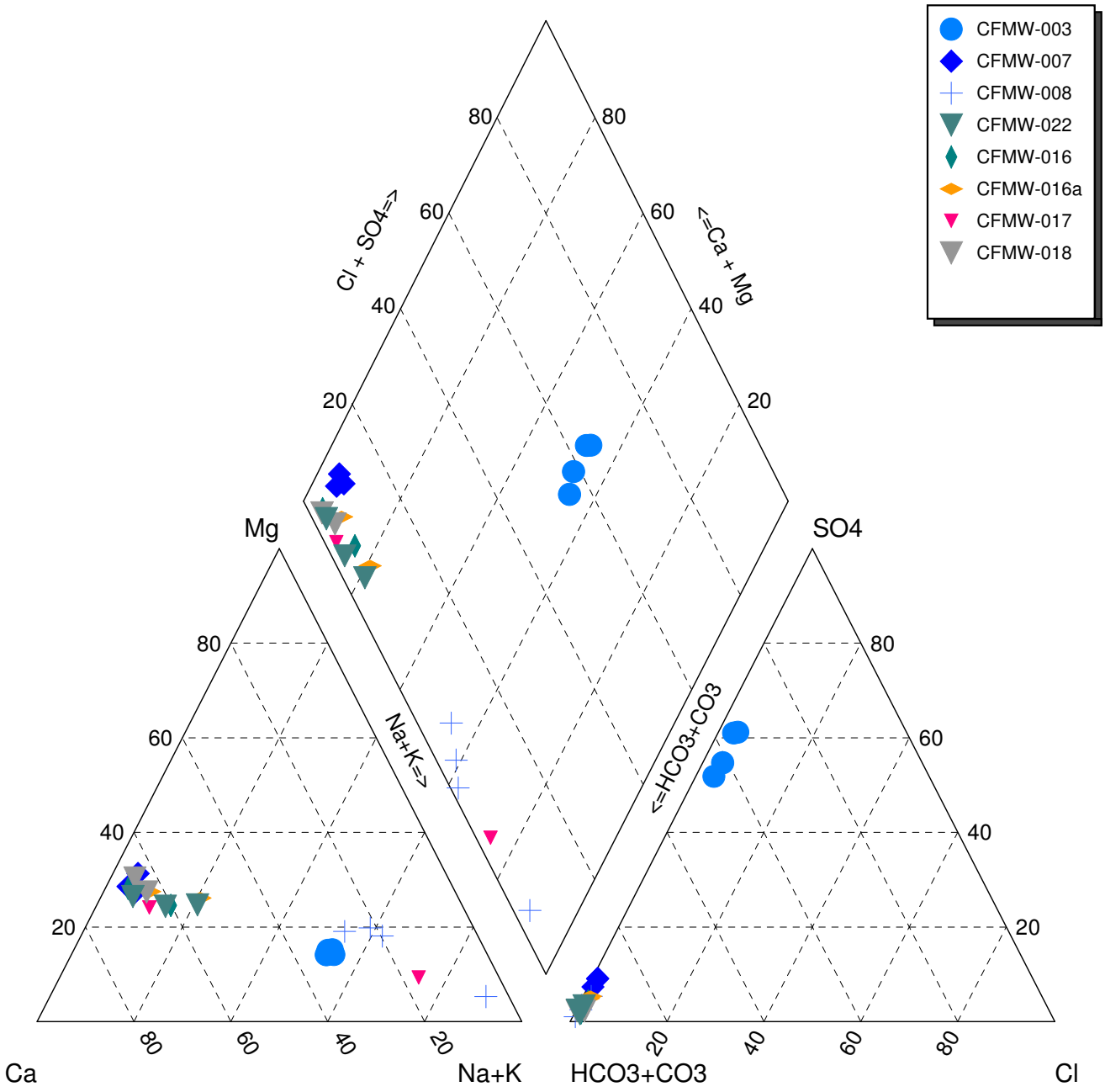
APPENDIX N

Piper Plots for Groundwater and Surface Water Geochemistry

1. Piper Plots for Monitoring Wells Screened in Upper Hydrogeologic Unit
2. Piper Plots for Monitoring Wells Screened Below the Upper Hydrogeologic Unit
3. Piper Plots for Surface Water

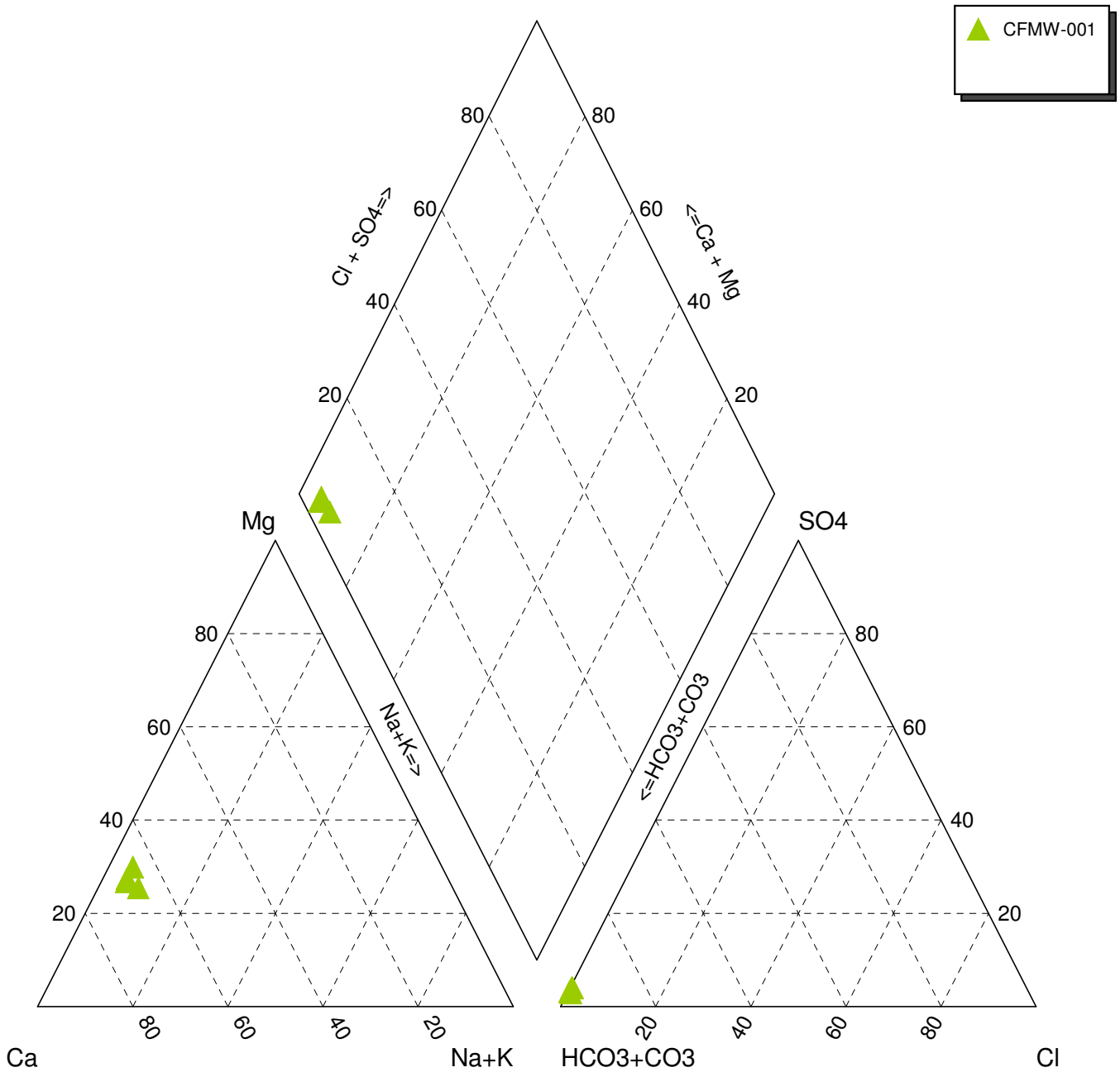
APPENDIX N-1

Piper Plots for Monitoring Wells Screened in Upper Hydrogeologic Unit



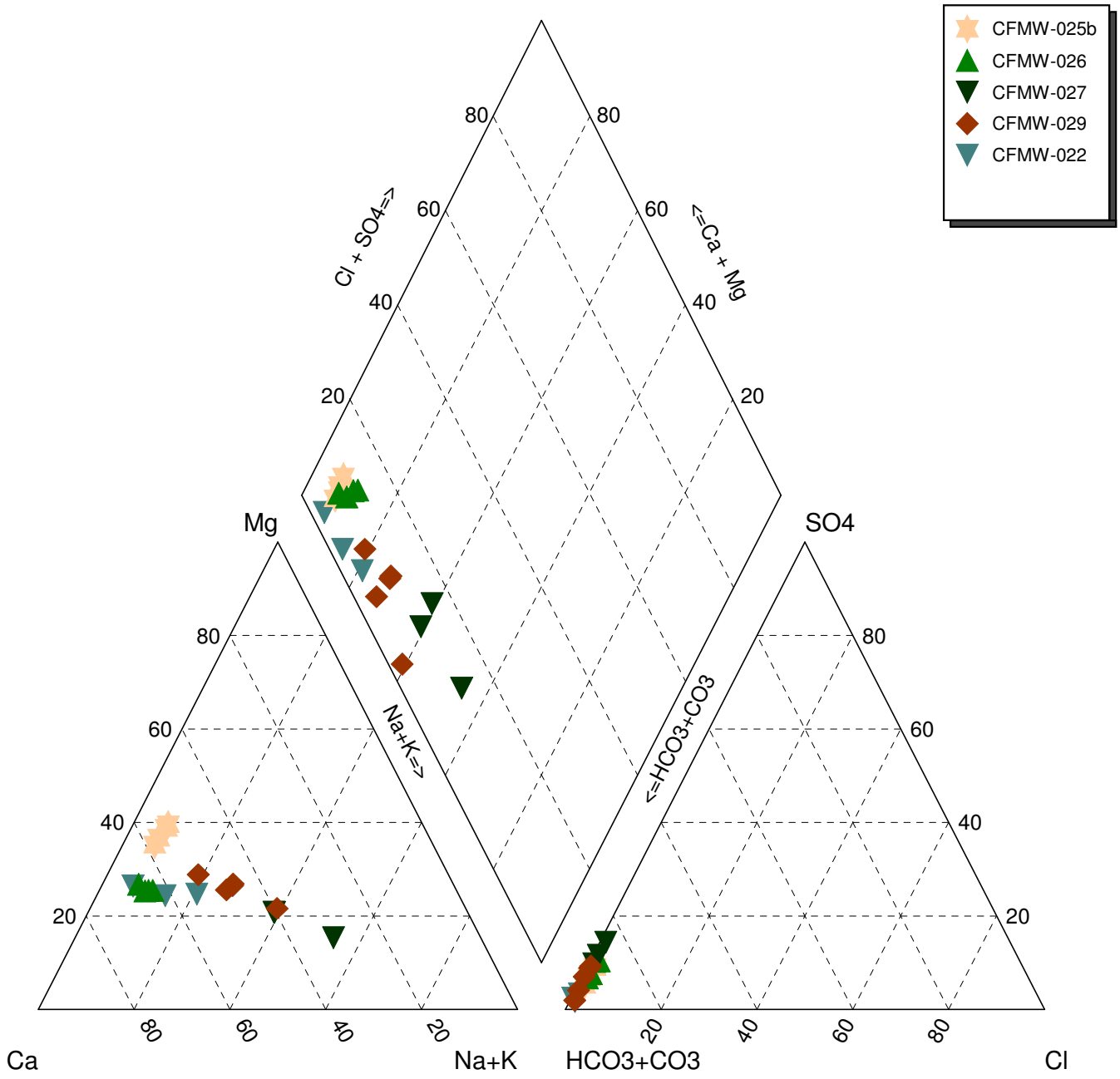
TITLE: Piper Plot for Monitoring Wells Screened in Upper Hydrogeologic Unit - Adjacent to Landfills

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



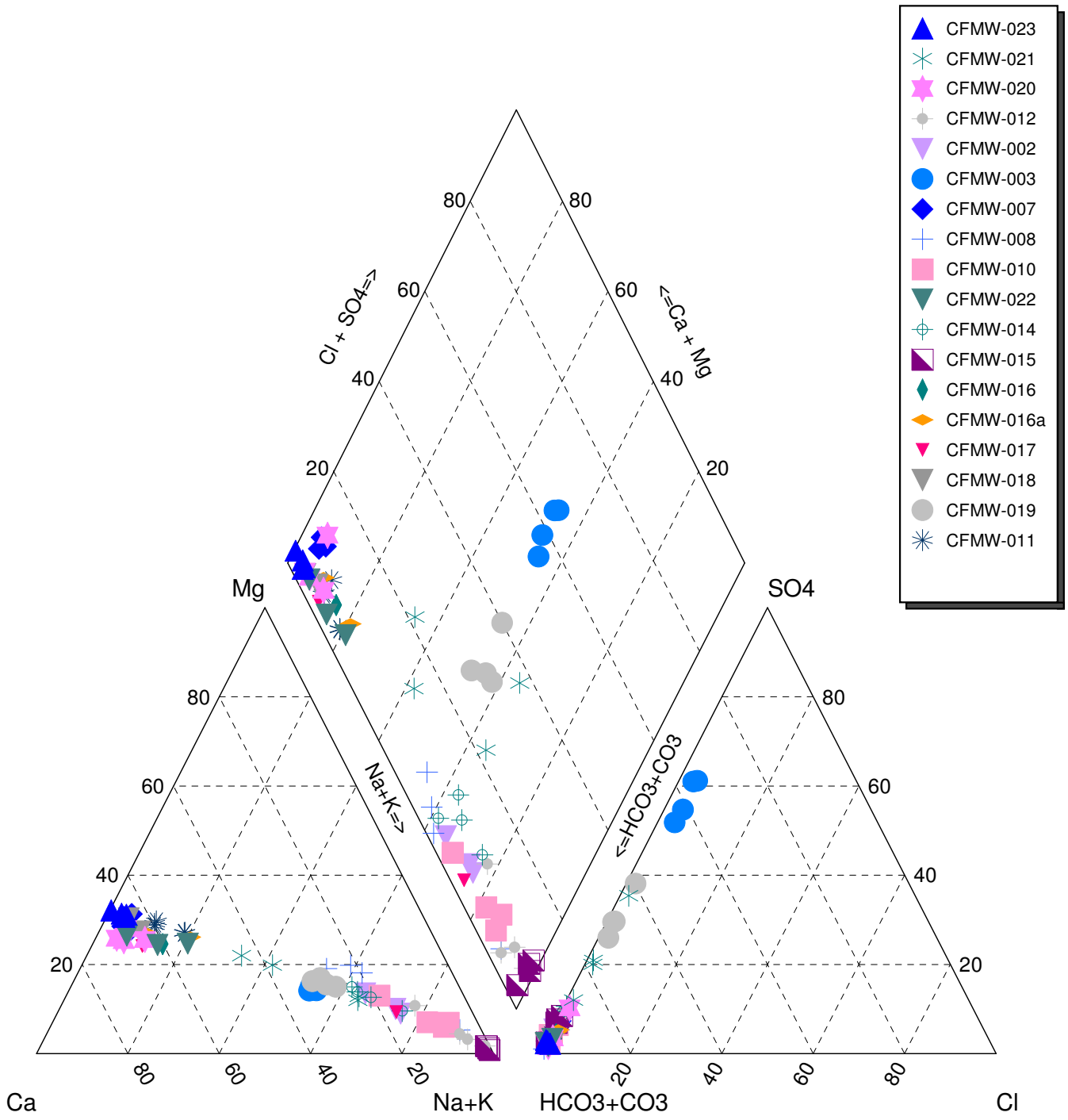
TITLE: All Rounds Piper Plots of General Chemistry in Background Monitoring Wells Screened in Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 to 4



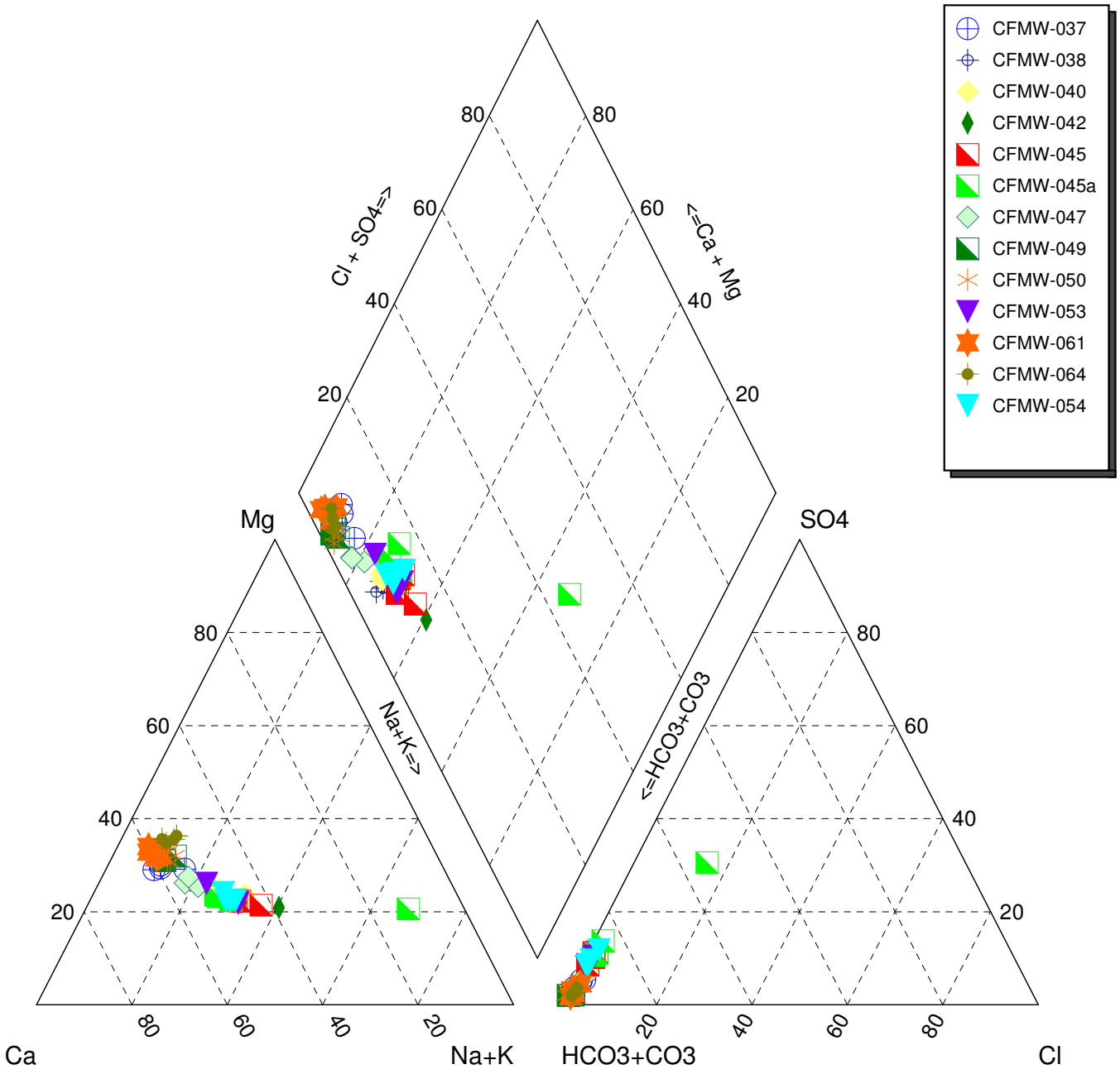
TITLE: Piper Plot for Monitoring Wells Screened in Upper Hydrogeologic Unit - Downgradient of Landfill Area

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



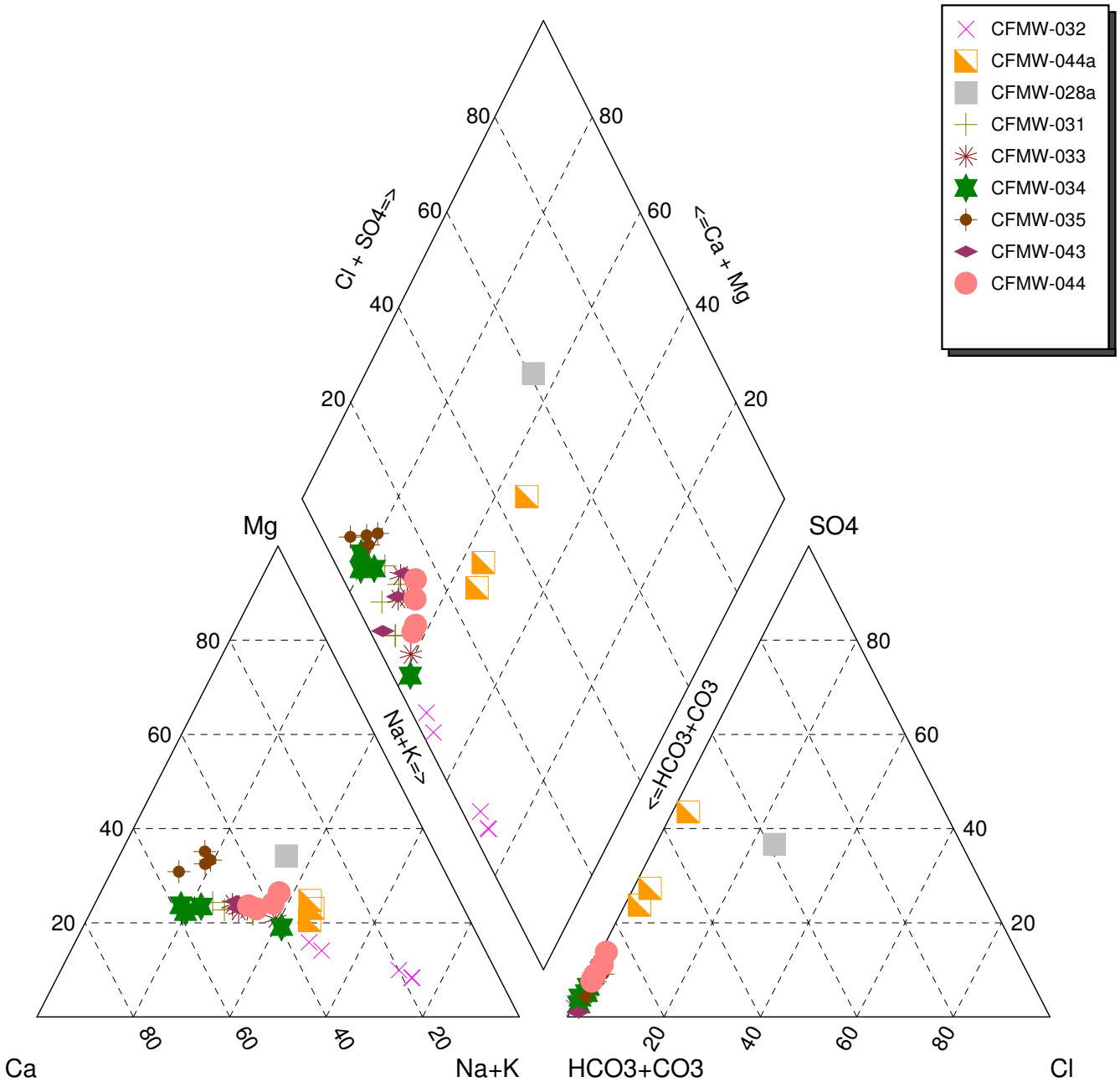
TITLE: Piper Plot for Monitoring Wells Screened in Upper Hydrogeologic Unit - Greater Landfill Area

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



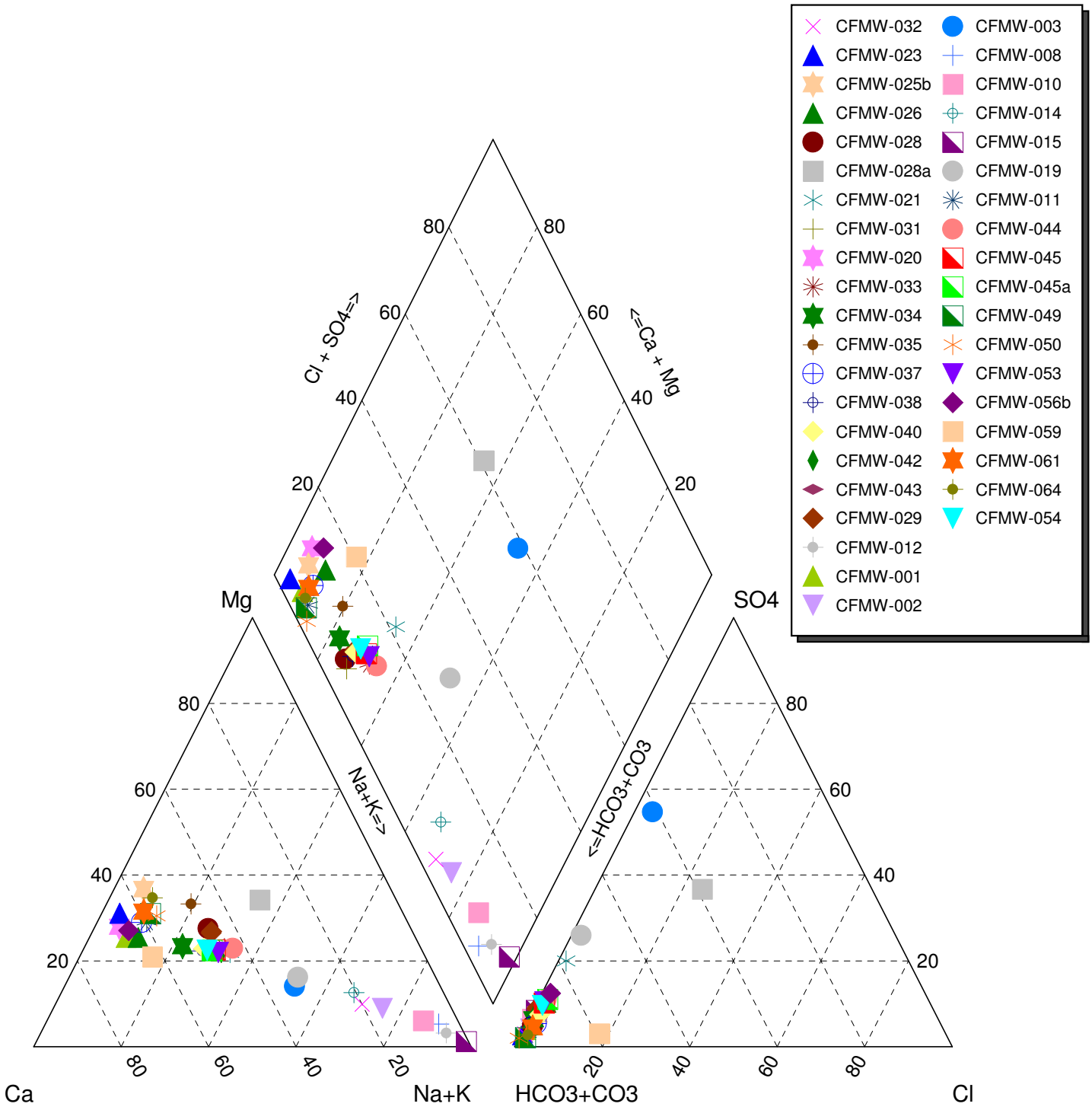
TITLE: Piper Plot for Monitoring Wells Screened in Upper Hydrogeologic Unit - Near Flathead River

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



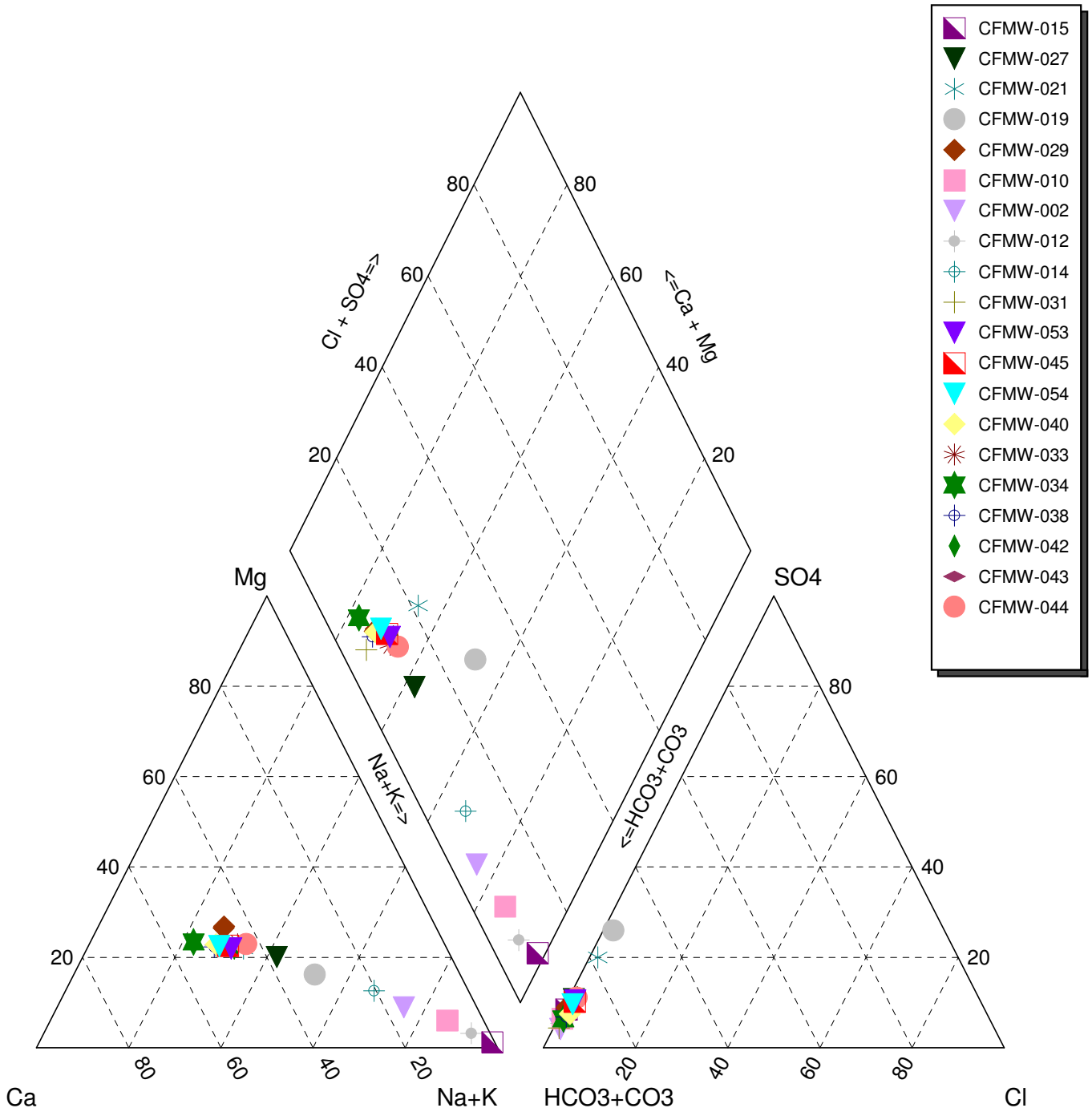
TITLE: Piper Plot for Monitoring Wells Screened in Upper Hydrogeologic Unit - Near Main Plant

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



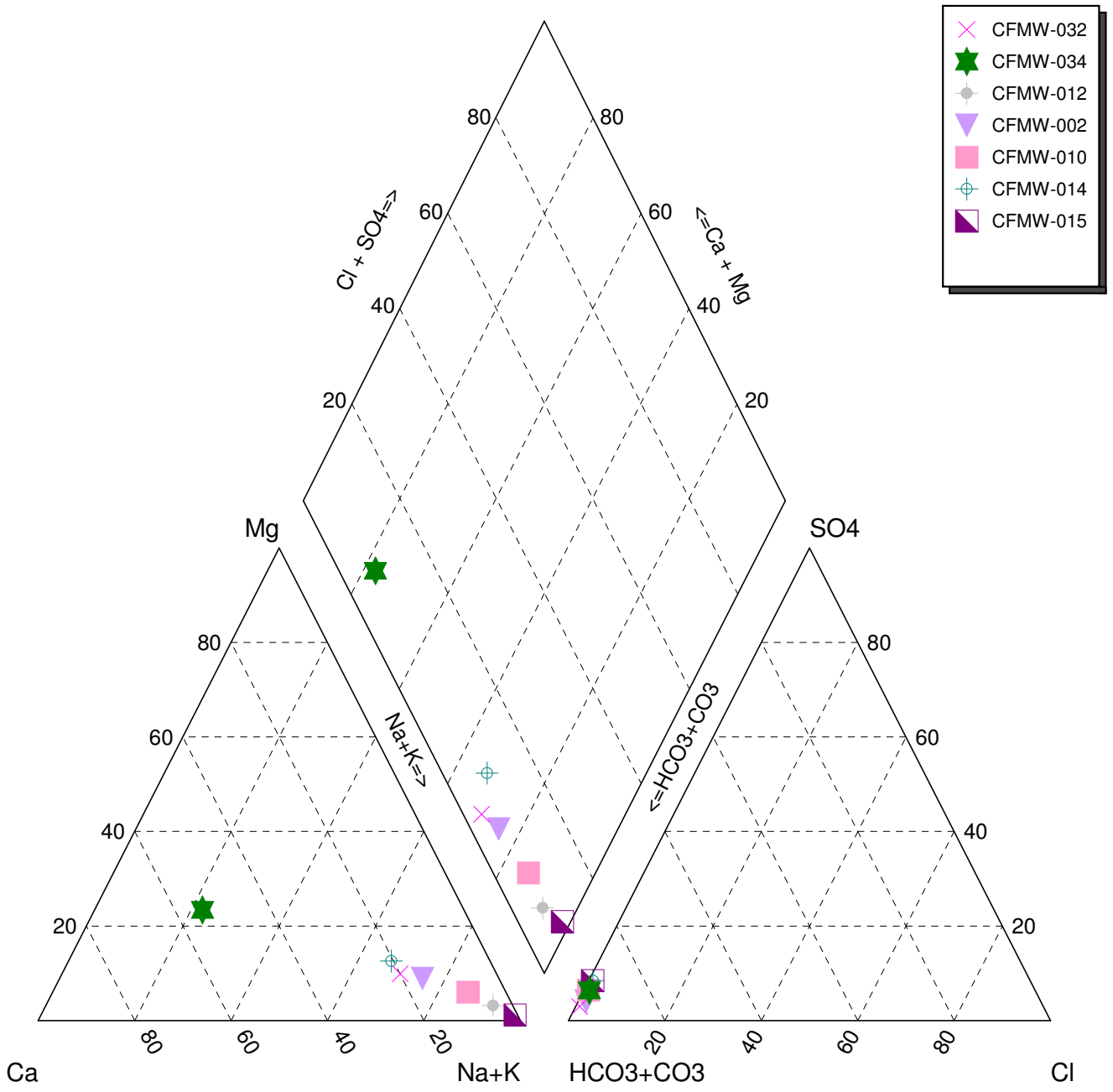
TITLE: Round 1 Piper Plot of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept 2016 (Round 1)



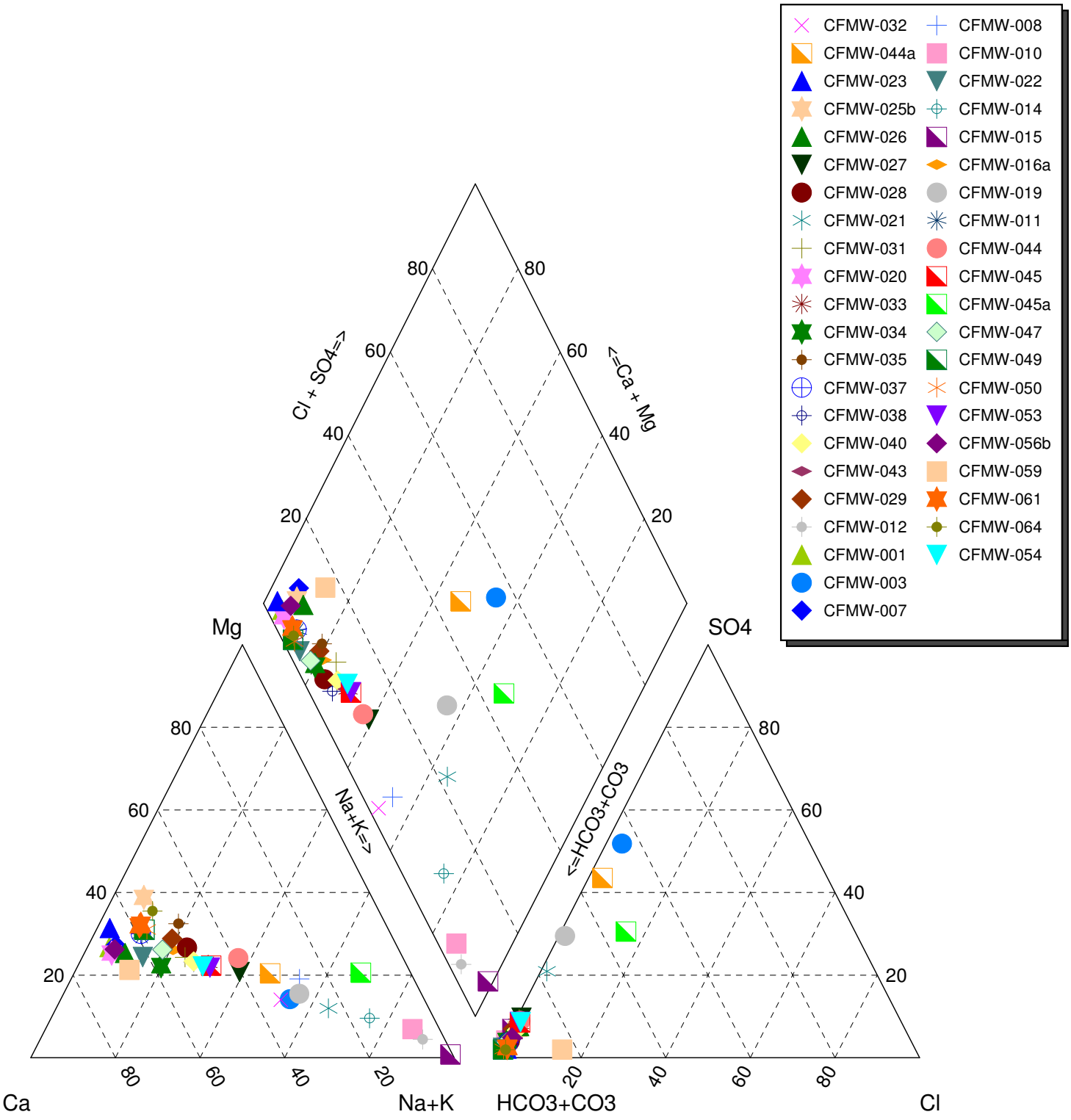
TITLE: Round 1 Piper Plots of General Chemistry in Monitoring Wells Screened in Upper Hydrogeologic Unit with High Cyanide

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)



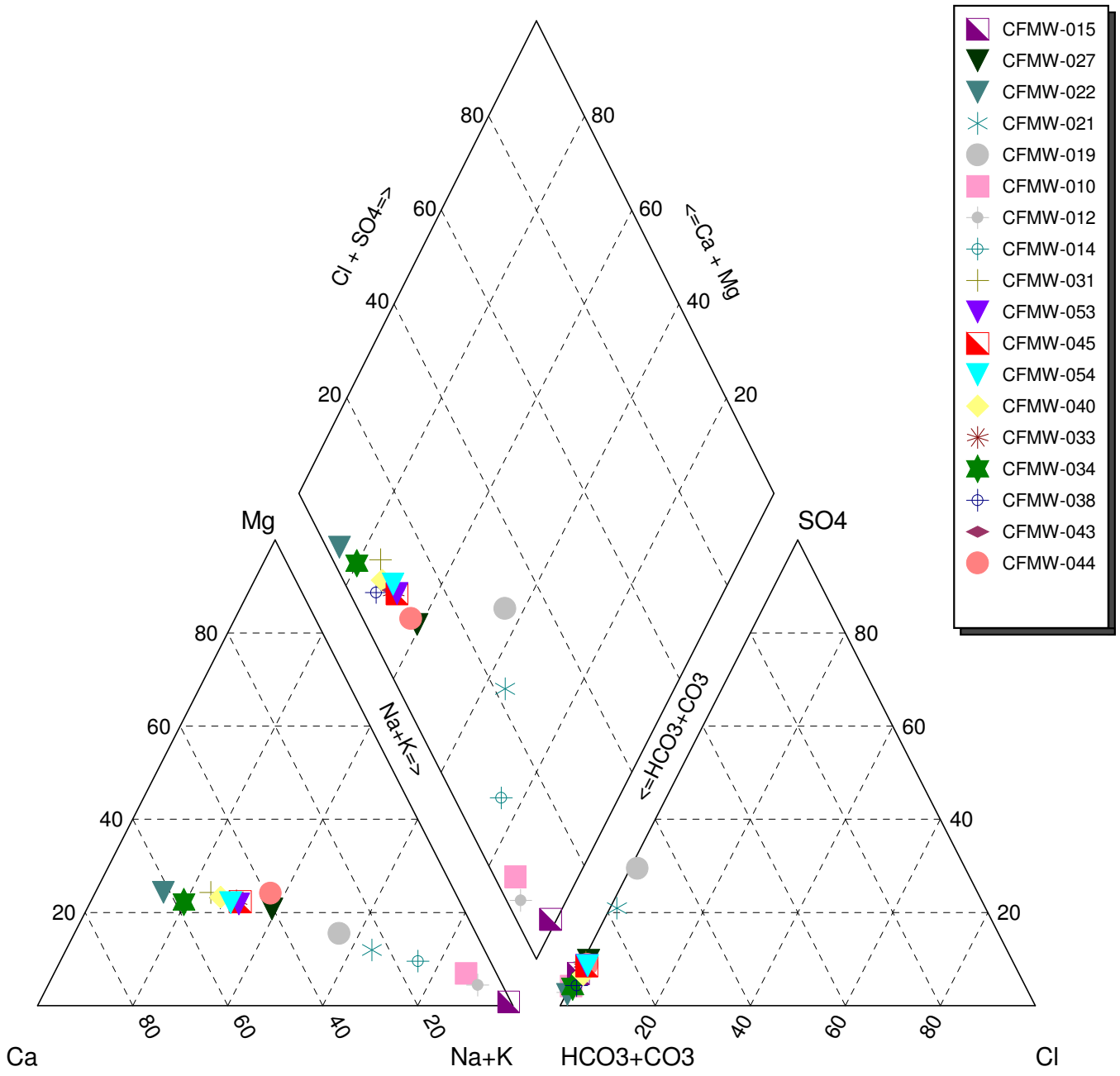
TITLE: Round 1 Piper Plots of General Chemistry in Monitoring Wells Screened in Upper Hydrogeologic Unit with High Fluoride

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)



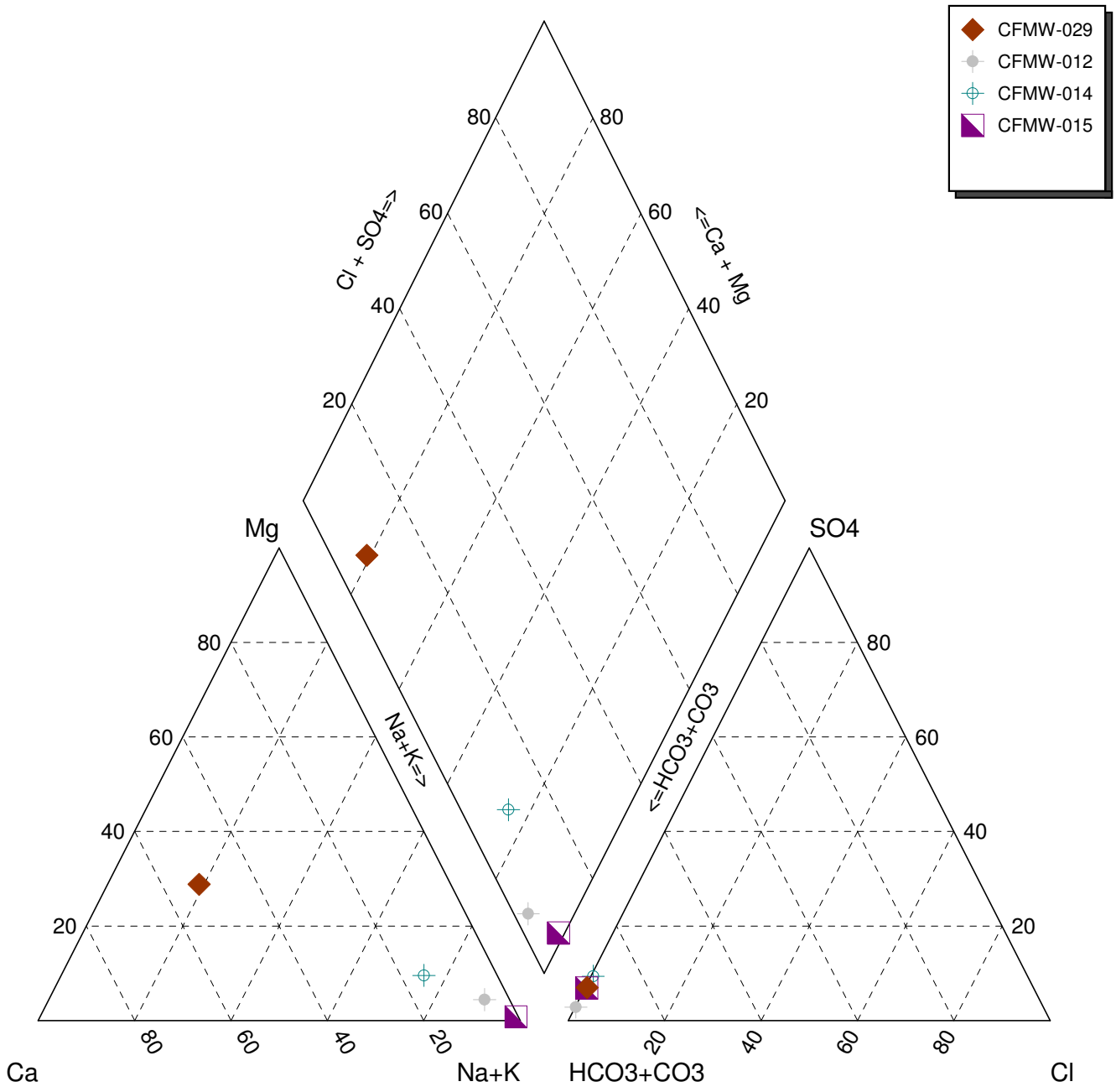
TITLE: Round 2 Piper Plot of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)



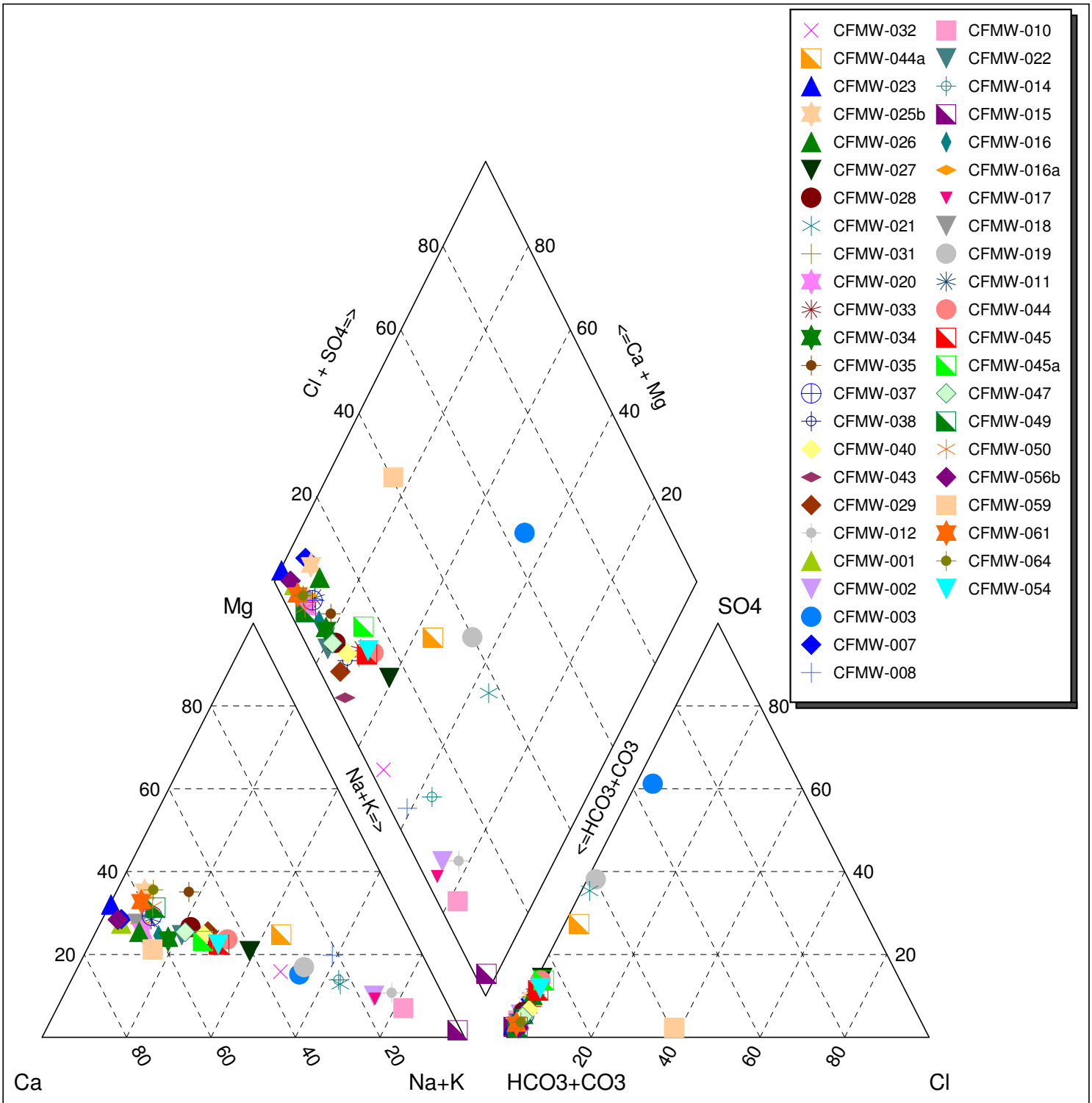
TITLE: Round 2 Piper Plots of General Chemistry in Monitoring Wells Screened in Upper Hydrogeologic Unit with High Cyanide

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)



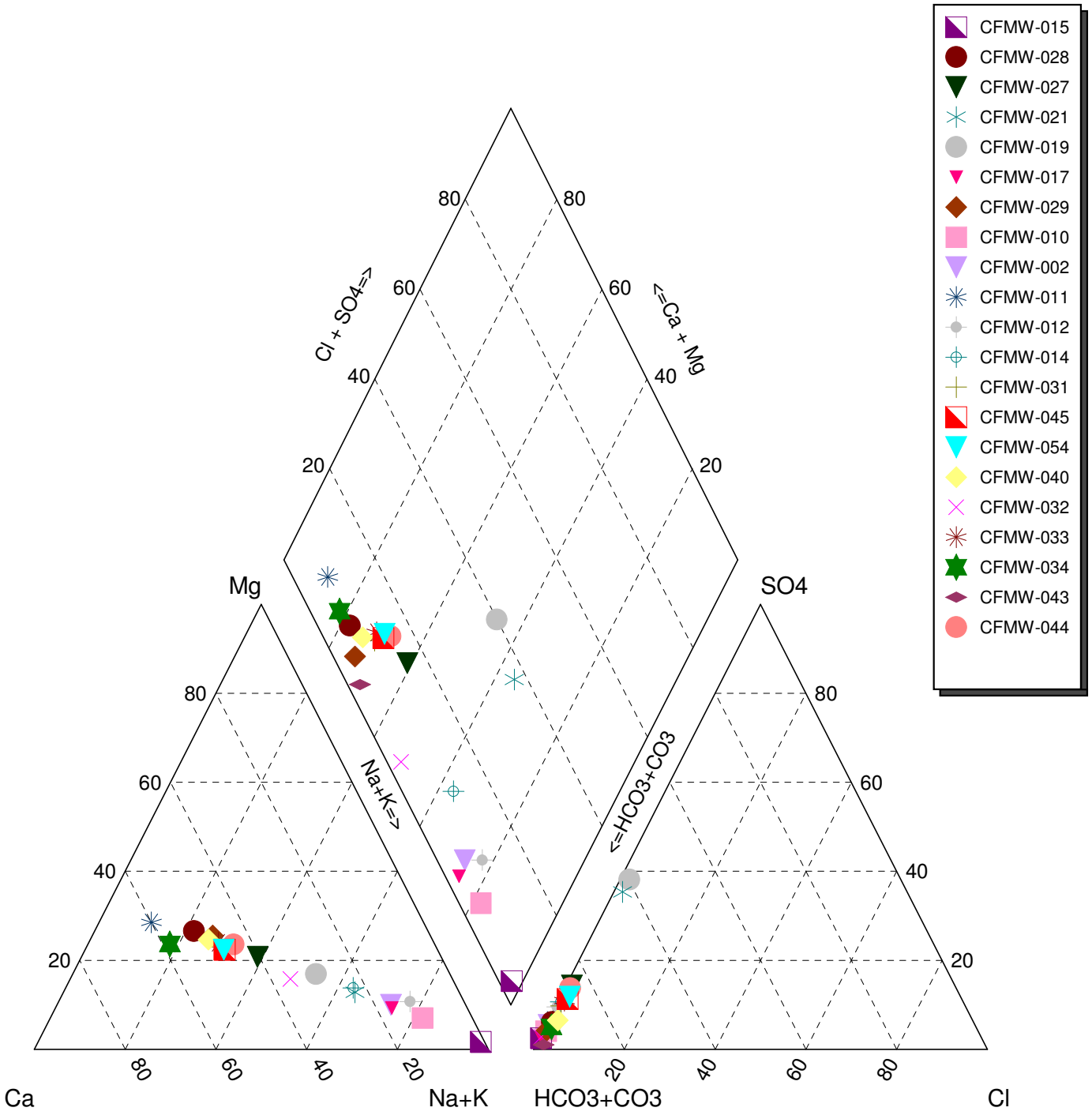
TITLE: Round 2 Piper Plots of General Chemistry in Monitoring Wells Screened in Upper Hydrogeologic Unit with High Fluoride

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)



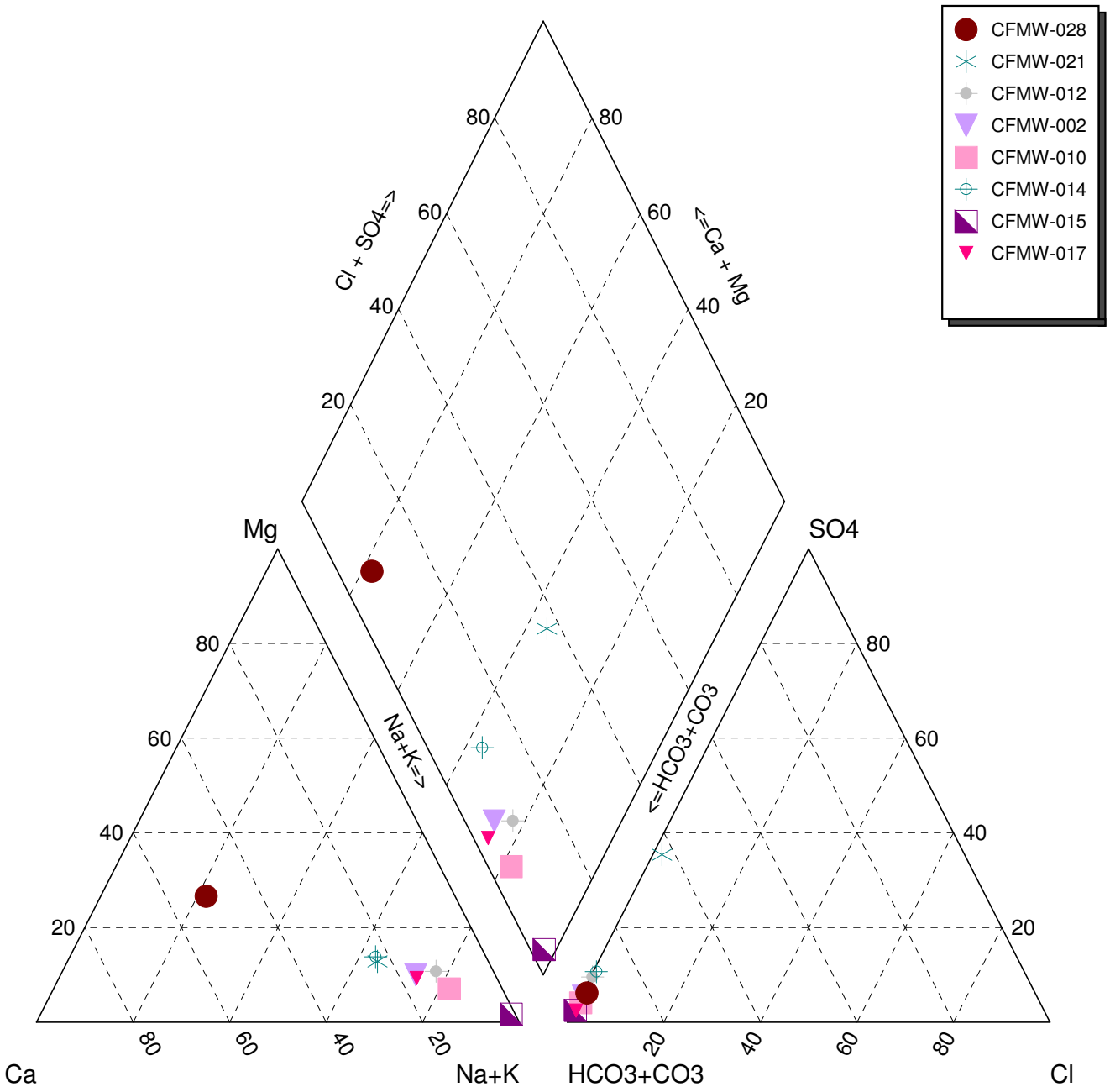
TITLE: Round 2 Piper Plot of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec 2016 (Round 2)



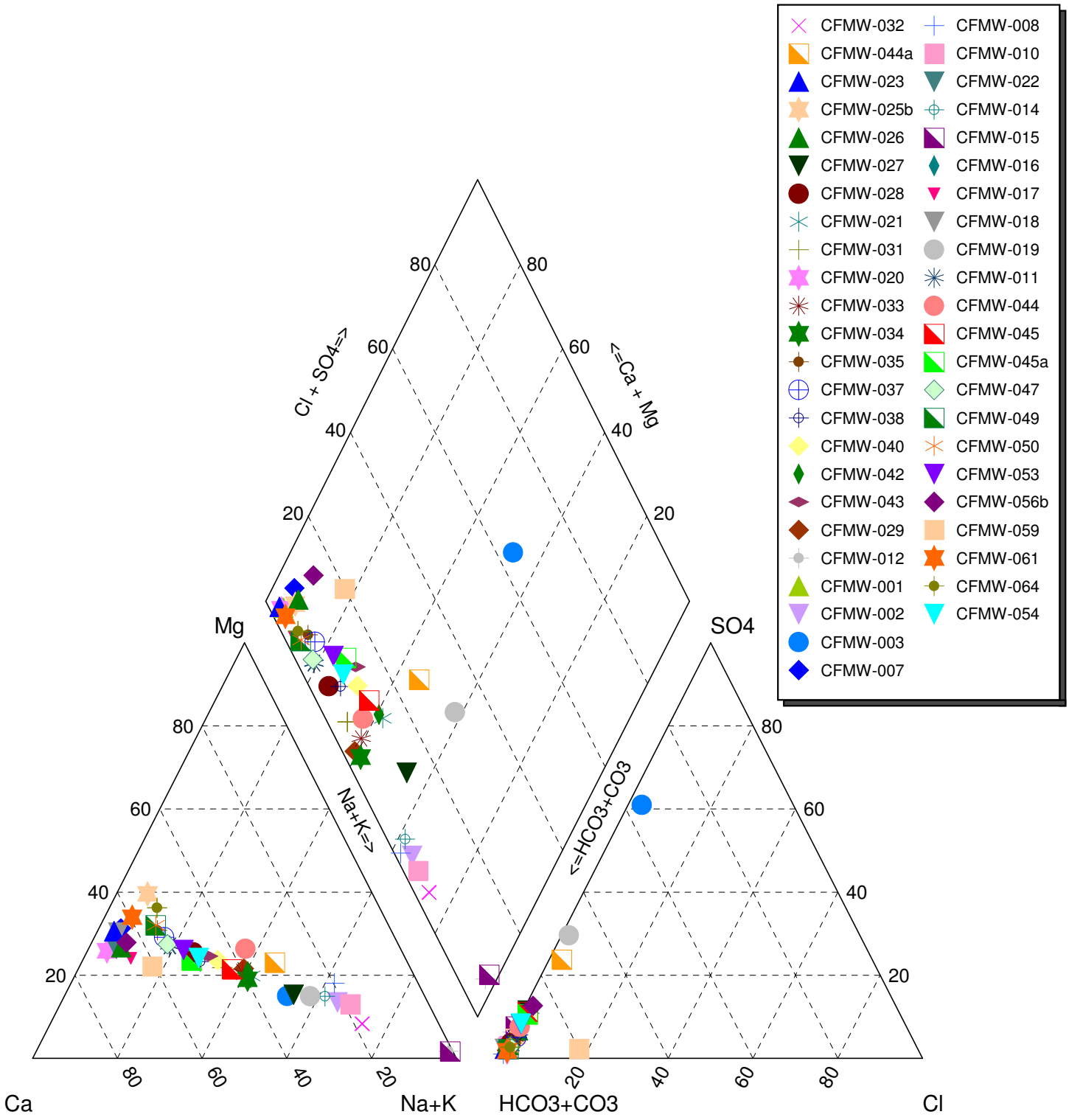
TITLE: Round 3 Piper Plots of General Chemistry in Monitoring Wells Screened in Upper Hydrogeologic Unit with High Cyanide

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2016 (Round 3)



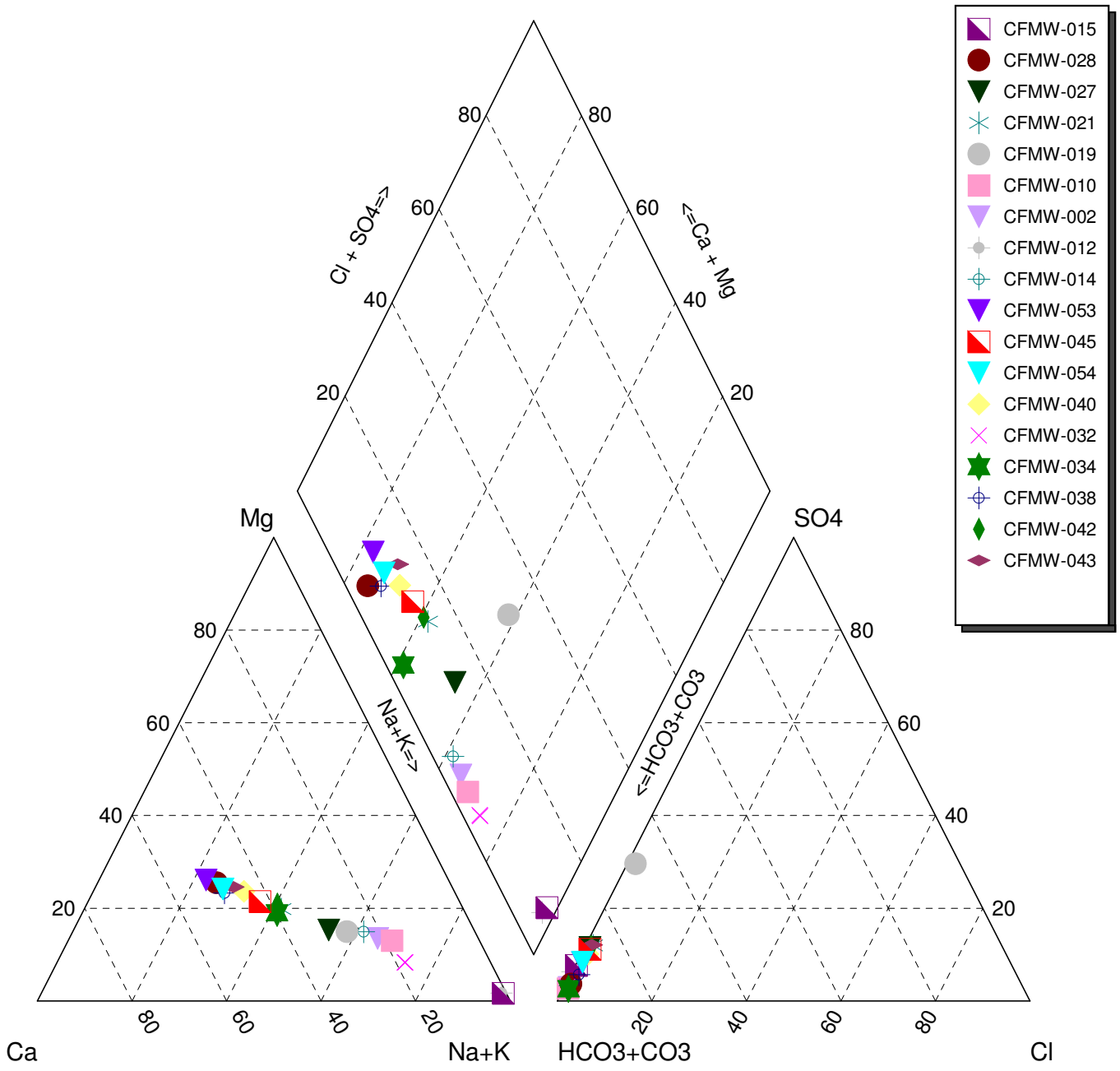
TITLE: Round 3 Piper Plots of General Chemistry in Monitoring Wells Screened in Upper Hydrogeologic Unit with High Fluoride

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)



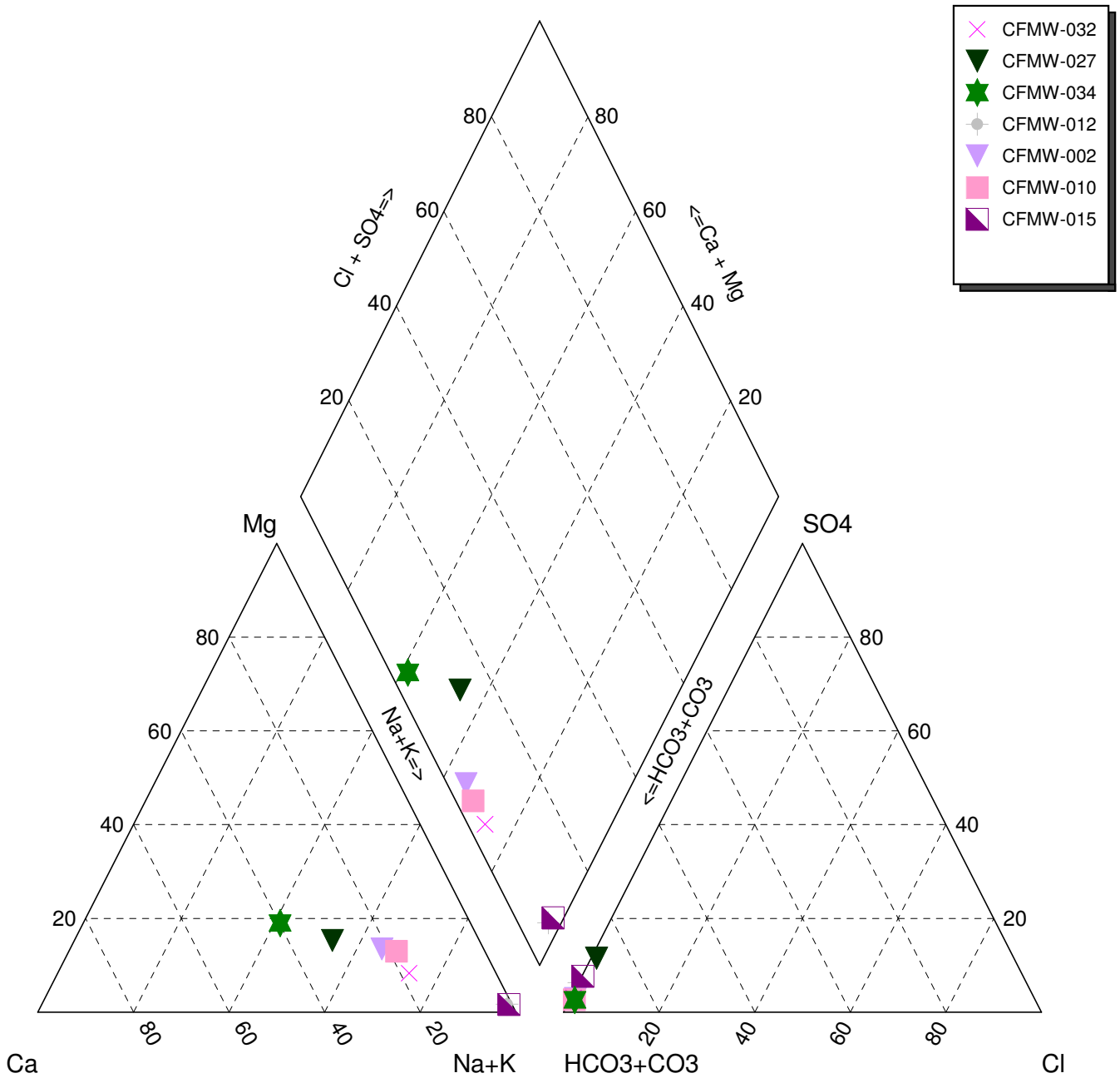
TITLE: Round 4 Piper Plot of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)



TITLE: Round 4 Piper Plots of General Chemistry in Monitoring Wells Screened in Upper Hydrogeologic Unit with High Cyanide

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

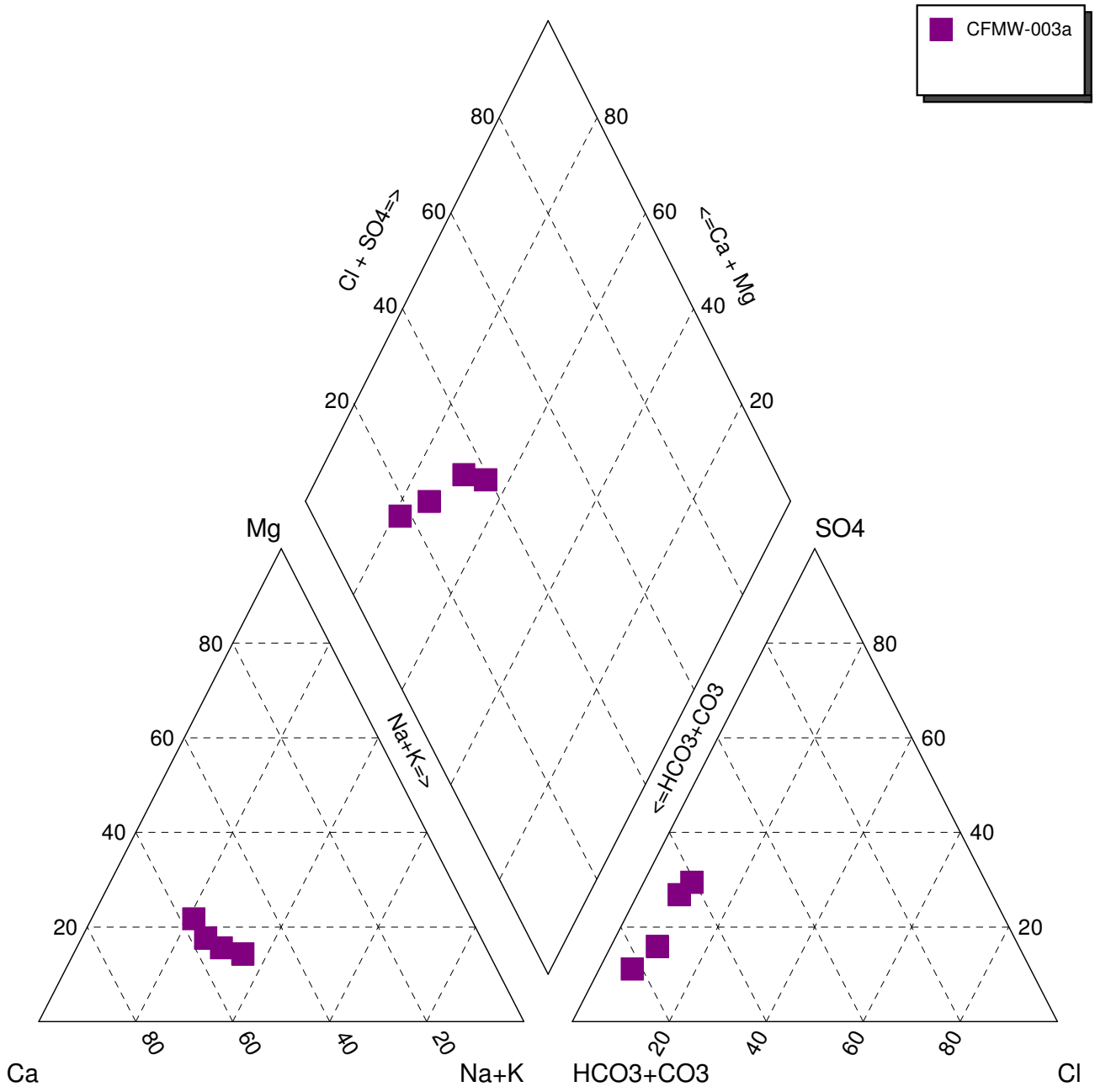


TITLE: Round 4 Piper Plots of General Chemistry in Monitoring Wells Screened in Upper Hydrogeologic Unit with High Fluoride

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

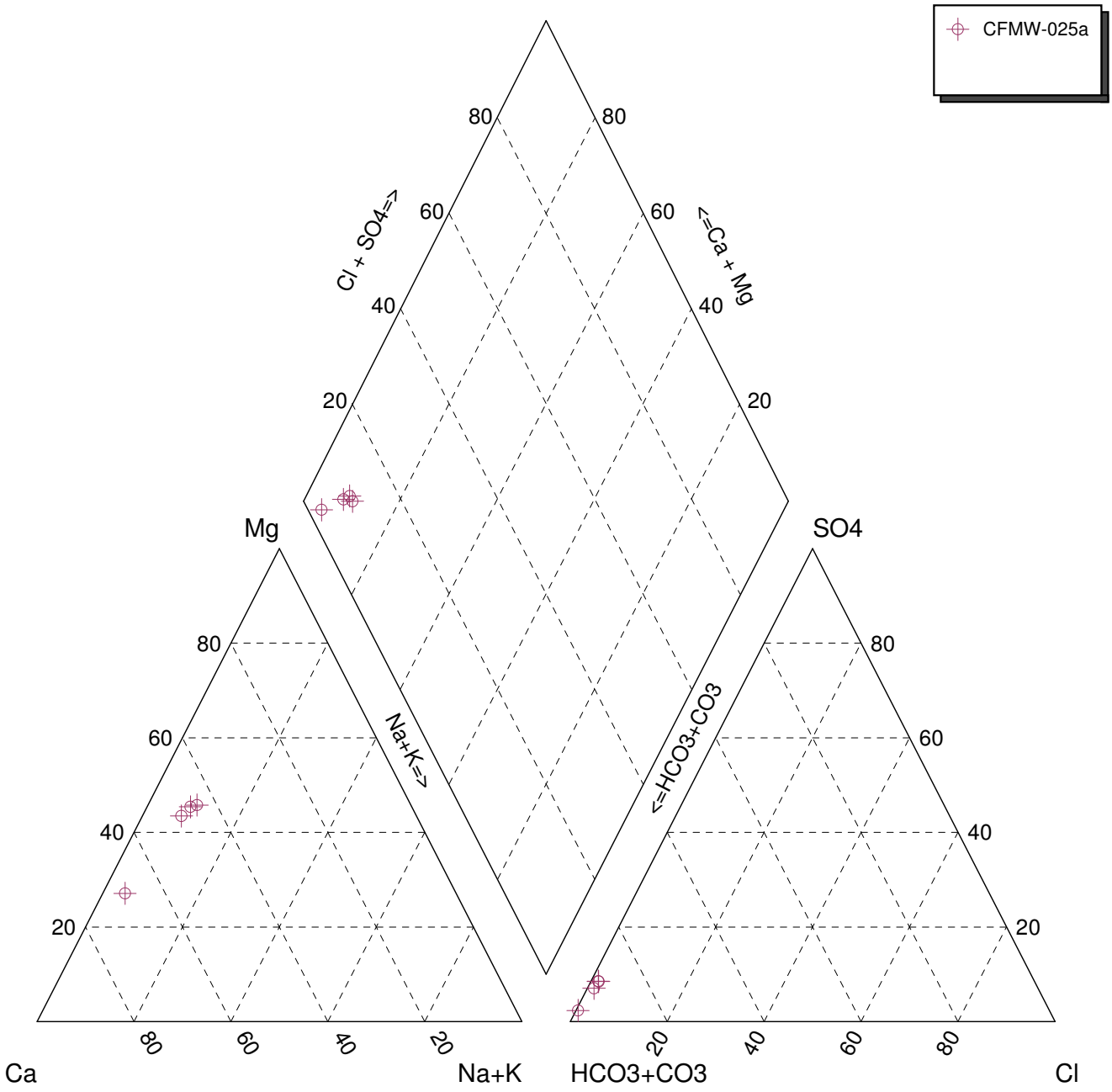
APPENDIX N-2

Piper Plots for Monitoring Wells Screened Below the Upper Hydrogeologic Unit



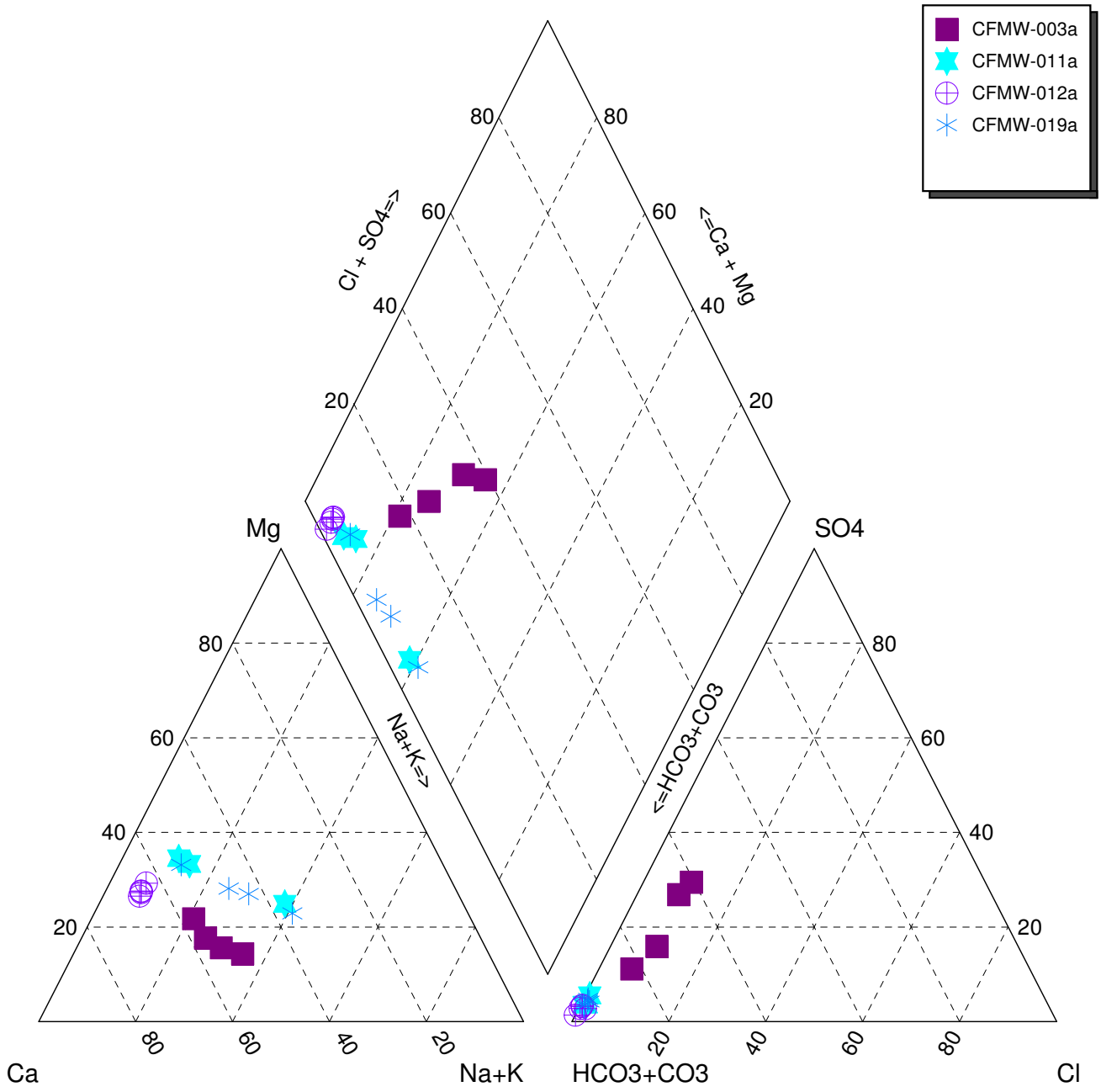
TITLE: Piper Plot for Monitoring Wells Screened Below Upper Hydrogeologic Unit - Adjacent to Landfills

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



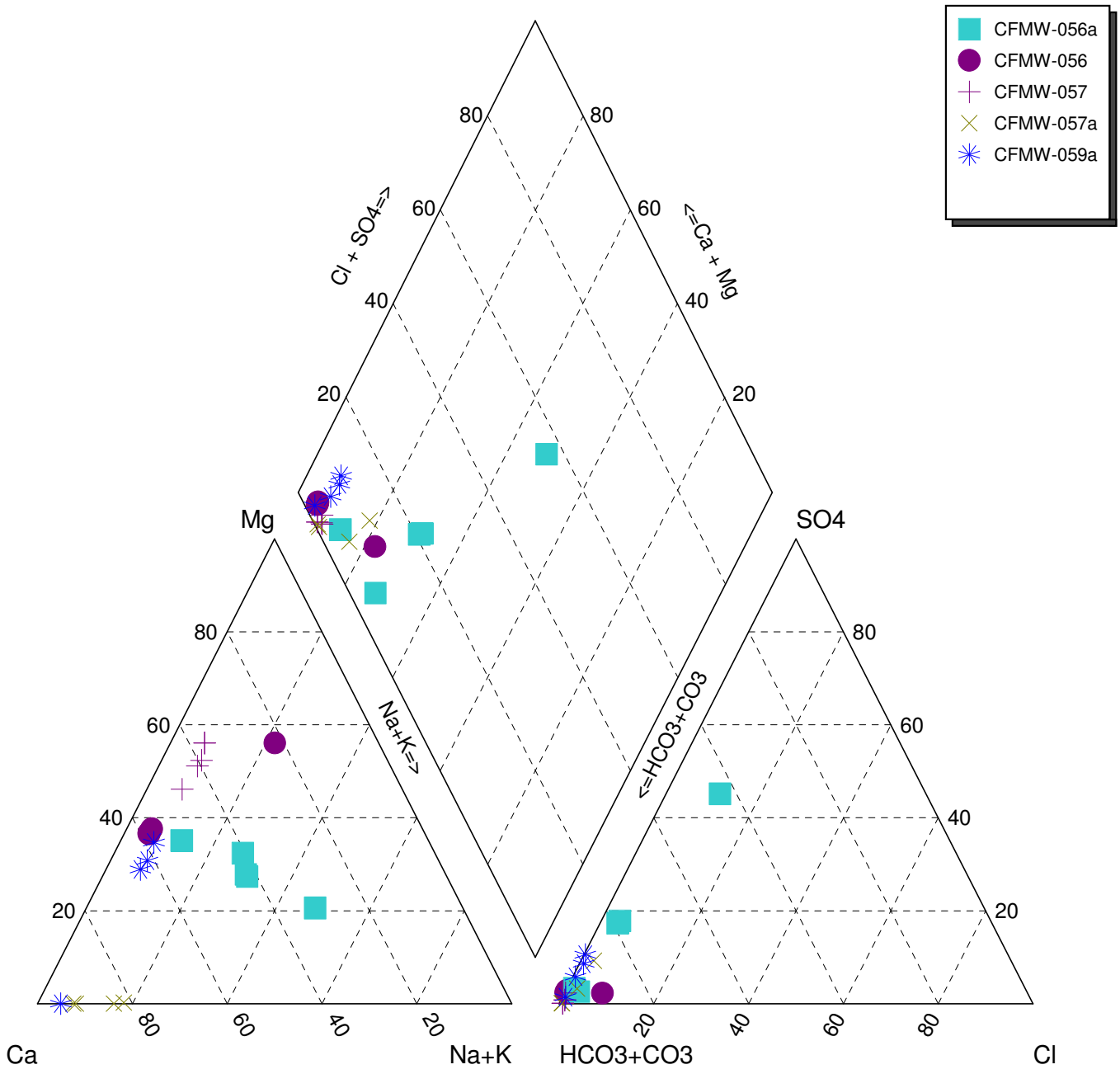
TITLE: Piper Plot for Monitoring Wells Screened Below Upper Hydrogeologic Unit - Downgradient of Landfill Area

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



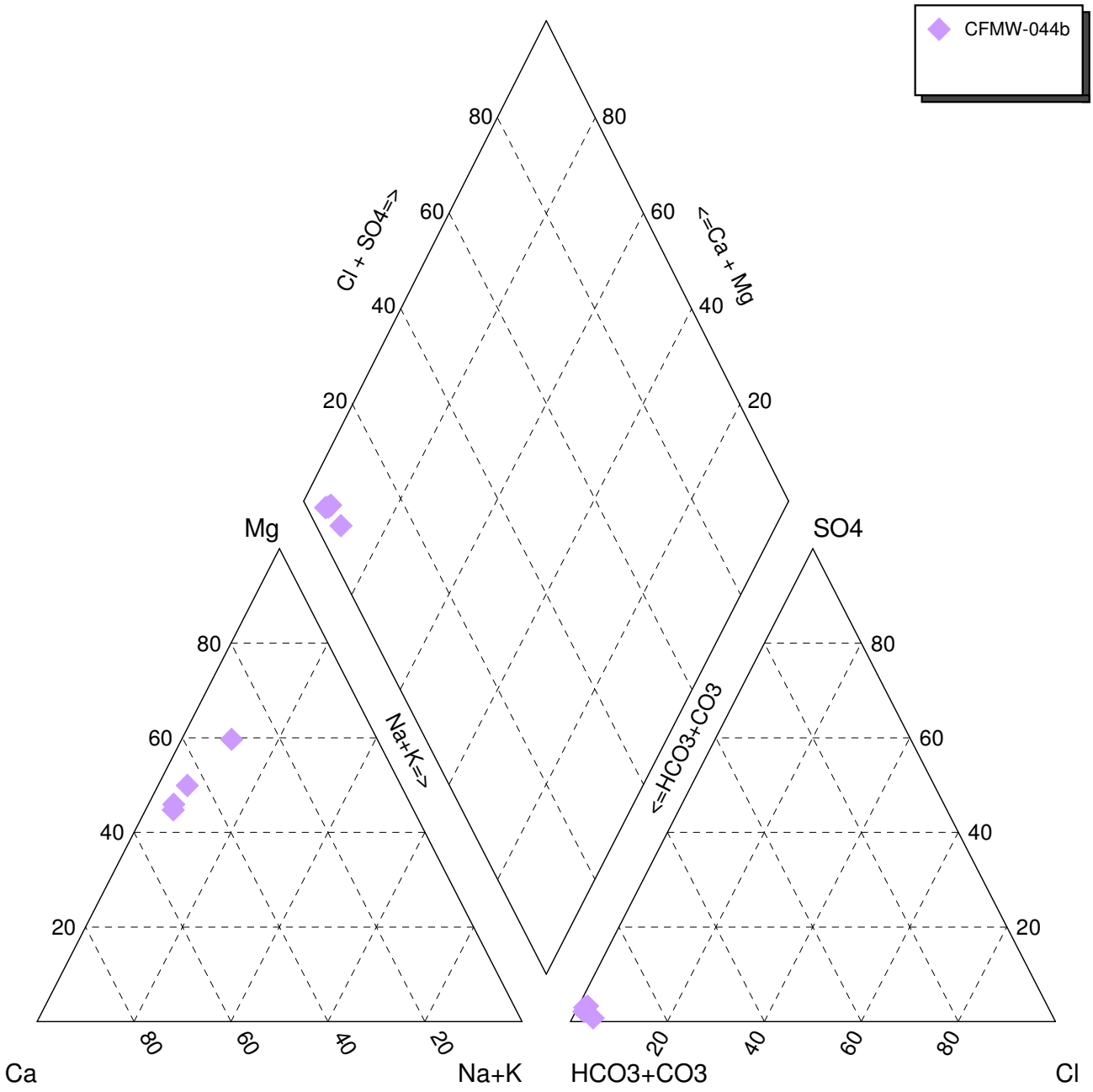
TITLE: Piper Plot for Monitoring Wells Screened Below Upper Hydrogeologic Unit - Greater Landfill Area

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



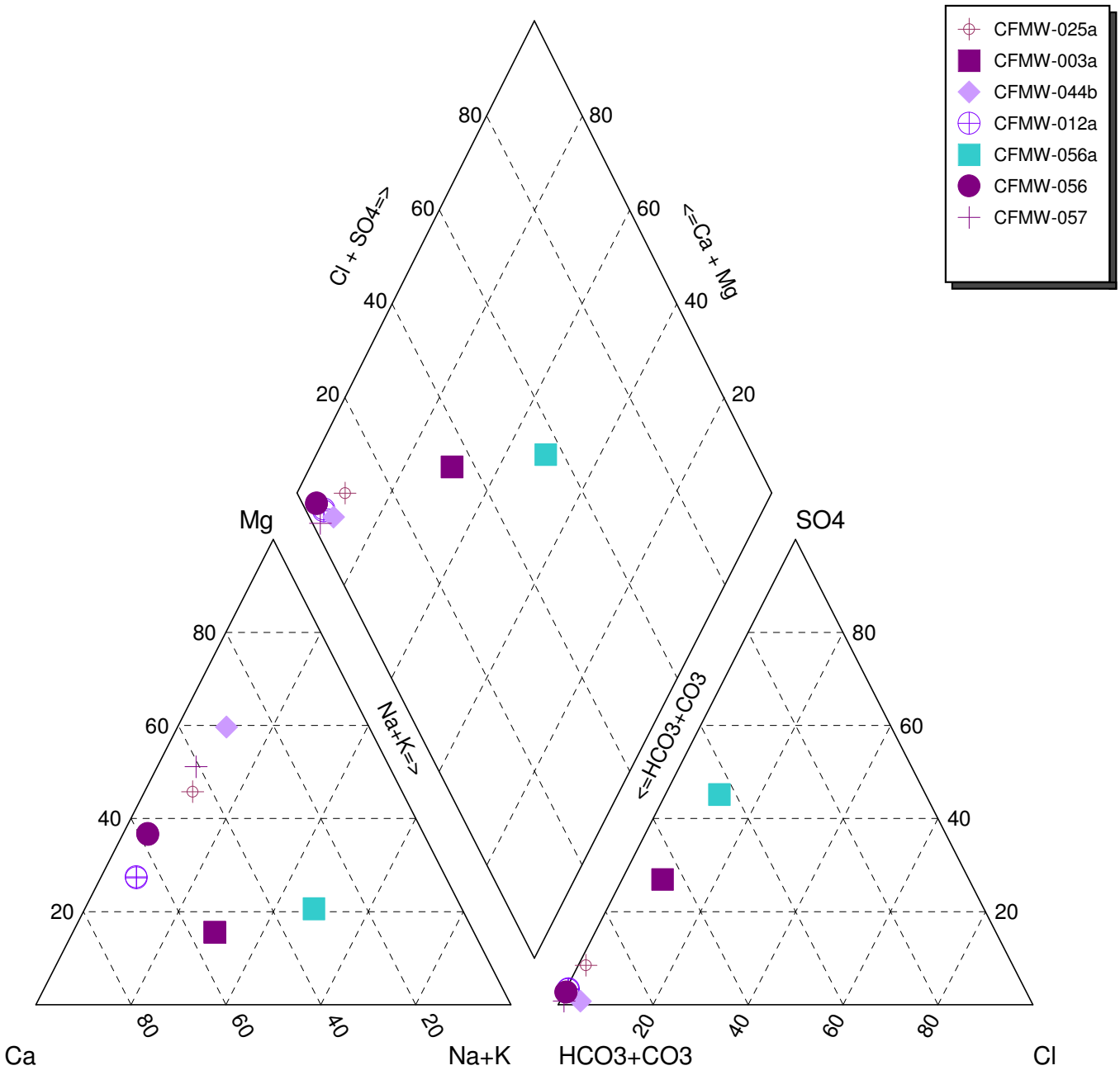
TITLE: All Rounds Piper Plots of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit in Aluminum City

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 to 4



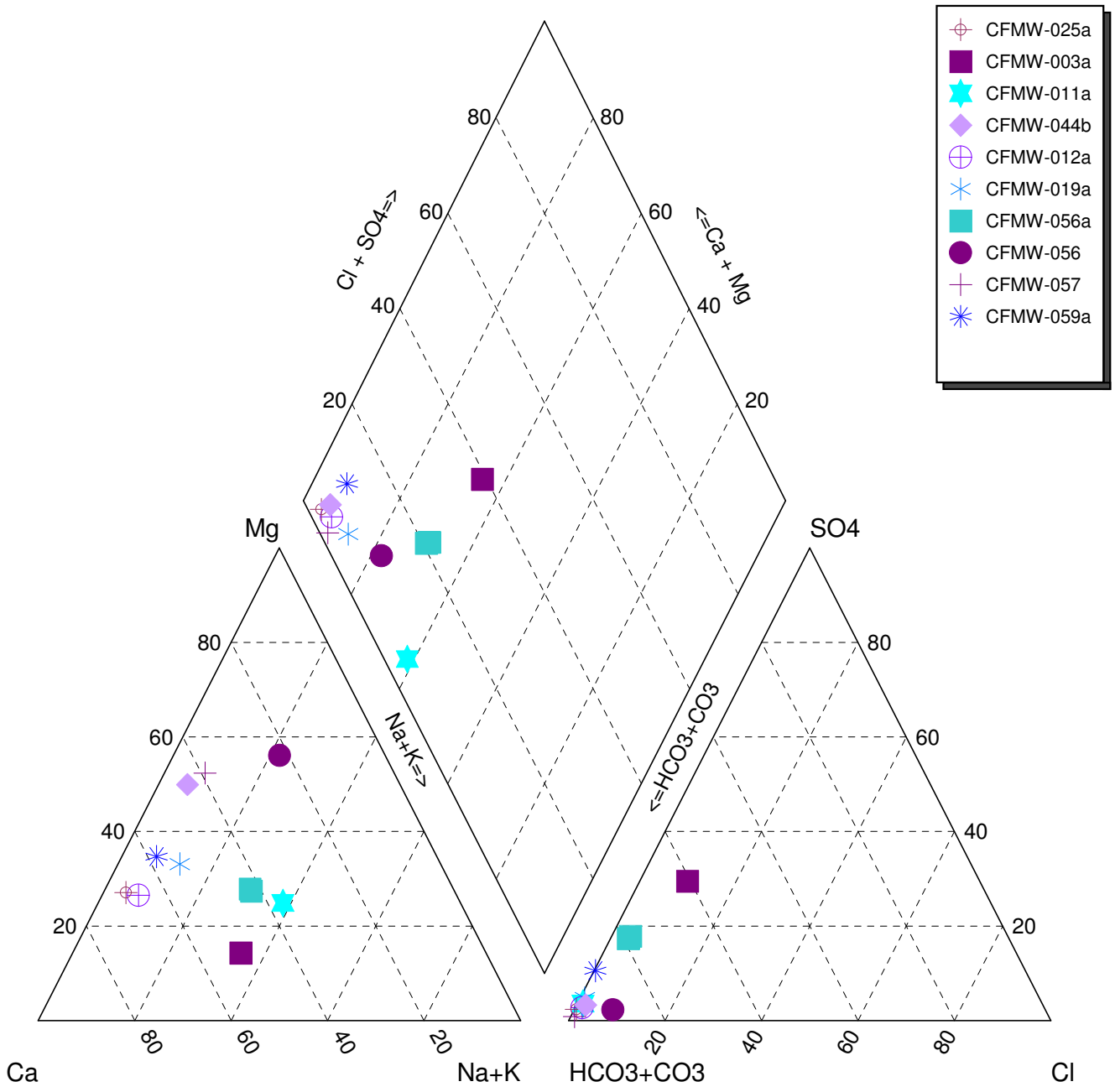
TITLE: Piper Plot for Monitoring Wells Screened Below Upper Hydrogeologic Unit - Near Main Plant

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 - 4



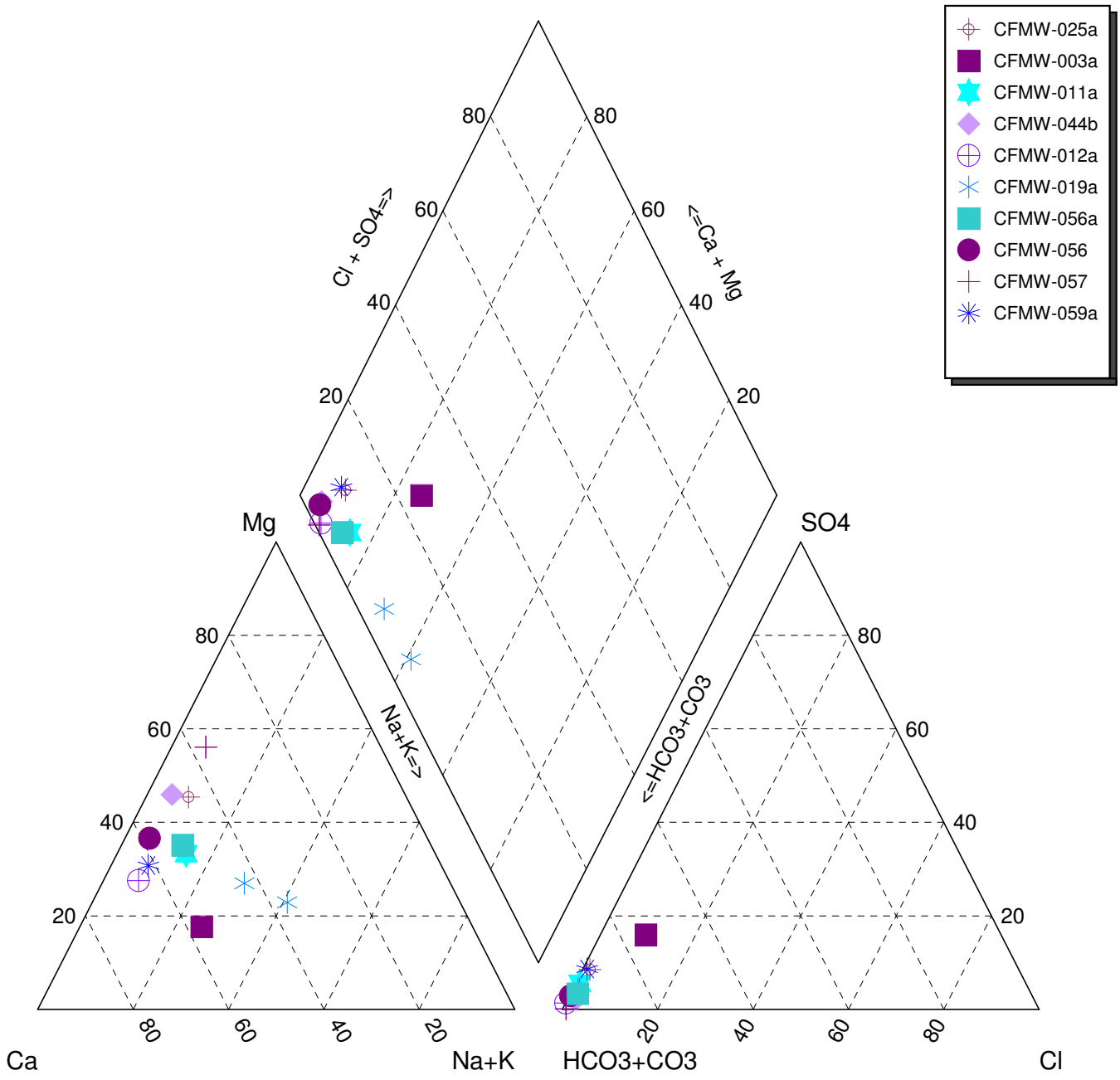
TITLE: Round 1 Piper Plot of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)



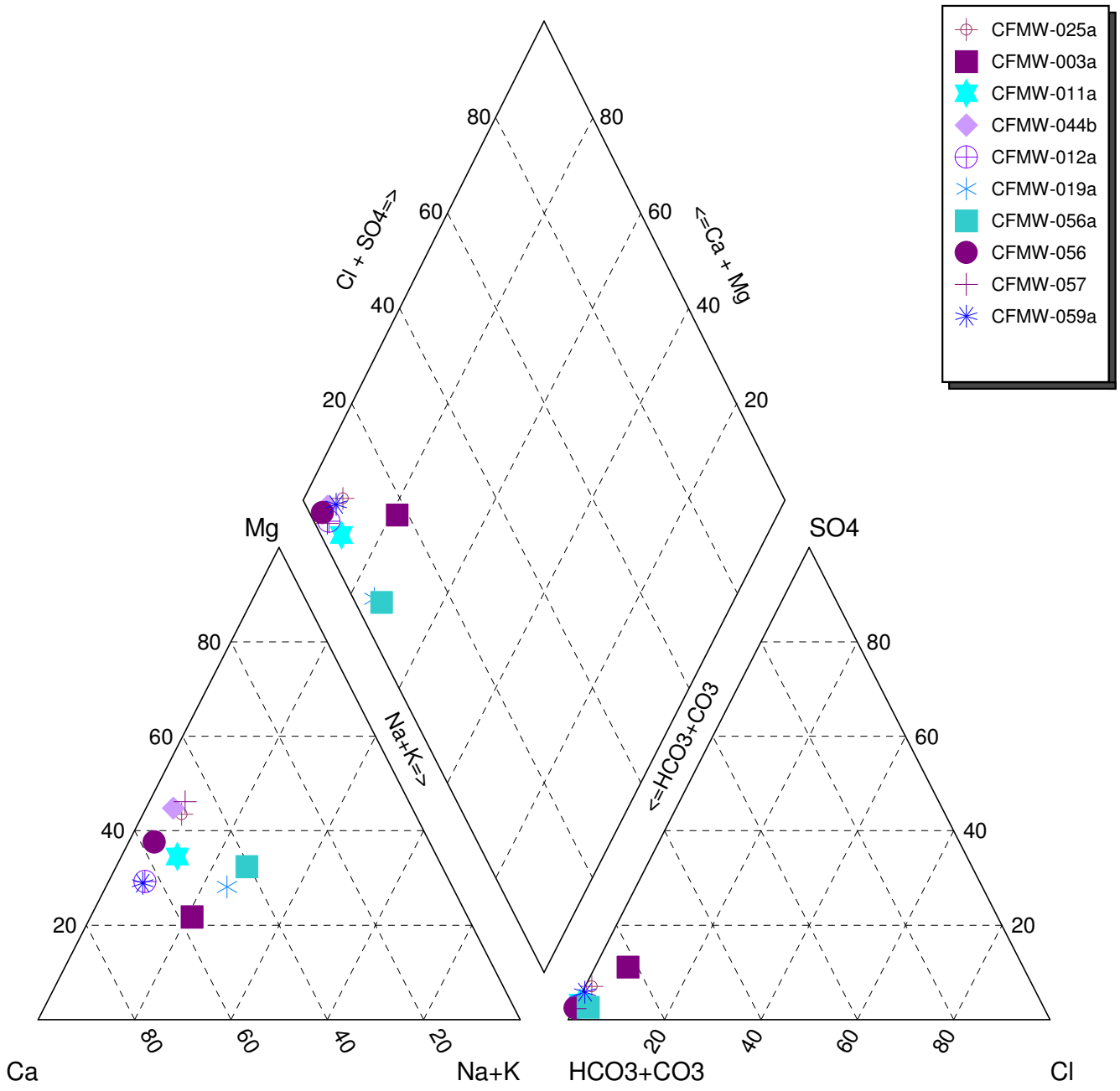
TITLE: Round 2 Piper Plot of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec 2016 (Round 2)



TITLE: Round 3 Piper Plot of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

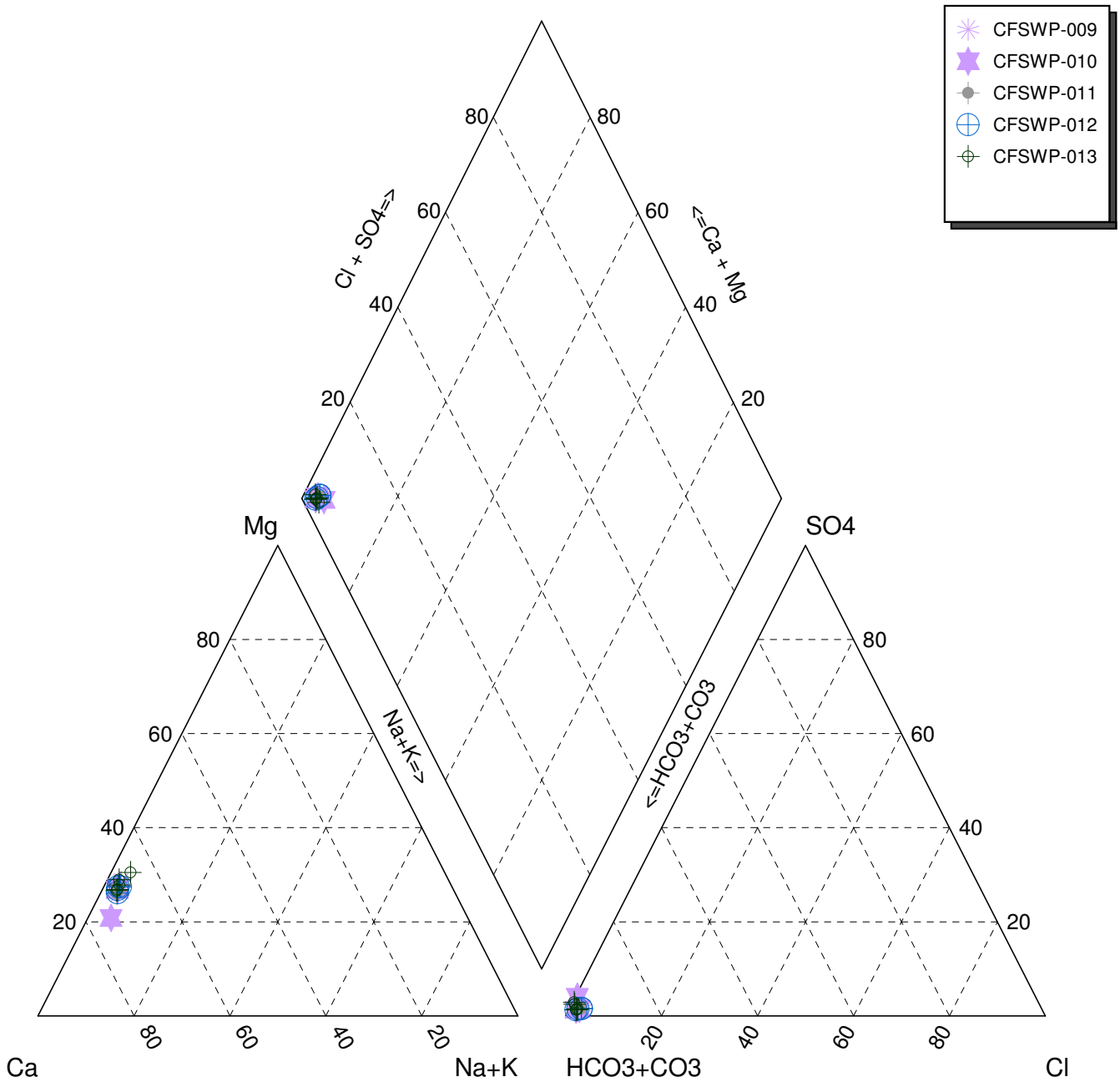


TITLE: Round 4 Piper Plot of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

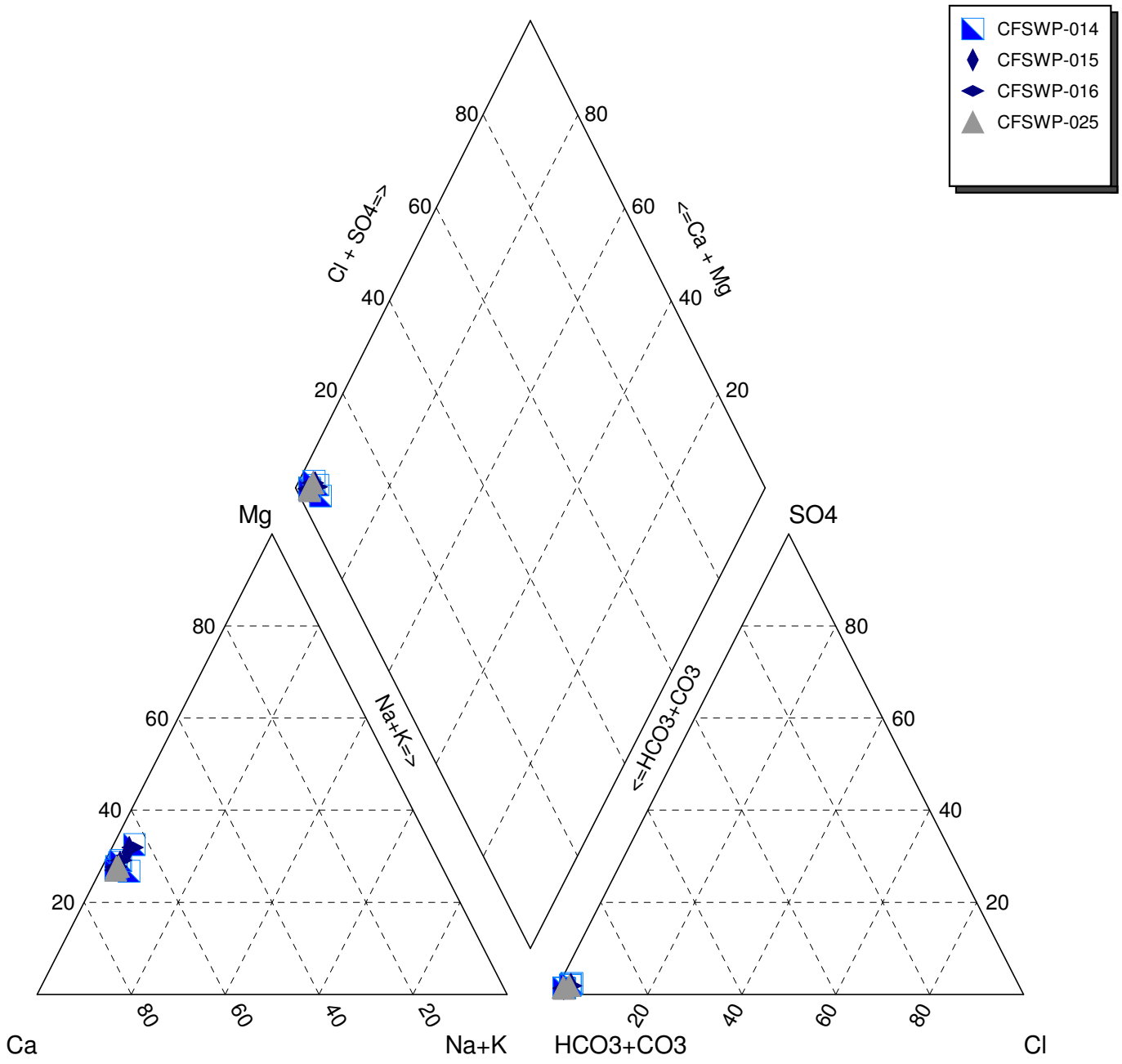
APPENDIX N-3

Piper Plots for Surface Water



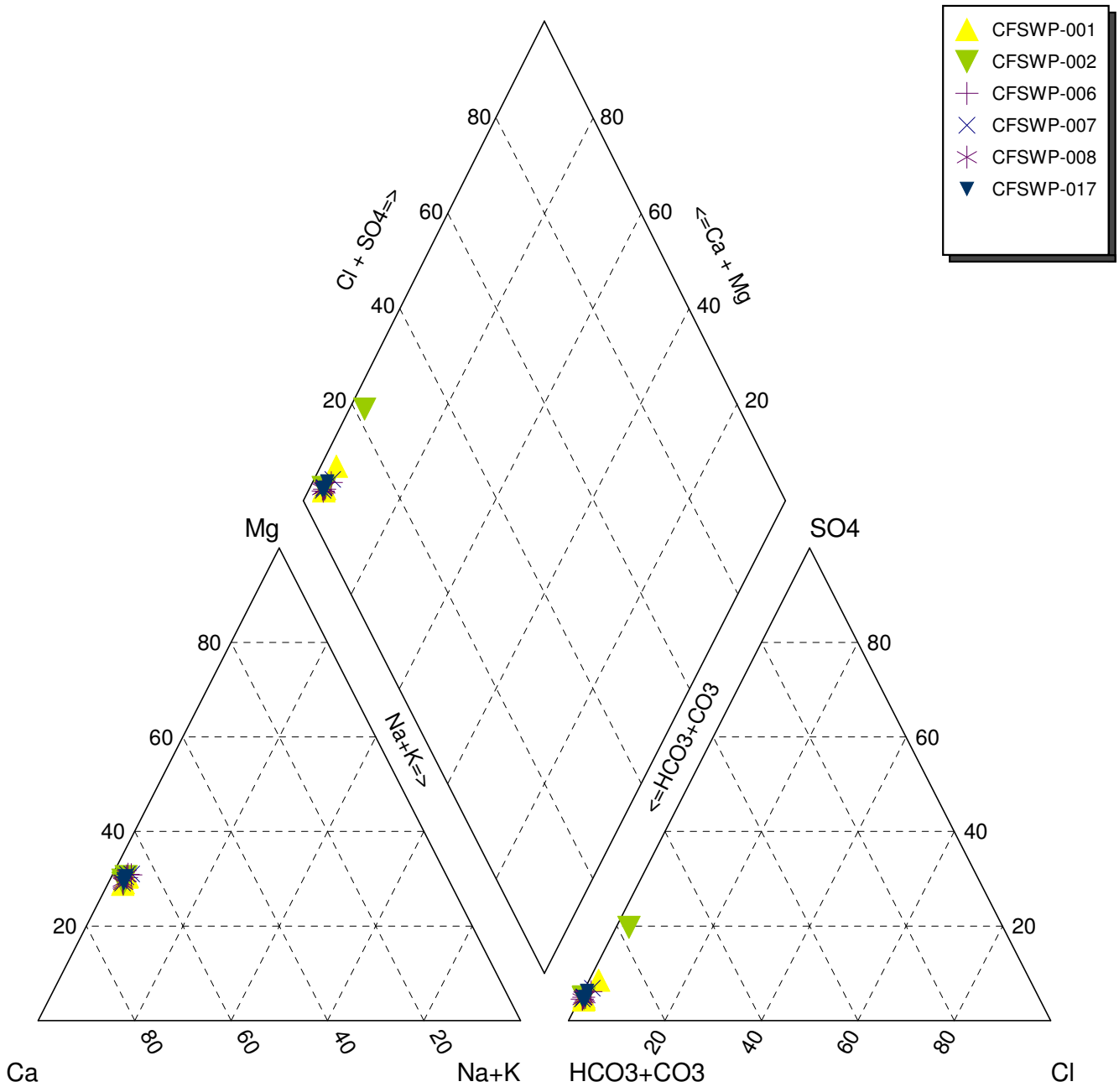
TITLE: All Rounds Piper Plots of General Chemistry in Surface Water of Cedar Creek Reservoir Overflow Ditch

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 to 4



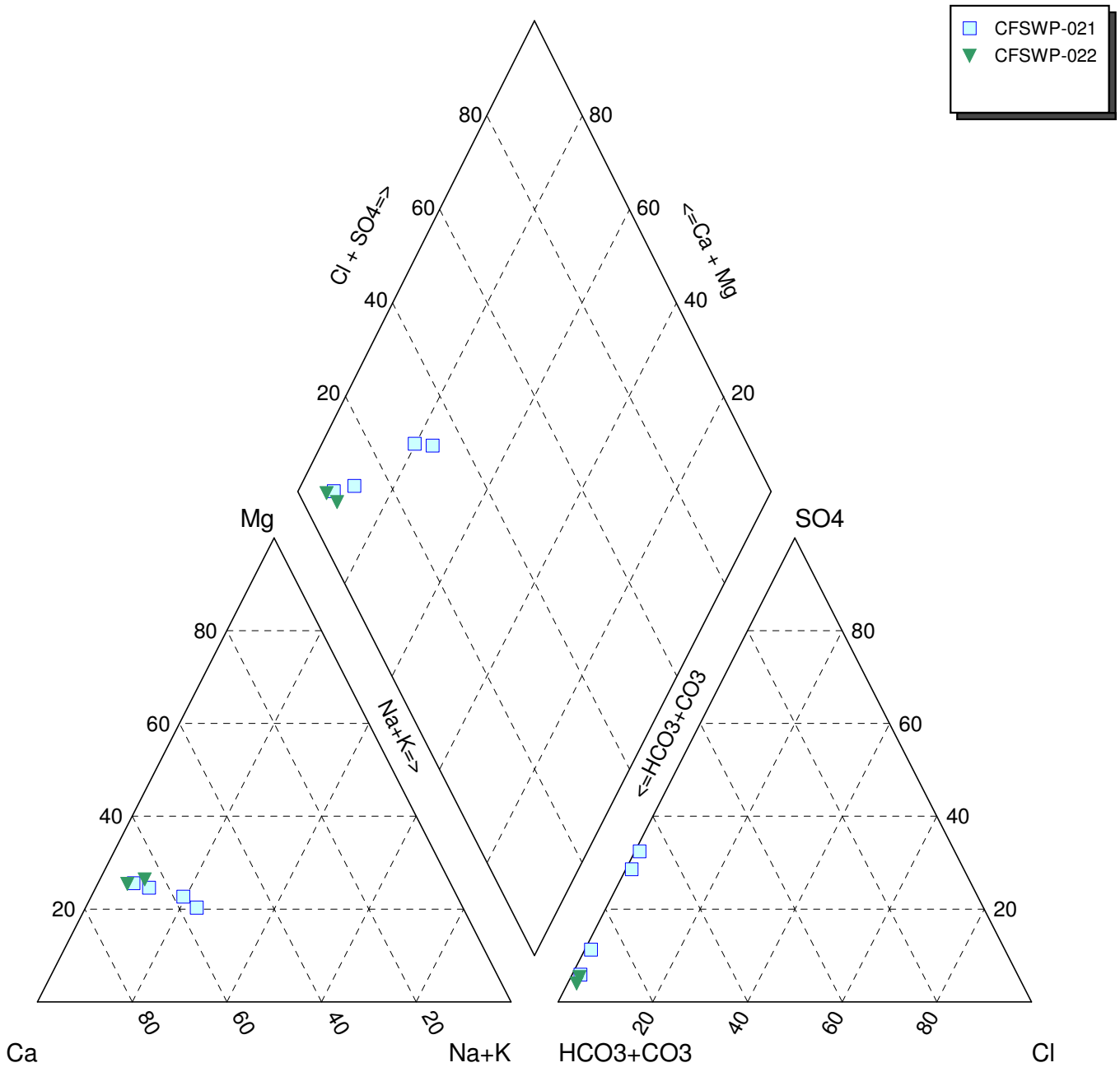
TITLE: All Rounds Piper Plots of General Chemistry in Surface Water of Cedar Creek

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 to 4



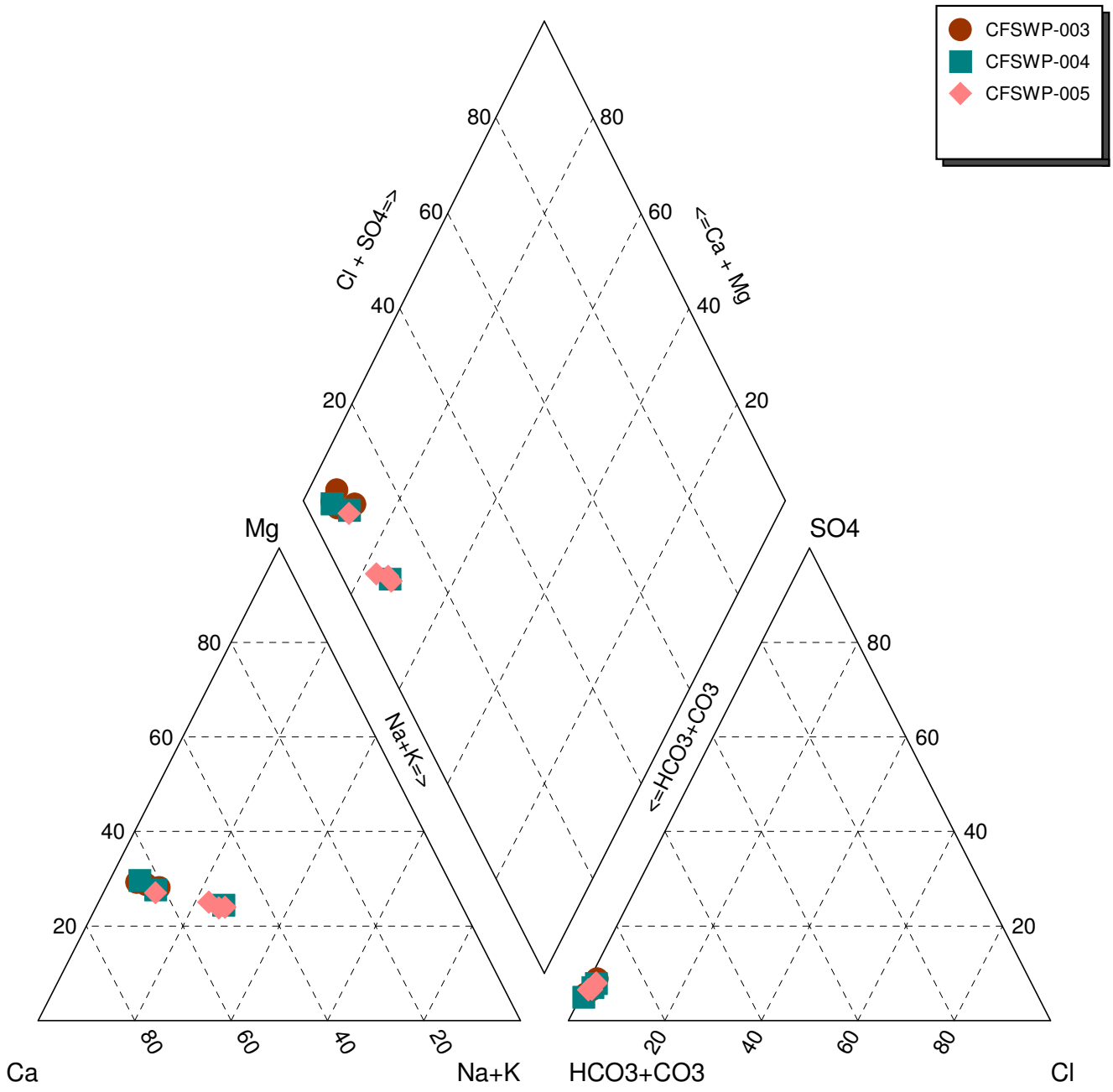
TITLE: All Rounds Piper Plots of General Chemistry in Surface Water of Flathead River

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 to 4



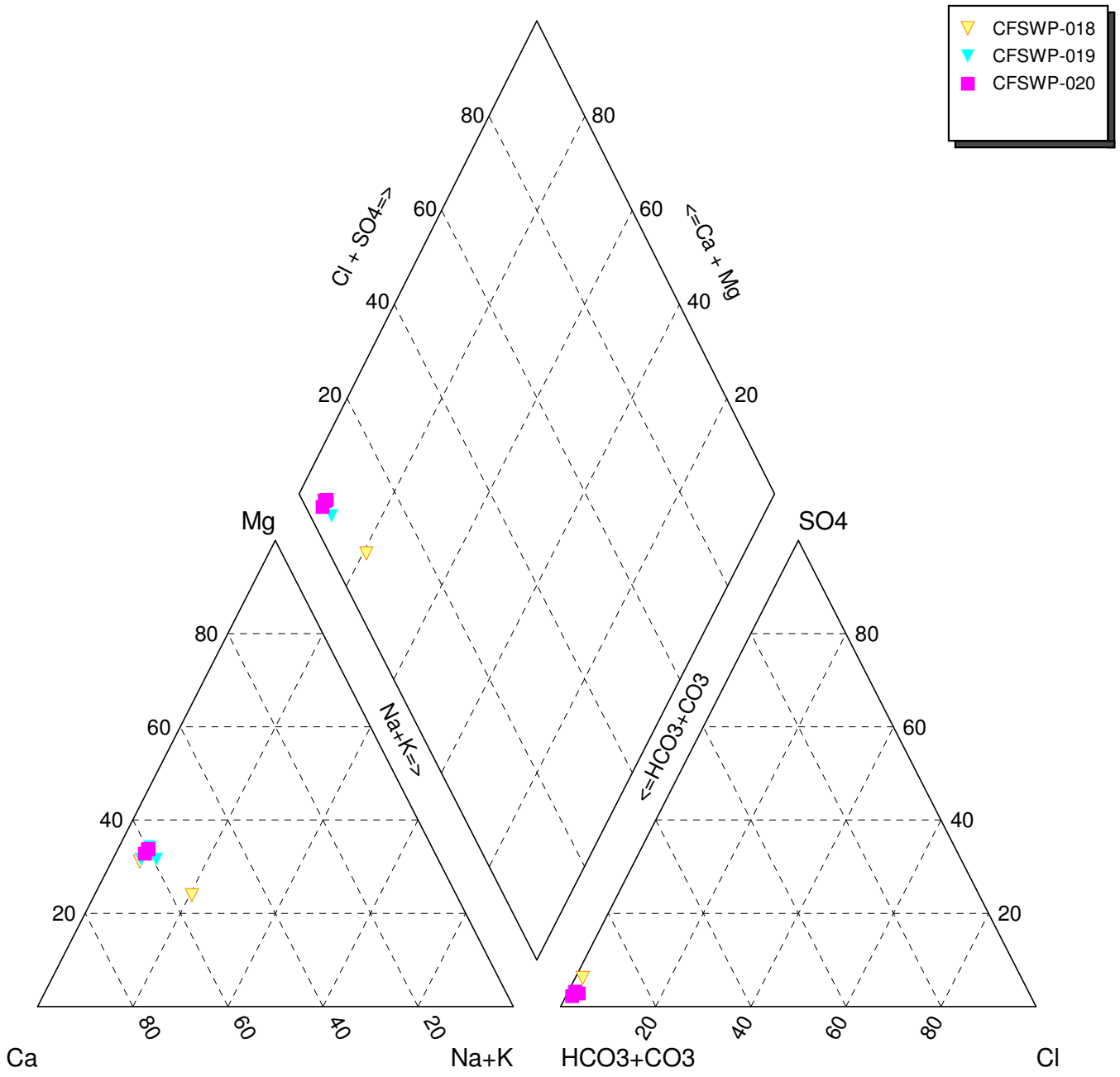
TITLE: All Rounds Piper Plots of General Chemistry in Surface Water of Northern Water Feature

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 to 4



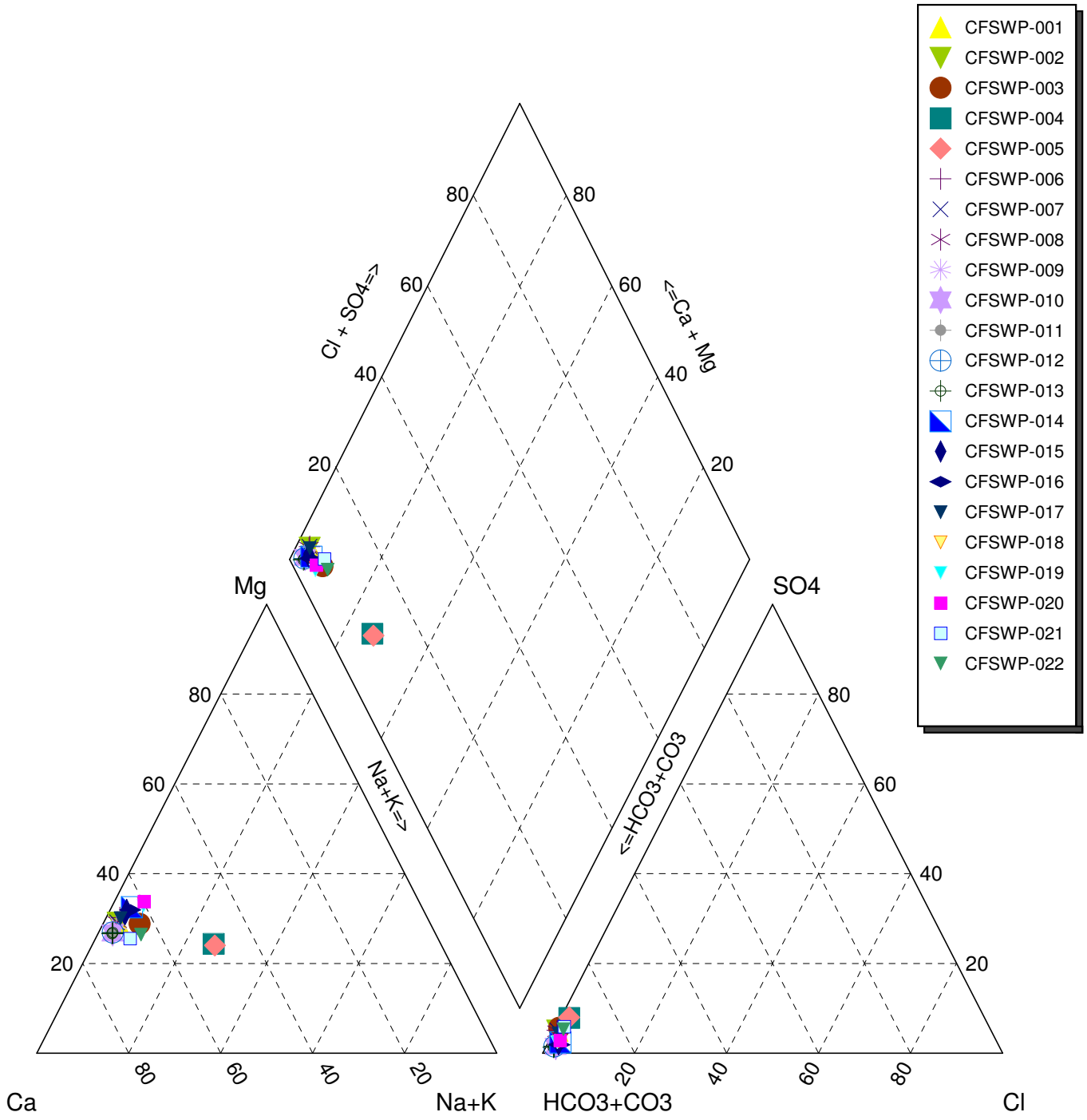
TITLE: All Rounds Piper Plots of General Chemistry in Surface Water of Backwater Seep Sampling Area

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 to 4



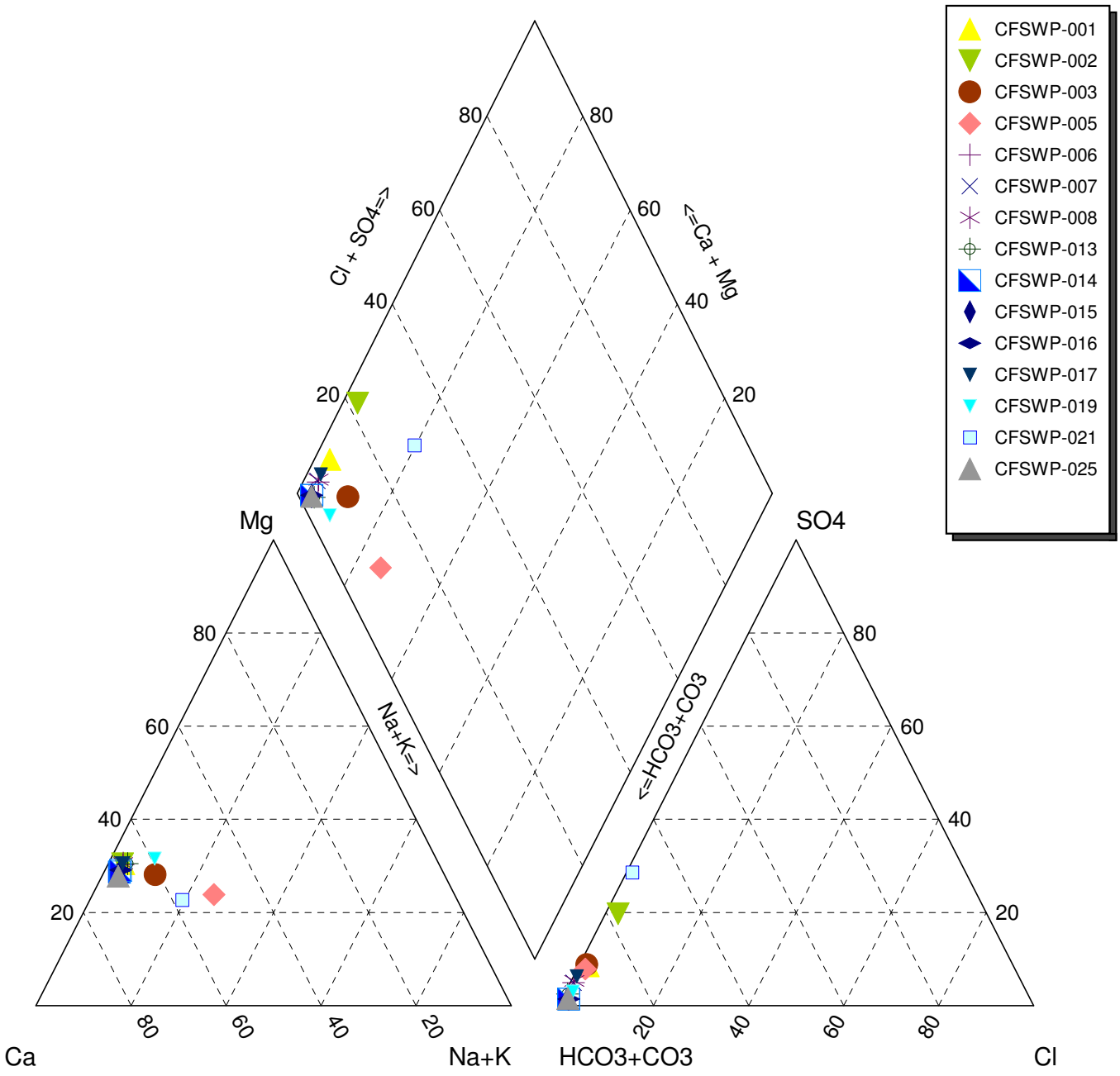
TITLE: All Rounds Piper Plots of General Chemistry in Surface Water of South Percolation Ponds

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Rounds 1 to 4



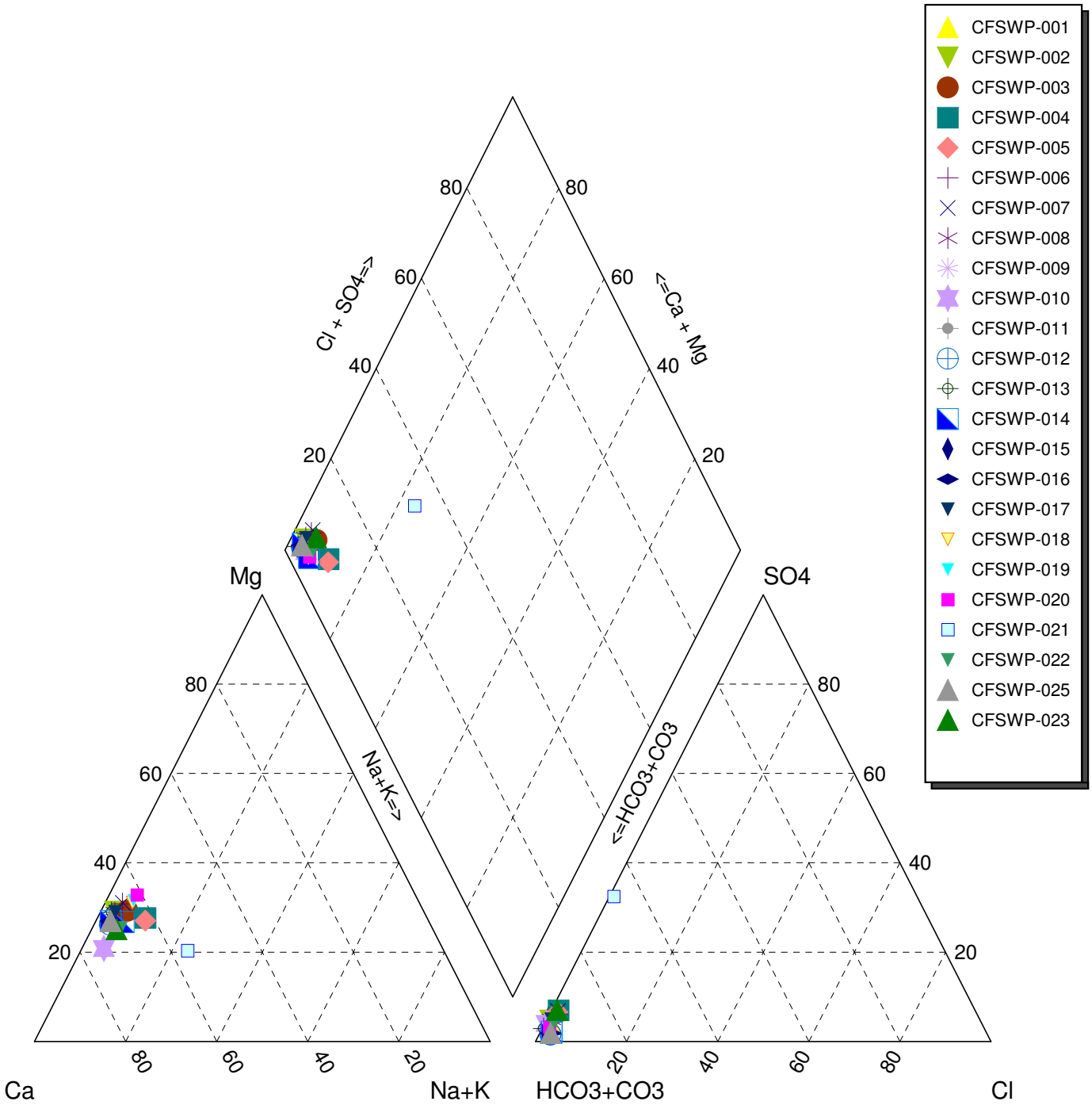
TITLE: Round 1 Piper Plots of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)



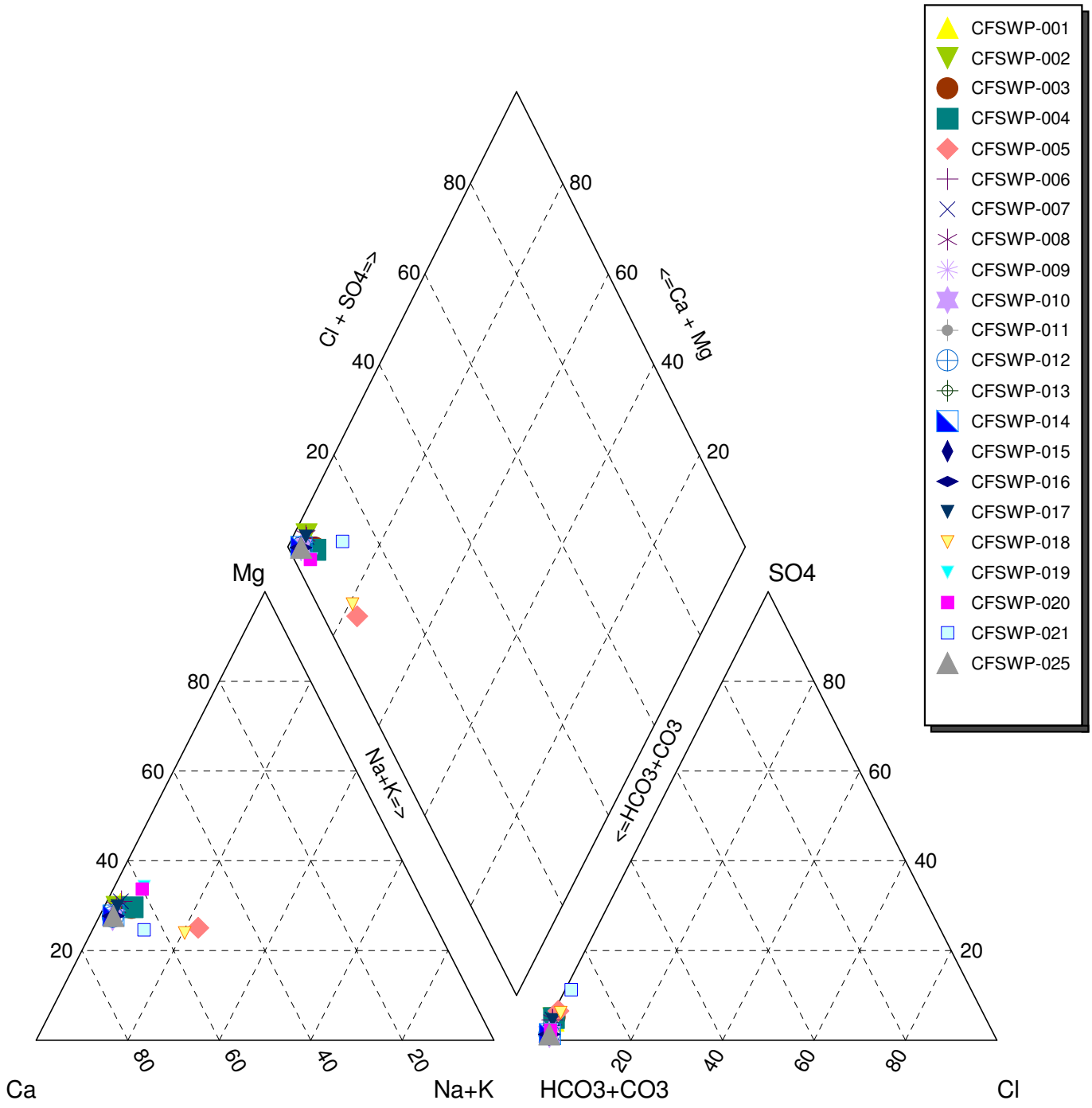
TITLE: Round 2 Piper Plots of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)



TITLE: Round 3 Piper Plots of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)



TITLE: Round 4 Piper Plots of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

APPENDIX O

Stiff Diagrams for Groundwater and Surface Water Geochemistry

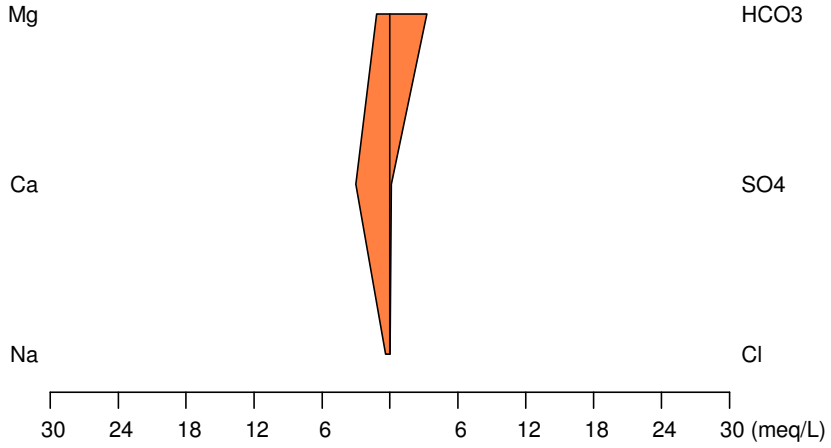
1. Stiff Diagrams for Monitoring Wells Screened in Upper Hydrogeologic Unit
2. Stiff Diagrams for Monitoring Wells Screened Below the Upper Hydrogeologic Unit
3. Stiff Diagrams for Surface Water

APPENDIX O-1

Stiff Diagrams for Monitoring Wells Screened in Upper Hydrogeologic Unit

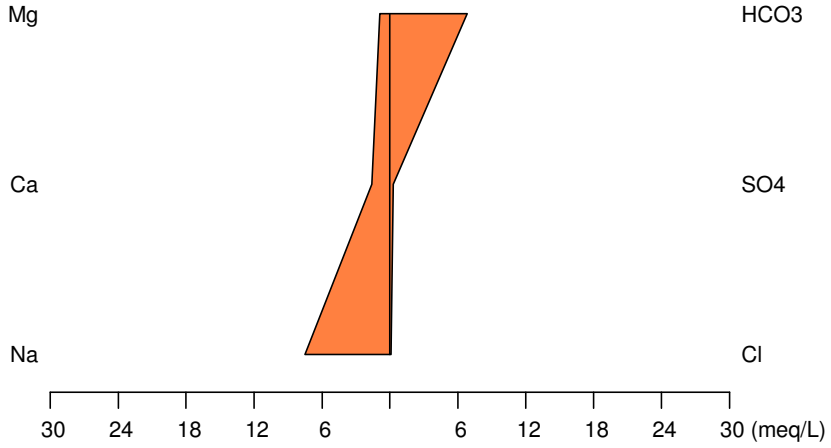
CFMW-001,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 216
El Cond. (uS/cm) =34700



CFMW-002,9/12/2016

Date: 9/12/2016
TDS (mg/l) = 590
El Cond. (uS/cm) =90900

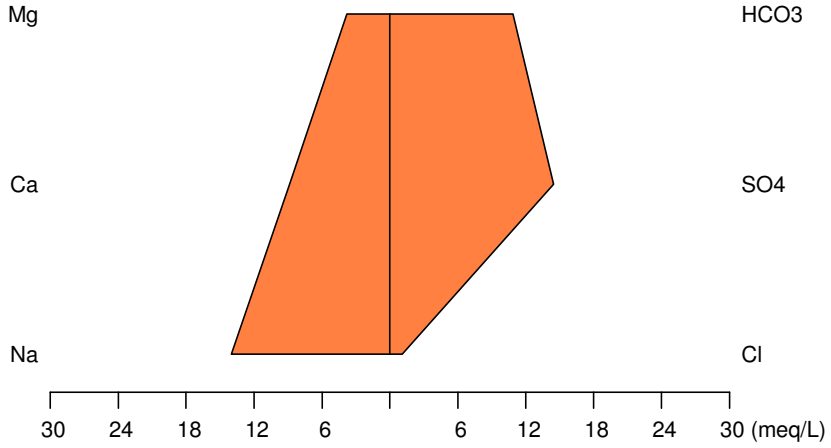


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

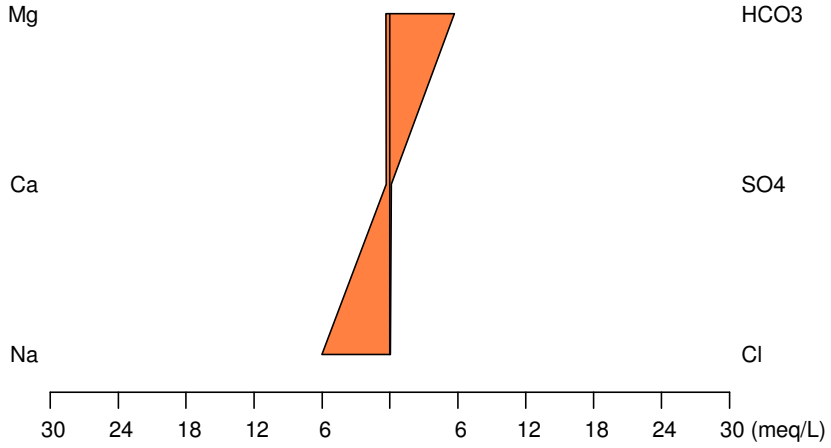
CFMW-003,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 1650
El Cond. (uS/cm) =262000



CFMW-008,9/21/2016

Date: 9/21/2016
TDS (mg/l) = 353
El Cond. (uS/cm) =63000

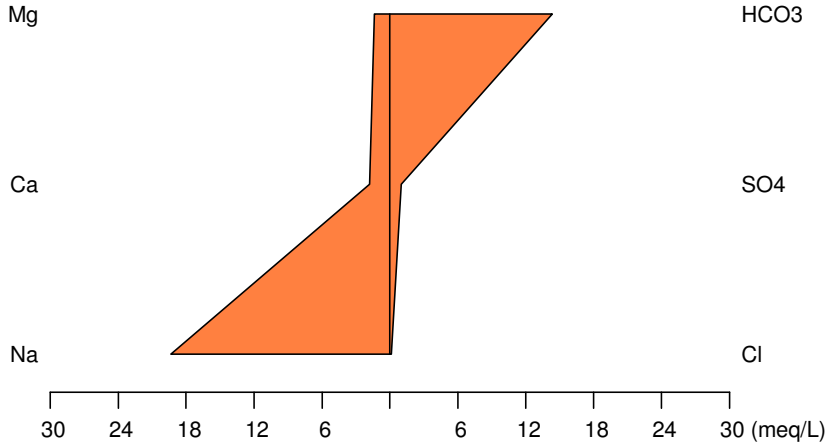


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

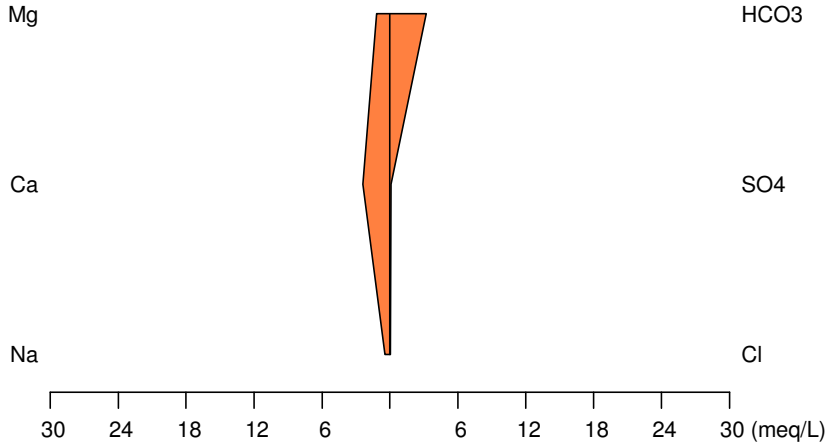
CFMW-010,9/12/2016

Date: 9/12/2016
TDS (mg/l) = 1350
El Cond. (uS/cm) =201000



CFMW-011,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 219
El Cond. (uS/cm) =38500

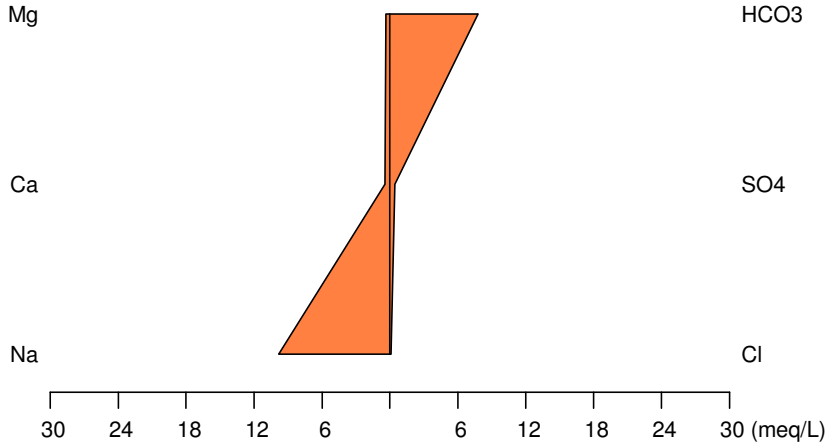


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

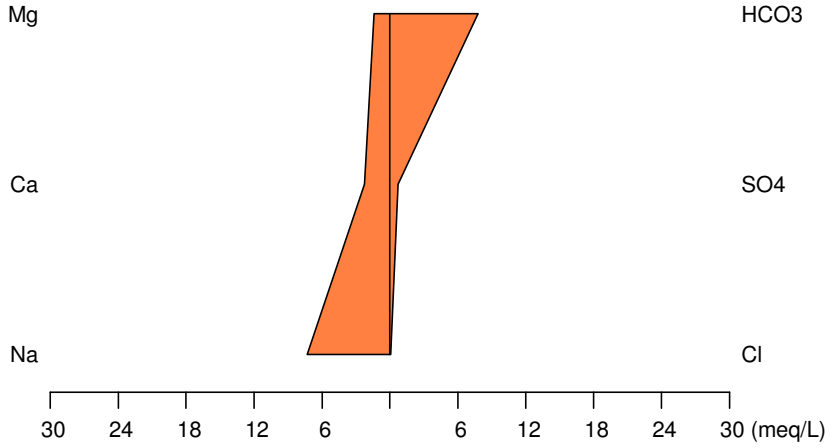
CFMW-012,9/12/2016

Date: 9/12/2016
TDS (mg/l) = 660
El Cond. (uS/cm) =105000



CFMW-014,9/12/2016

Date: 9/12/2016
TDS (mg/l) = 656
El Cond. (uS/cm) =104000

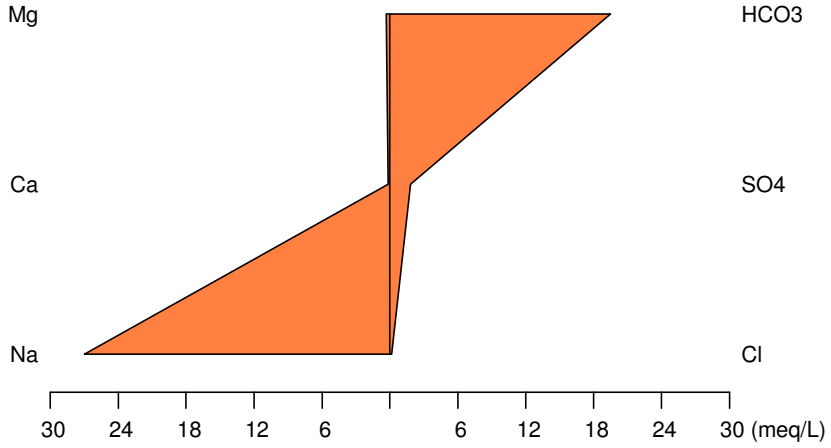


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

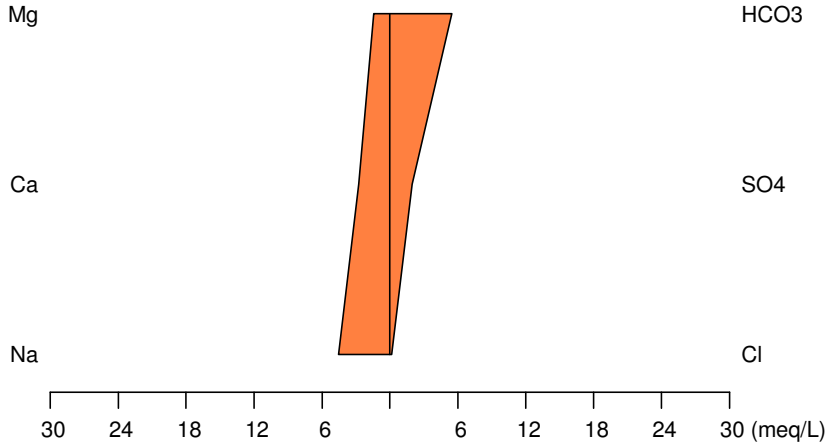
CFMW-015,9/12/2016

Date: 9/12/2016
TDS (mg/l) = 1730
El Cond. (uS/cm) =256000



CFMW-019,9/12/2016

Date: 9/12/2016
TDS (mg/l) = 510
El Cond. (uS/cm) =83900

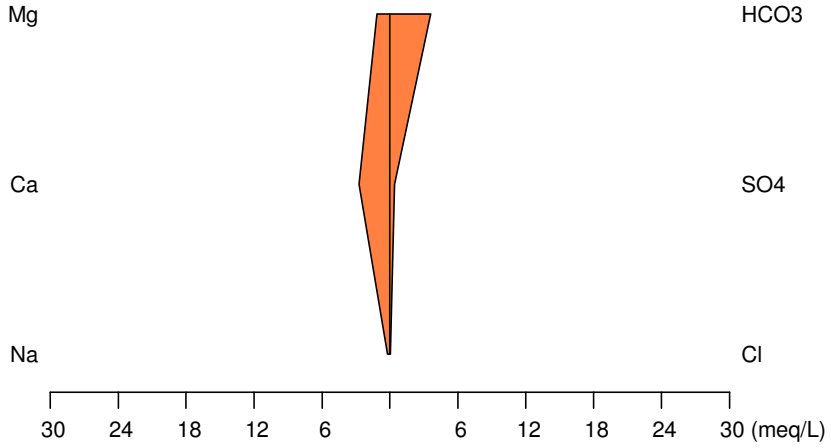


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

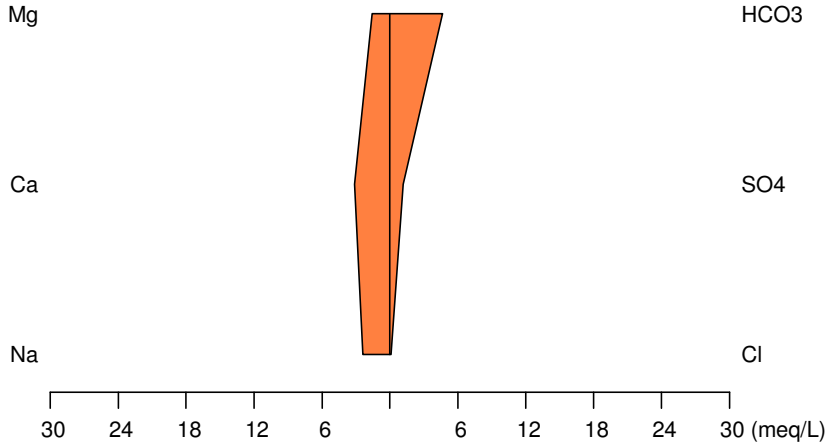
CFMW-020,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 235
El Cond. (uS/cm) =40800



CFMW-021,9/12/2016

Date: 9/12/2016
TDS (mg/l) = 342
El Cond. (uS/cm) =63100

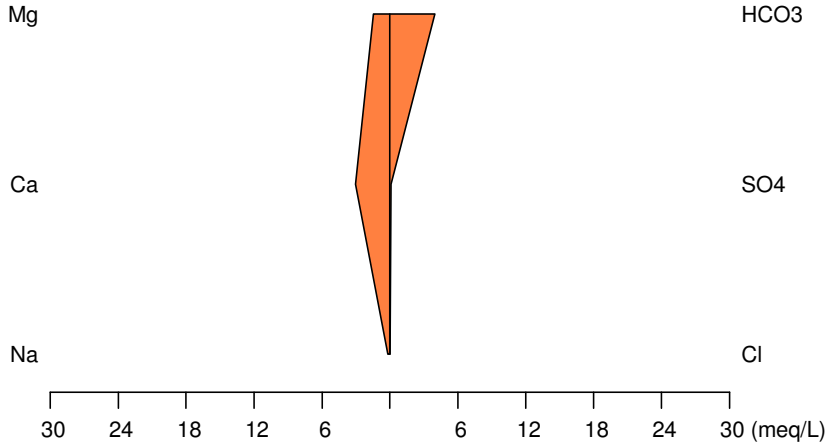


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

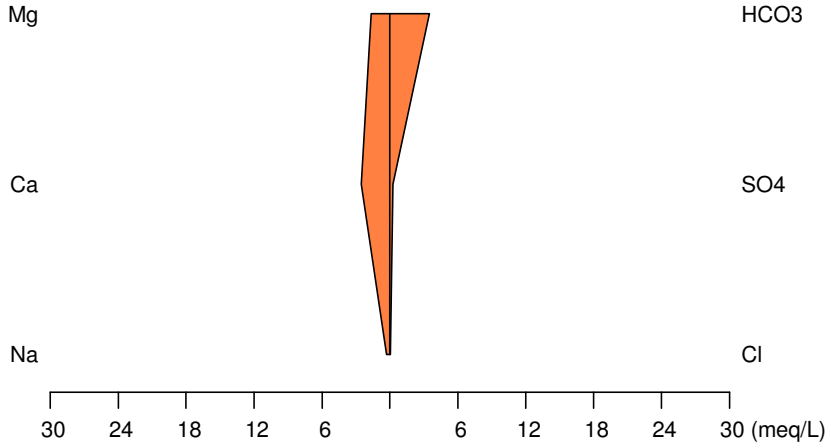
CFMW-023,9/21/2016

Date: 9/21/2016
TDS (mg/l) = 242
El Cond. (uS/cm) =44900



CFMW-025b,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 243
El Cond. (uS/cm) =43000

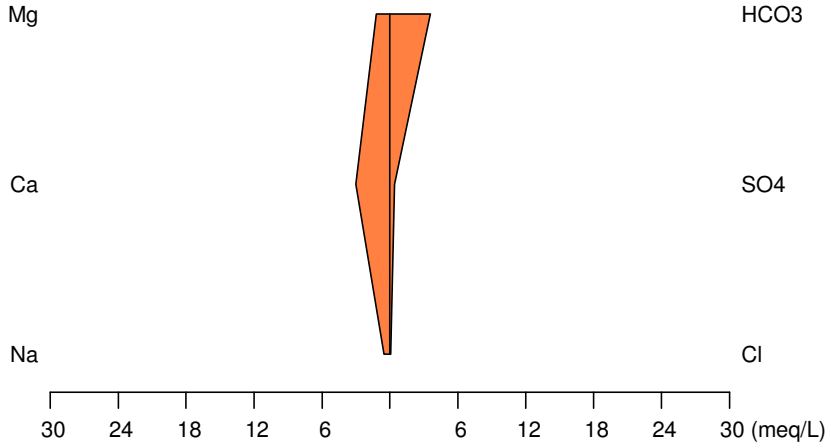


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

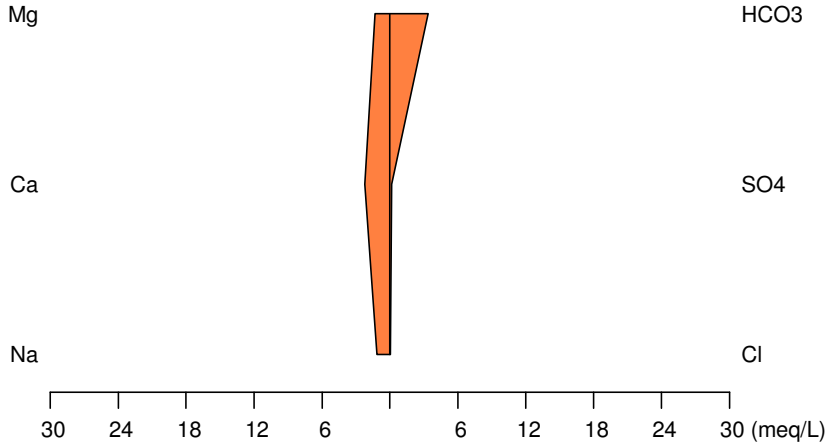
CFMW-026,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 265
El Cond. (uS/cm) =46800



CFMW-028,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 231
El Cond. (uS/cm) =42700

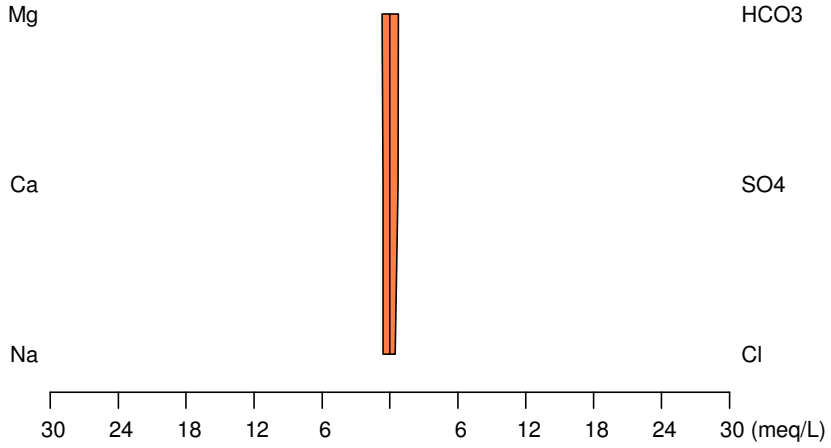


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

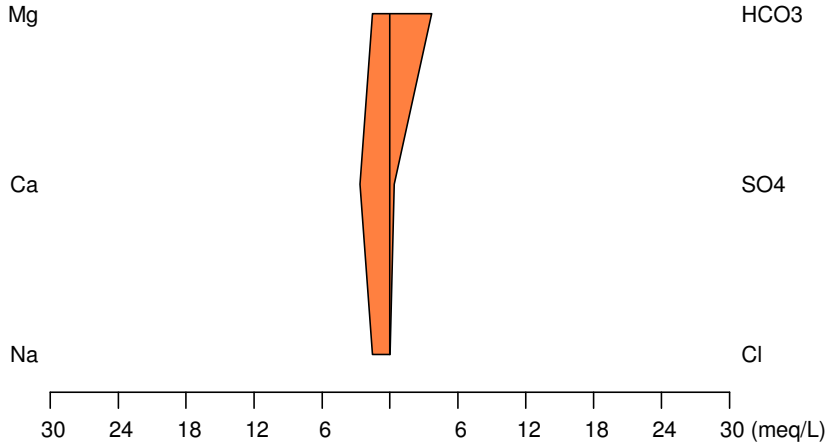
CFMW-028a,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 105
El Cond. (uS/cm) =20300



CFMW-029,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 319
El Cond. (uS/cm) =49600

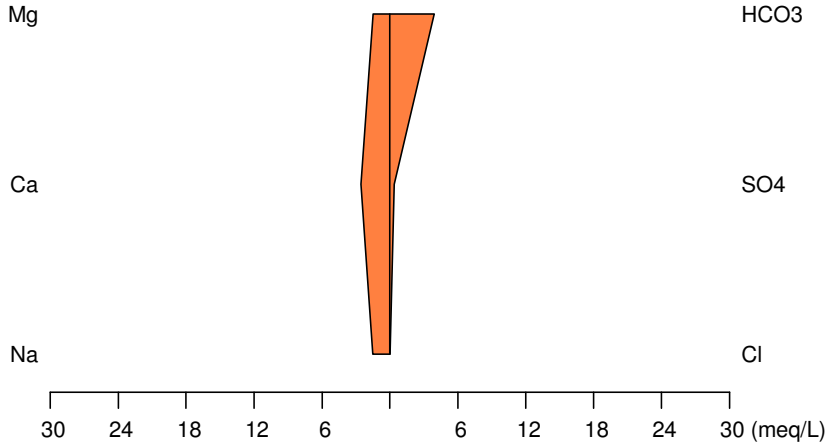


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

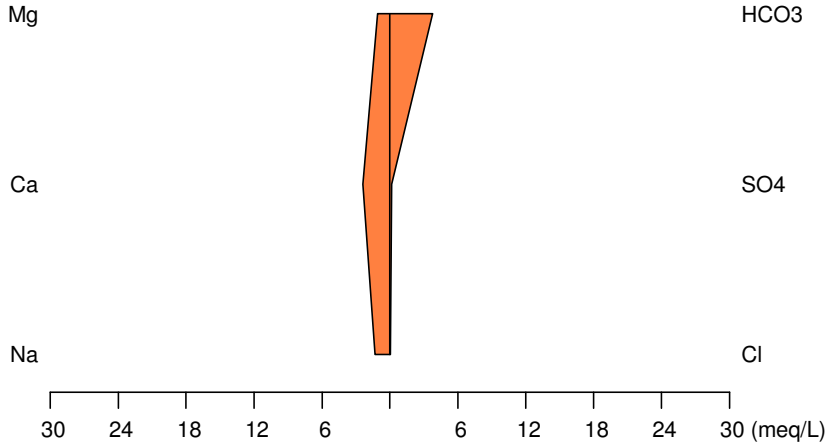
CFMW-029,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 312
El Cond. (uS/cm) =49600



CFMW-031,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 237
El Cond. (uS/cm) =48200

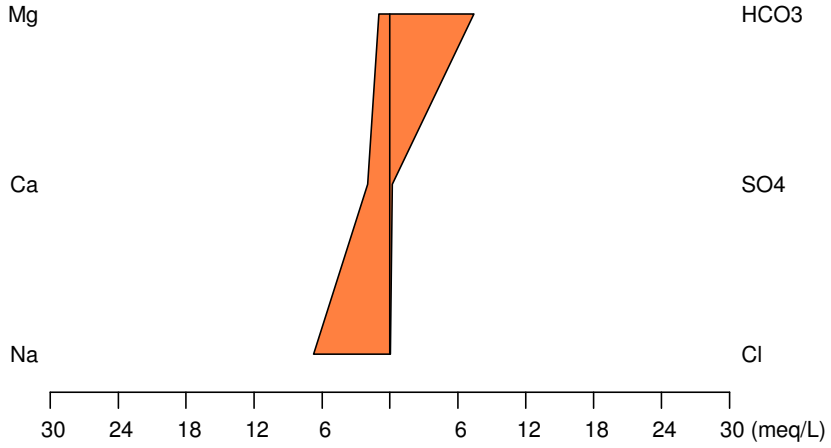


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

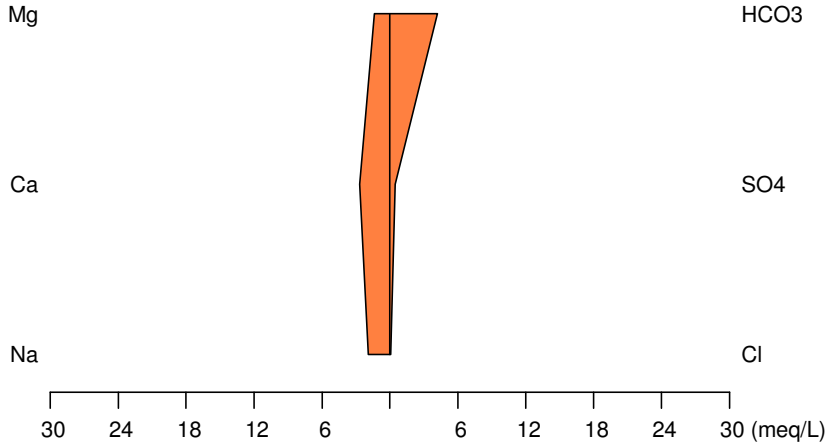
CFMW-032,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 500
El Cond. (uS/cm) =96500



CFMW-033,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 307
El Cond. (uS/cm) =56500

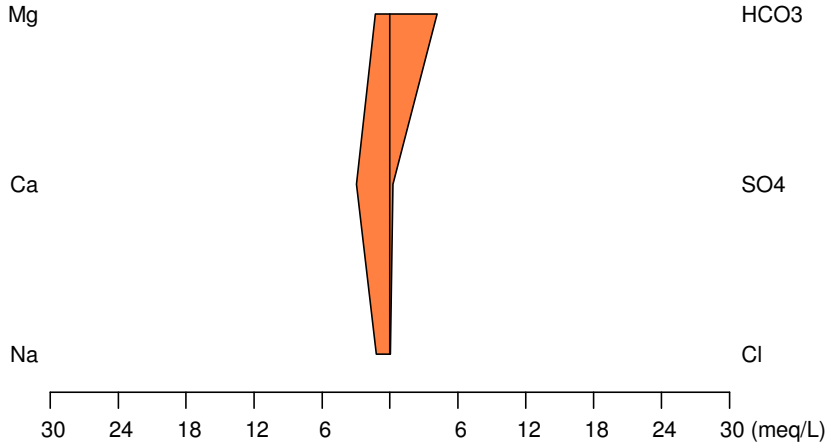


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

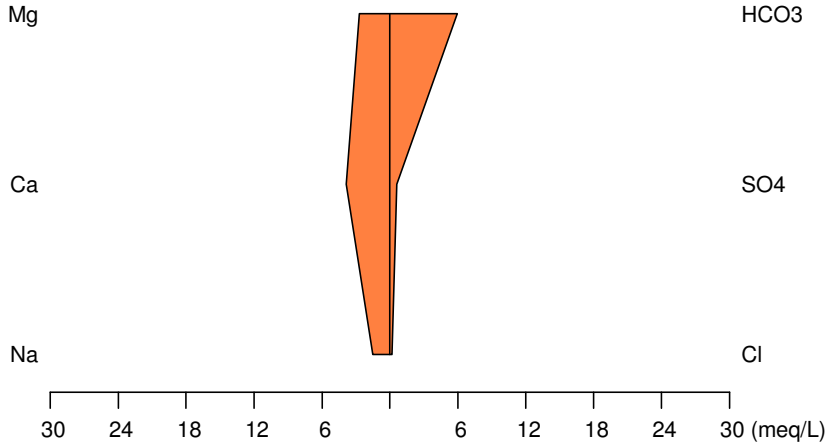
CFMW-034,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 271
El Cond. (uS/cm) =50900



CFMW-035,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 423
El Cond. (uS/cm) =70000

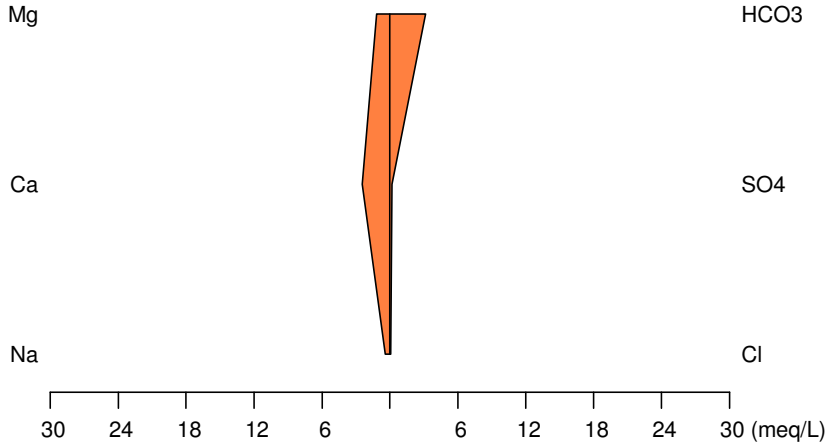


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

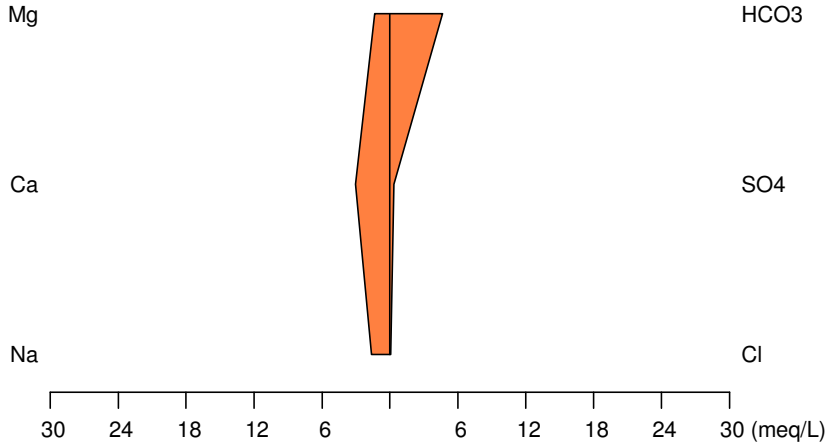
CFMW-037,9/16/2016

Date: 9/16/2016
TDS (mg/l) = 226
El Cond. (uS/cm) =37600



CFMW-038,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 311
El Cond. (uS/cm) =57900

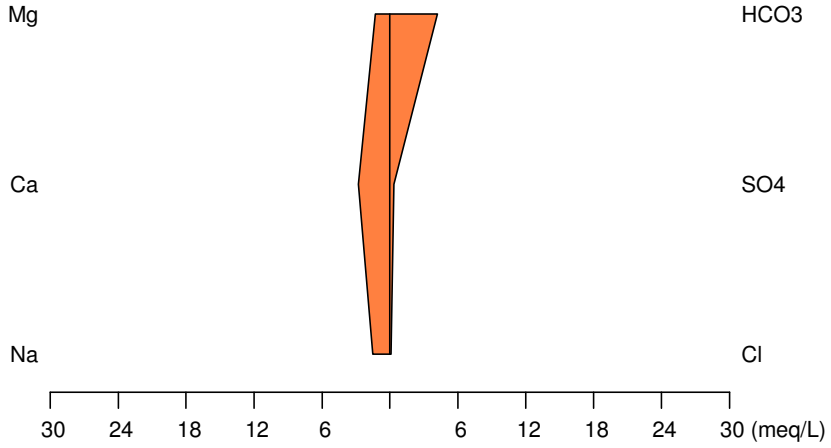


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

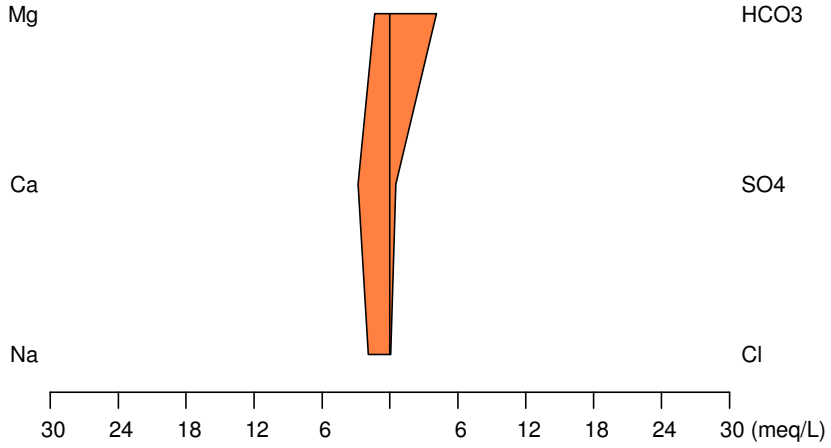
CFMW-040,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 323
El Cond. (uS/cm) =55800



CFMW-042,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 346
El Cond. (uS/cm) =54300

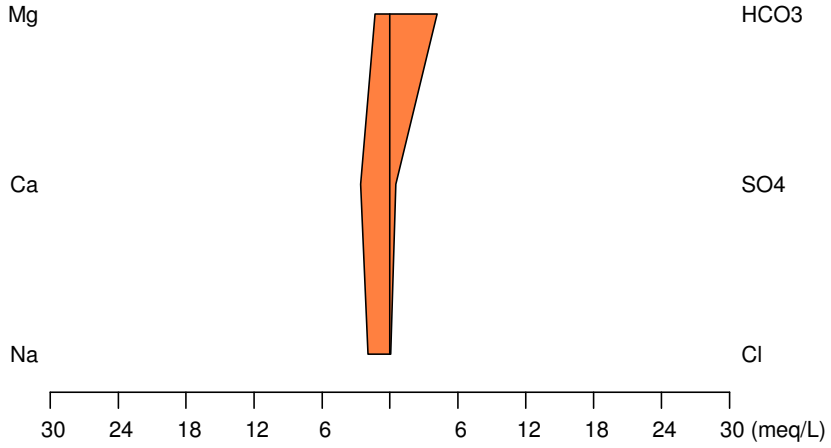


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

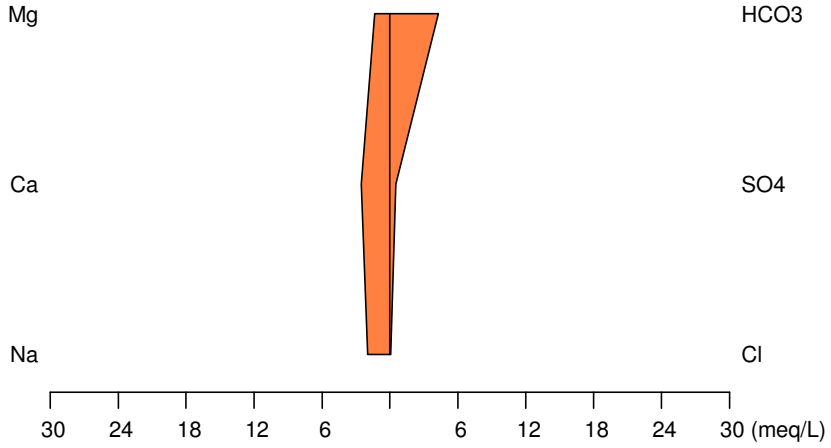
CFMW-043,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 354
El Cond. (uS/cm) =56100



CFMW-044,9/16/2016

Date: 9/16/2016
TDS (mg/l) = 313
El Cond. (uS/cm) =56600

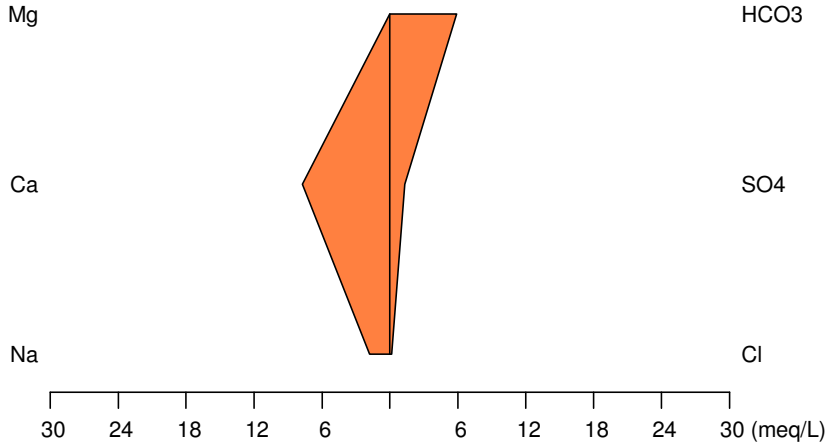


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

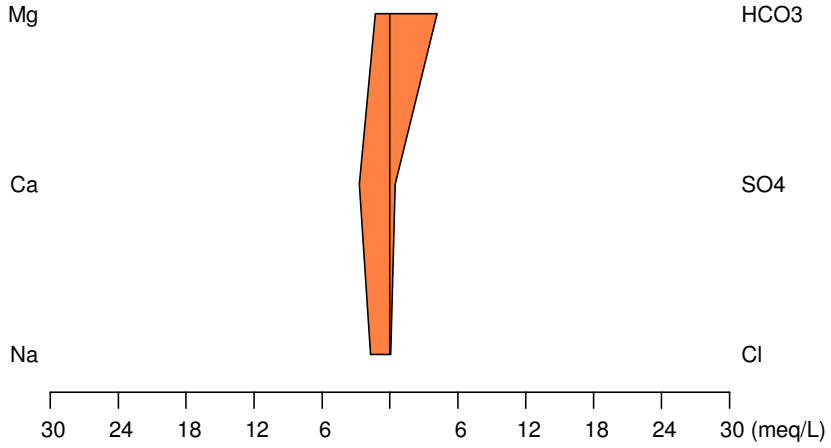
CFMW-044a,9/19/2016

Date: 9/19/2016
TDS (mg/l) = 458
El Cond. (uS/cm) =201000



CFMW-045,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 296
El Cond. (uS/cm) =55200

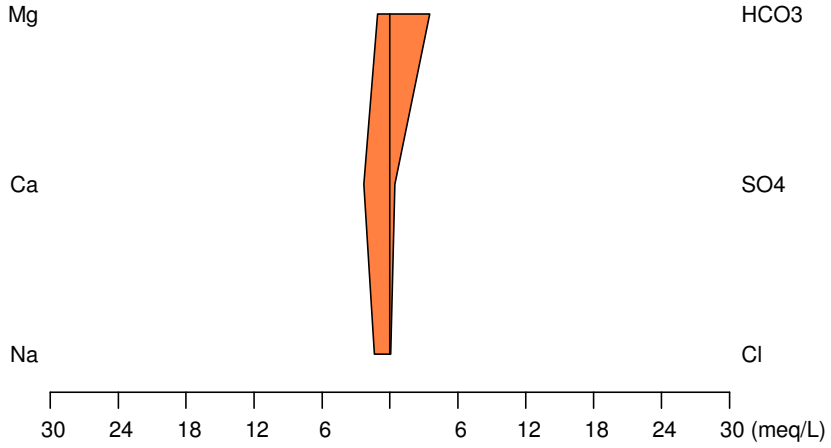


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

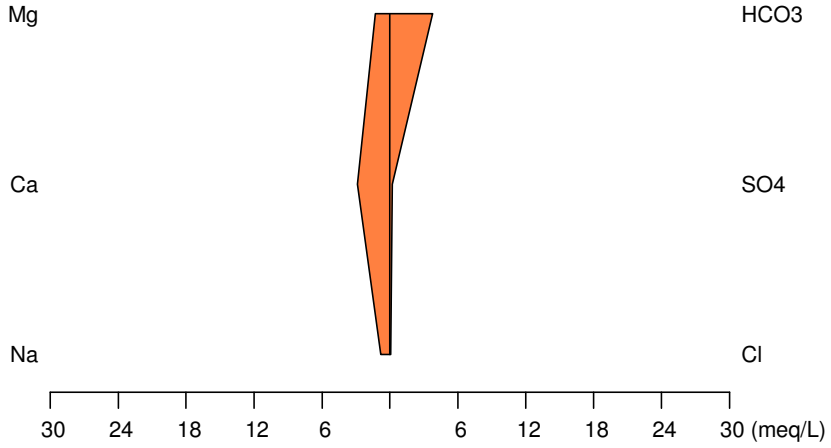
CFMW-045a,9/19/2016

Date: 9/19/2016
TDS (mg/l) = 189
El Cond. (uS/cm) =39400



CFMW-047,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 245
El Cond. (uS/cm) =30800

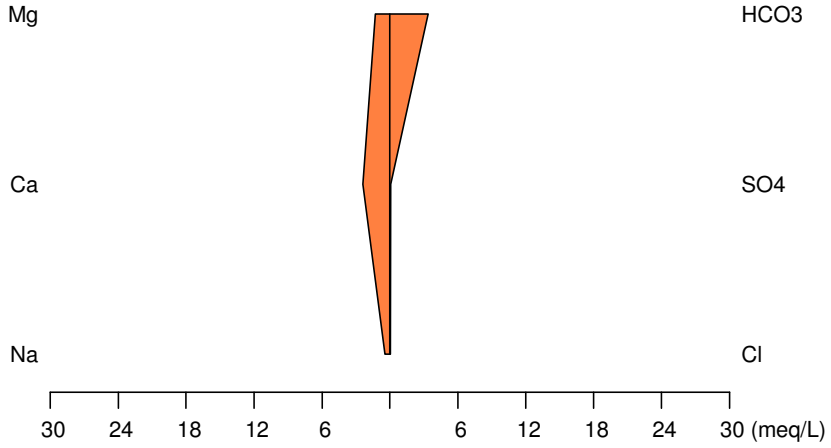


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

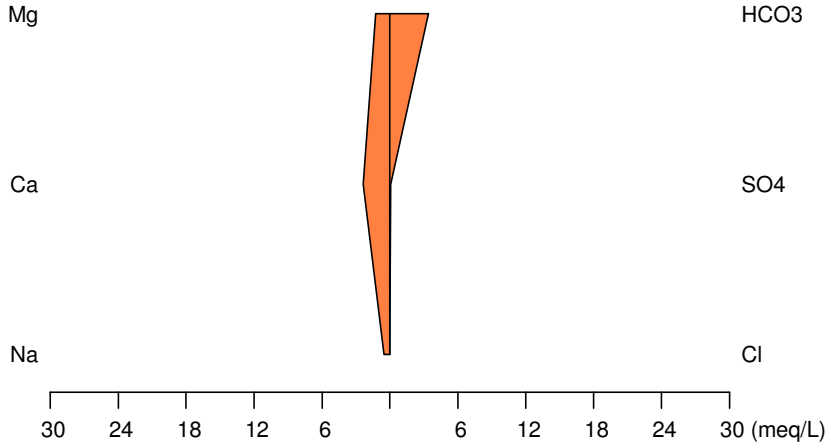
CFMW-049,9/21/2016

Date: 9/21/2016
TDS (mg/l) = 188
El Cond. (uS/cm) =39900



CFMW-050,9/19/2016

Date: 9/19/2016
TDS (mg/l) = 192
El Cond. (uS/cm) =39200

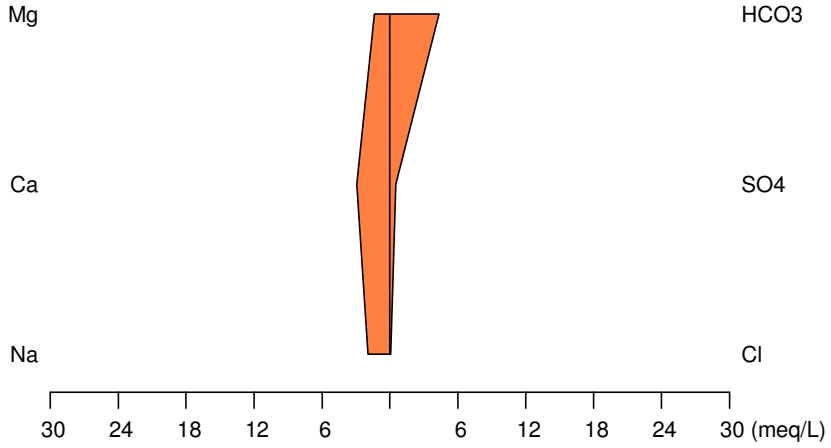


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

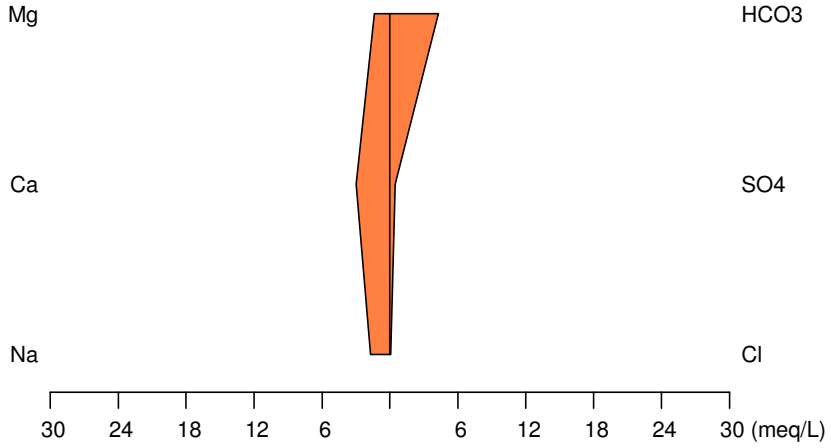
CFMW-053,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 302
El Cond. (uS/cm) =53600



CFMW-054,9/14/2016

Date: 9/14/2016
TDS (mg/l) = 302
El Cond. (uS/cm) =53400

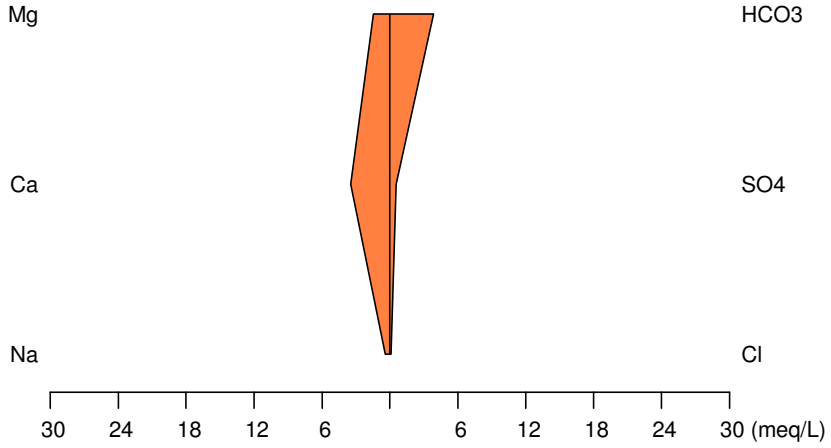


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

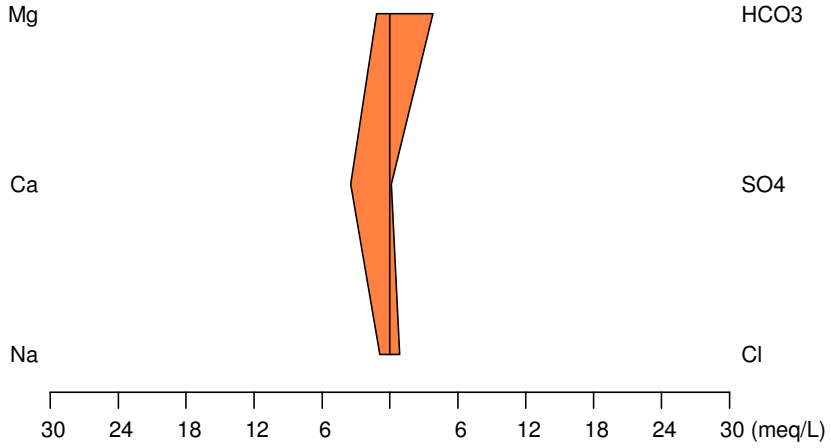
CFMW-056b,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 312
El Cond. (uS/cm) =49500



CFMW-059,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 310
El Cond. (uS/cm) =56300

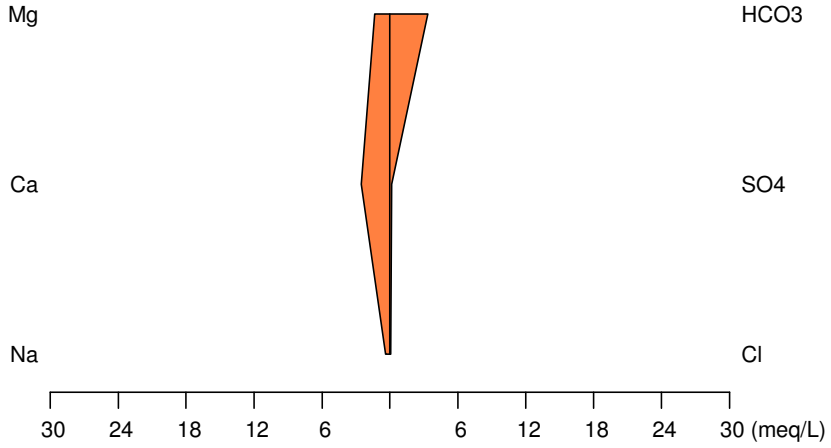


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

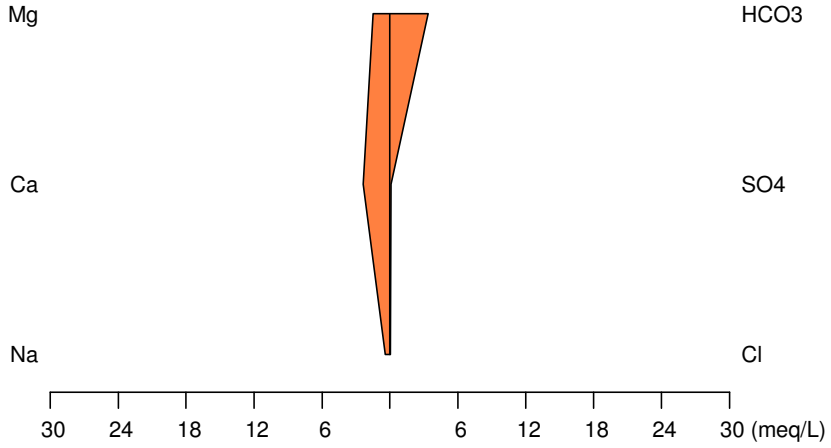
CFMW-061,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 231
El Cond. (uS/cm) =40700



CFMW-064,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 223
El Cond. (uS/cm) =40600

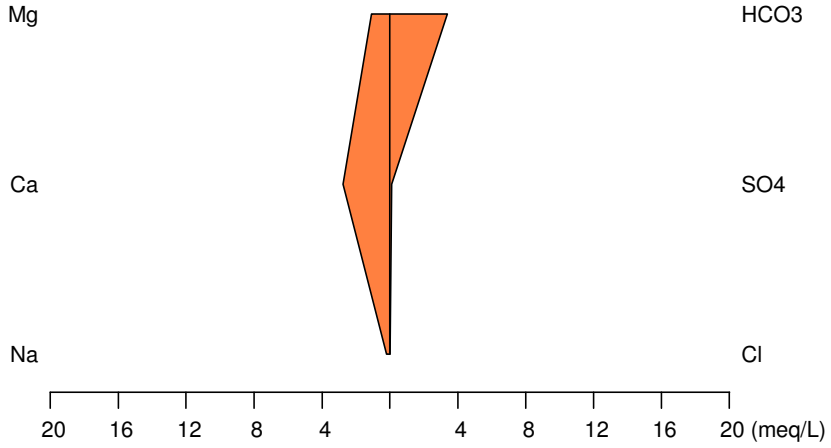


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

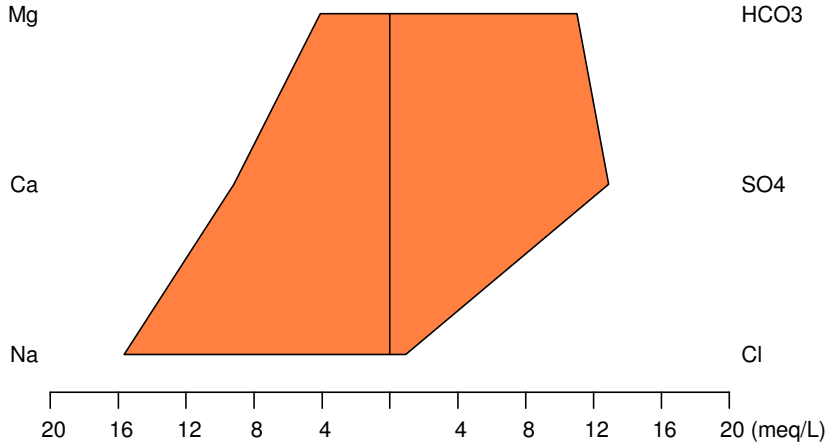
CFMW-001,12/12/2016

Date: 12/12/2016
TDS (mg/l) = 202
El Cond. (uS/cm) =43100



CFMW-003,12/9/2016

Date: 12/9/2016
TDS (mg/l) = 1760
El Cond. (uS/cm) =256000

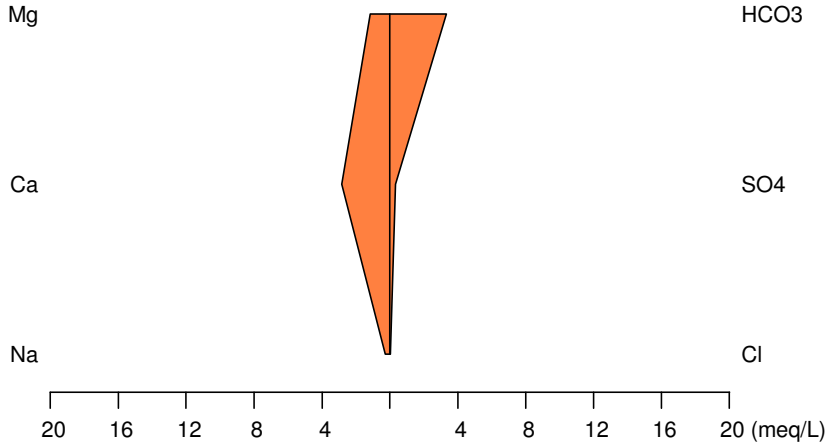


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

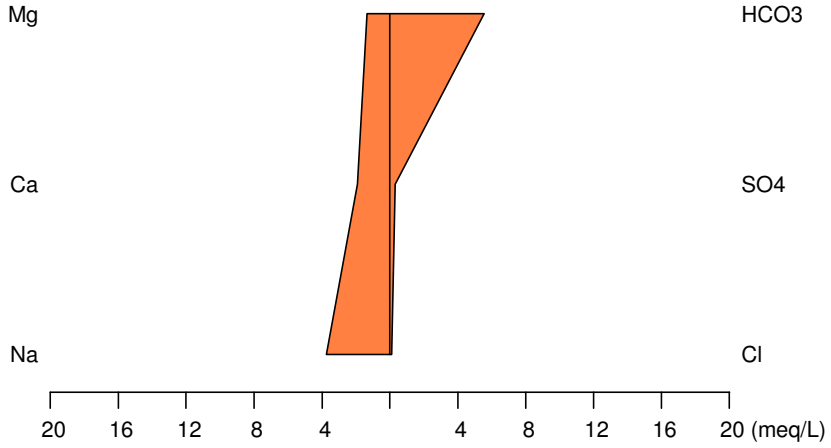
CFMW-007,12/12/2016

Date: 12/12/2016
TDS (mg/l) = 220
El Cond. (uS/cm) =43500



CFMW-008,12/16/2016

Date: 12/16/2016
TDS (mg/l) = 391
El Cond. (uS/cm) =83200

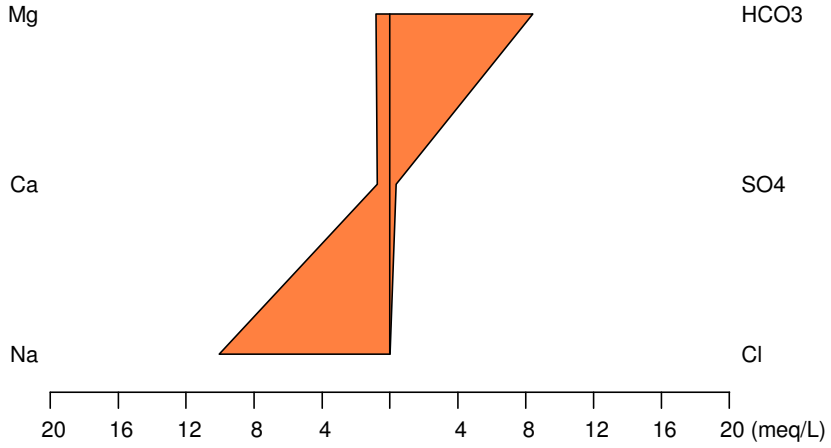


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

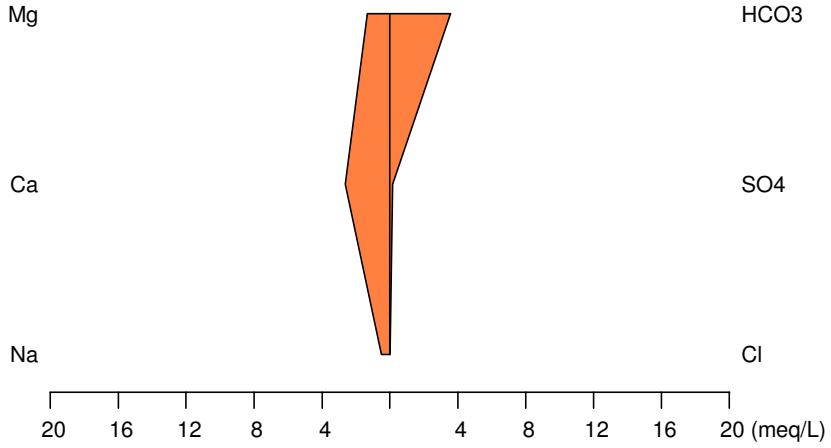
CFMW-010,12/15/2016

Date: 12/15/2016
TDS (mg/l) = 802
El Cond. (uS/cm) =106000



CFMW-011,12/8/2016

Date: 12/8/2016
TDS (mg/l) = 193
El Cond. (uS/cm) =45100

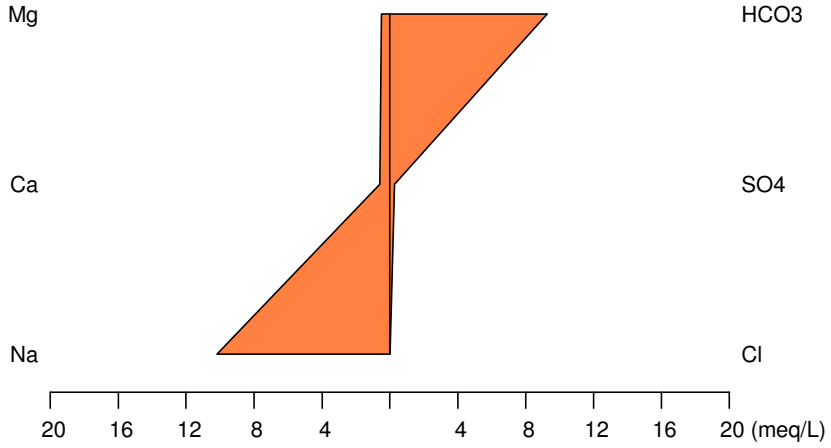


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

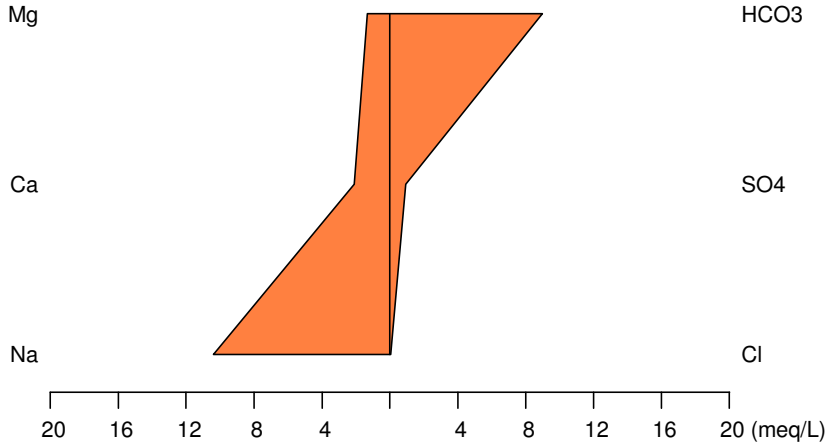
CFMW-012,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 688
El Cond. (uS/cm) =114000



CFMW-014,12/15/2016

Date: 12/15/2016
TDS (mg/l) = 854
El Cond. (uS/cm) =138000

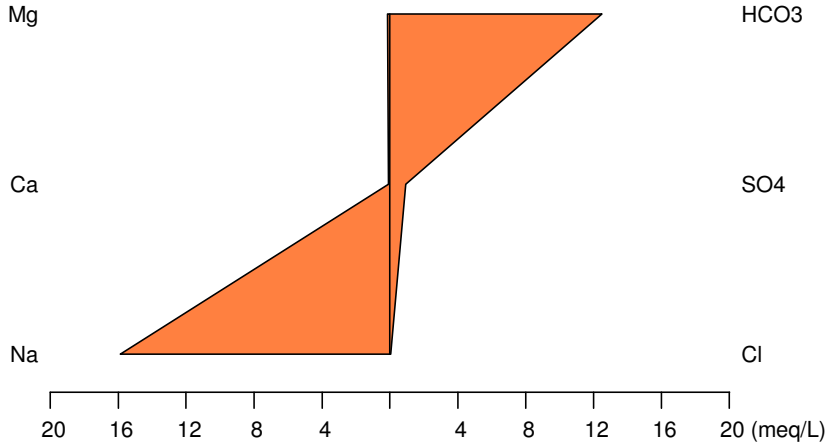


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

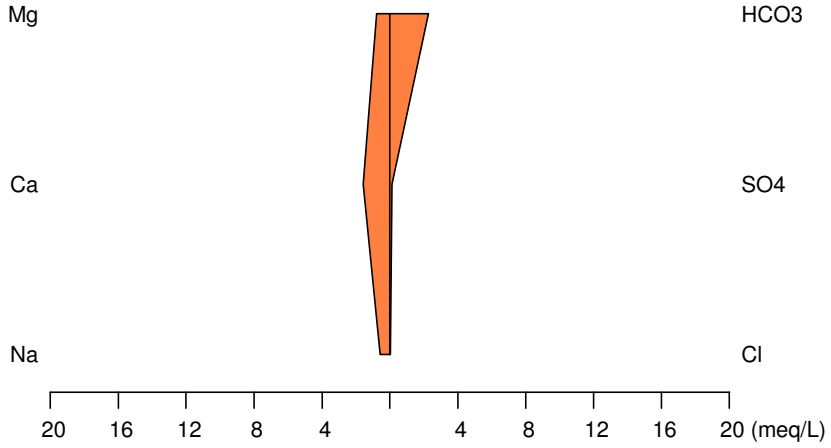
CFMW-015,12/15/2016

Date: 12/15/2016
TDS (mg/l) = 1020
El Cond. (uS/cm) =176000



CFMW-016a,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 163
El Cond. (uS/cm) =31900

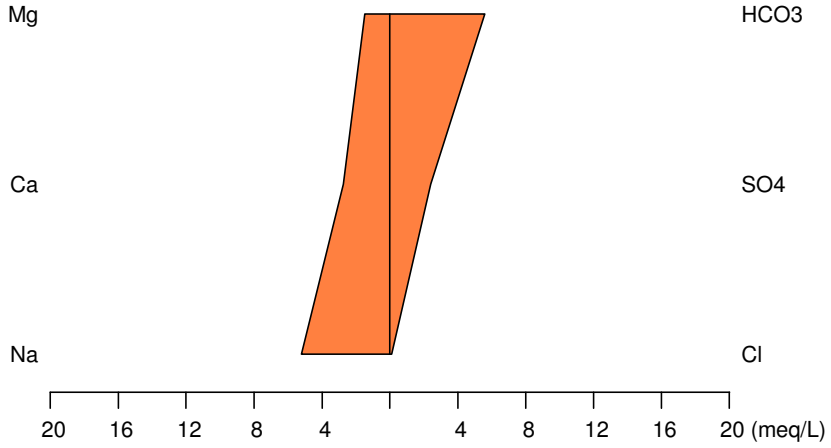


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

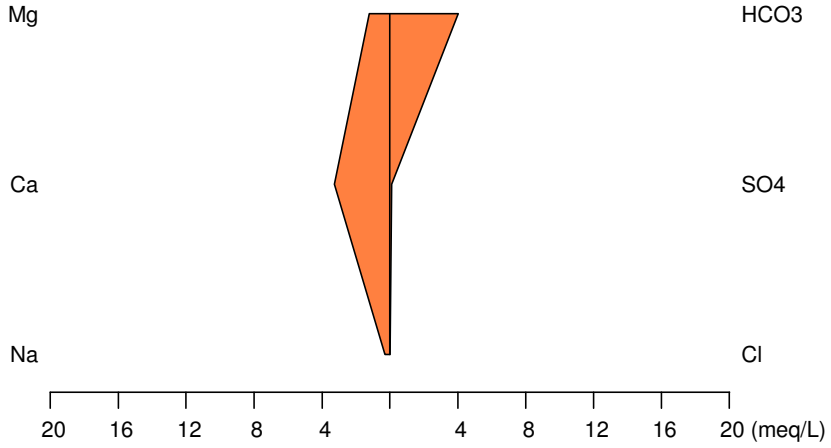
CFMW-019,12/15/2016

Date: 12/15/2016
TDS (mg/l) = 606
El Cond. (uS/cm) =96200



CFMW-020,12/13/2016

Date: 12/13/2016
TDS (mg/l) = 262
El Cond. (uS/cm) =49100

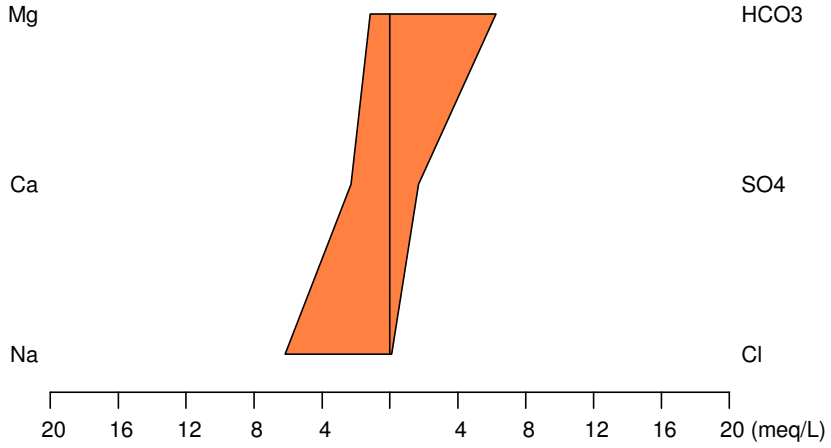


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

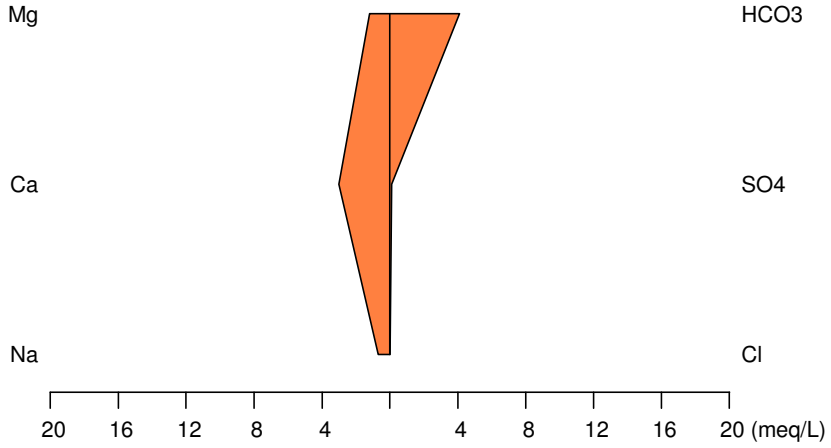
CFMW-021,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 540
El Cond. (uS/cm) =92700



CFMW-022,12/9/2016

Date: 12/9/2016
TDS (mg/l) = 256
El Cond. (uS/cm) =51400

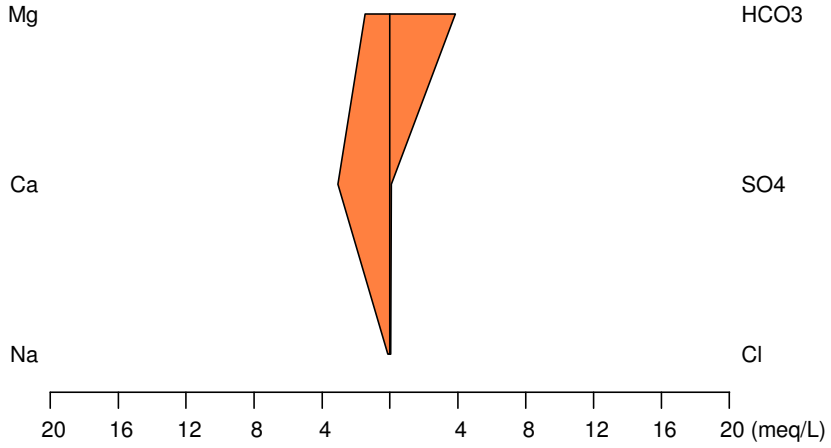


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

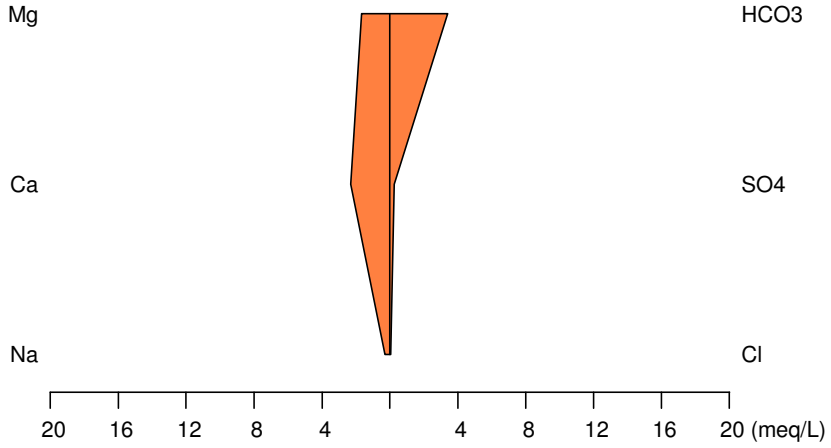
CFMW-023,12/19/2016

Date: 12/19/2016
TDS (mg/l) = 253
El Cond. (uS/cm) =38500



CFMW-025b,12/7/2016

Date: 12/7/2016
TDS (mg/l) = 222
El Cond. (uS/cm) =40200

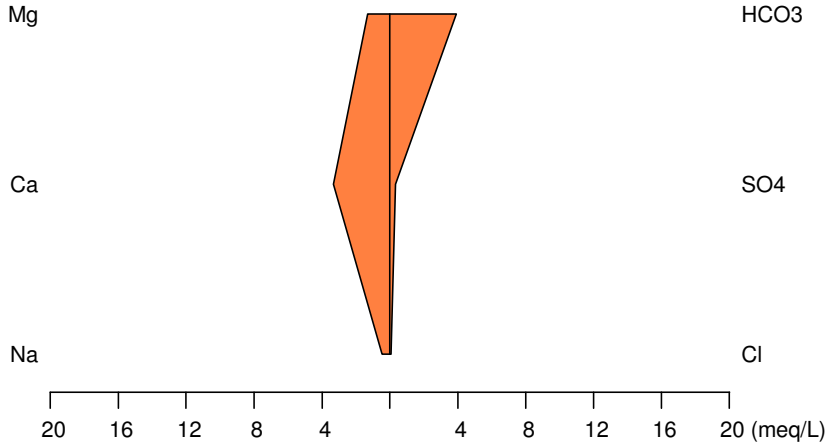


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

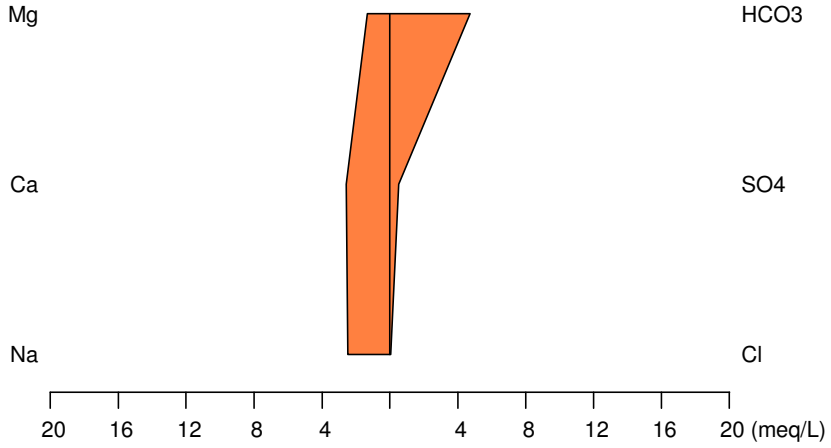
CFMW-026,12/5/2016

Date: 12/5/2016
TDS (mg/l) = 259
El Cond. (uS/cm) =52300



CFMW-027,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 358
El Cond. (uS/cm) =62600

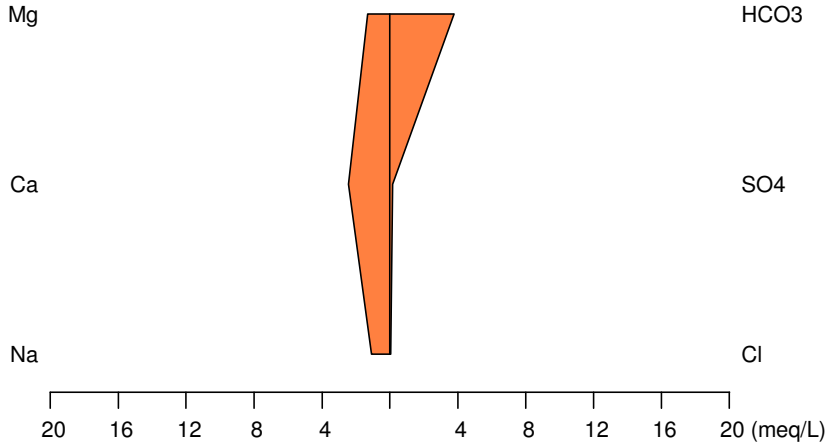


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

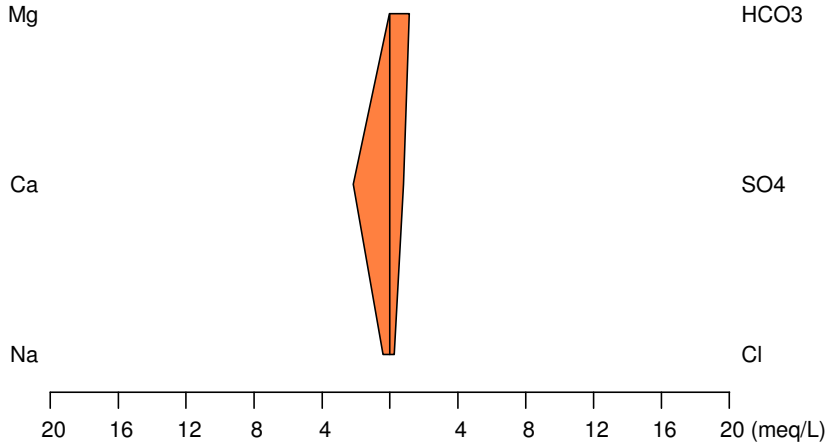
CFMW-028,12/5/2016

Date: 12/5/2016
TDS (mg/l) = 246
El Cond. (uS/cm) =49600



CFMW-028a,12/9/2016

Date: 12/9/2016
TDS (mg/l) = 166
El Cond. (uS/cm) =46400

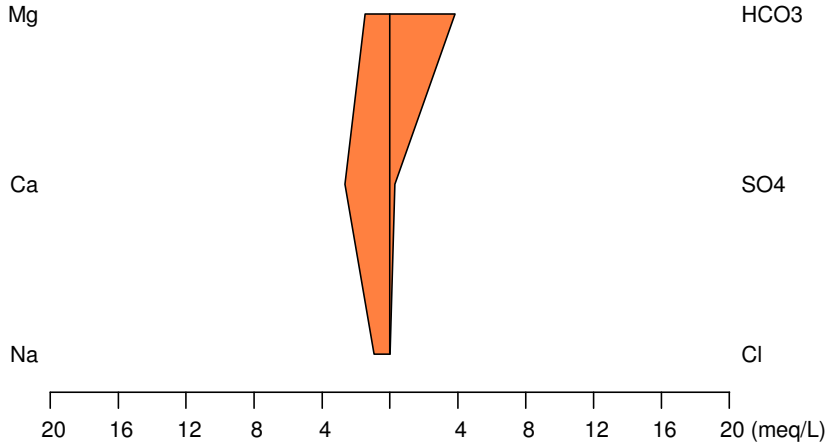


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

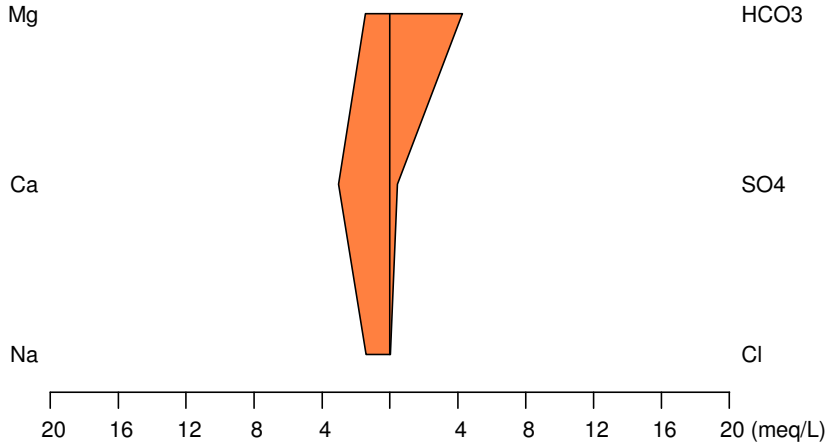
CFMW-029,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 274
El Cond. (uS/cm) =47600



CFMW-031,12/9/2016

Date: 12/9/2016
TDS (mg/l) = 311
El Cond. (uS/cm) =59500

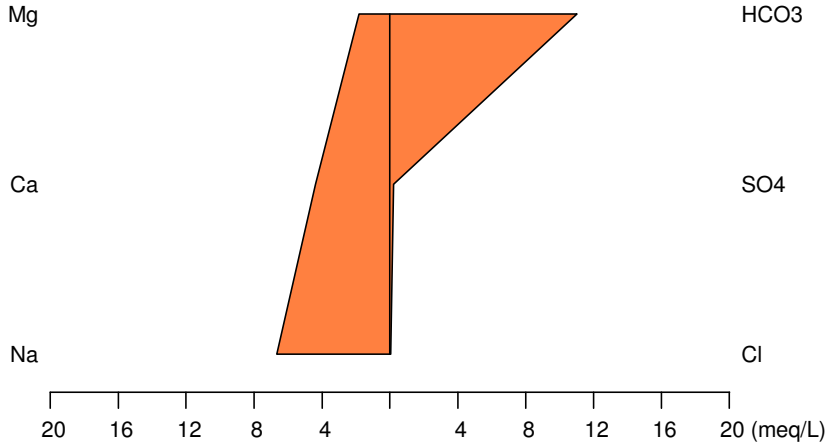


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

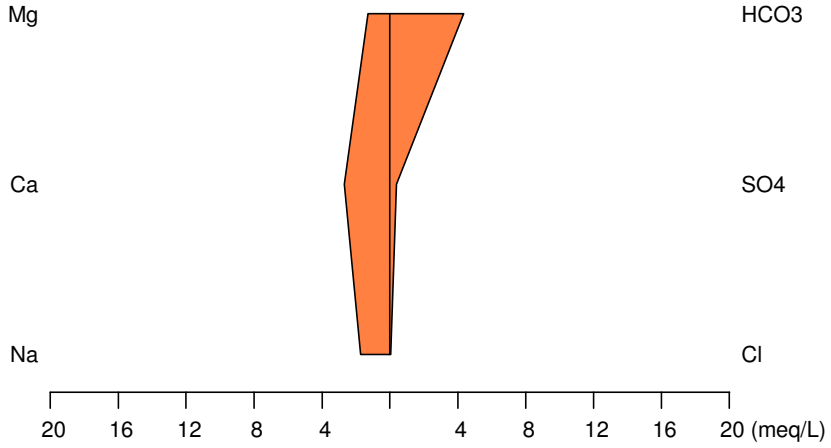
CFMW-032,12/13/2016

Date: 12/13/2016
TDS (mg/l) = 662
El Cond. (uS/cm) =122000



CFMW-033,12/6/2016

Date: 12/6/2016
TDS (mg/l) = 303
El Cond. (uS/cm) =59900

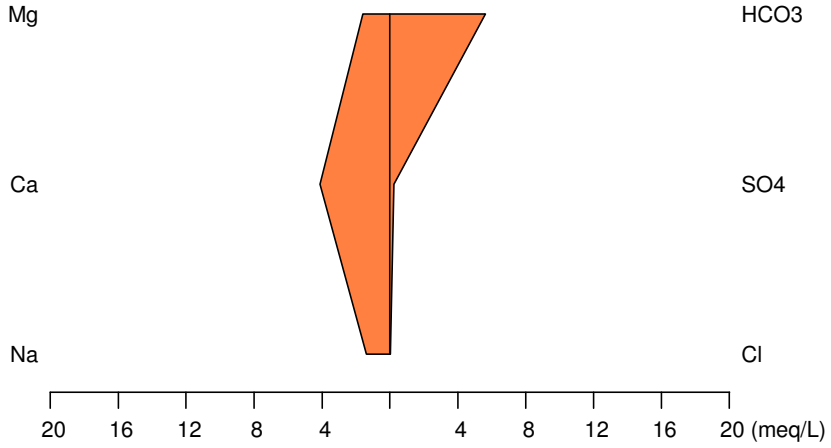


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

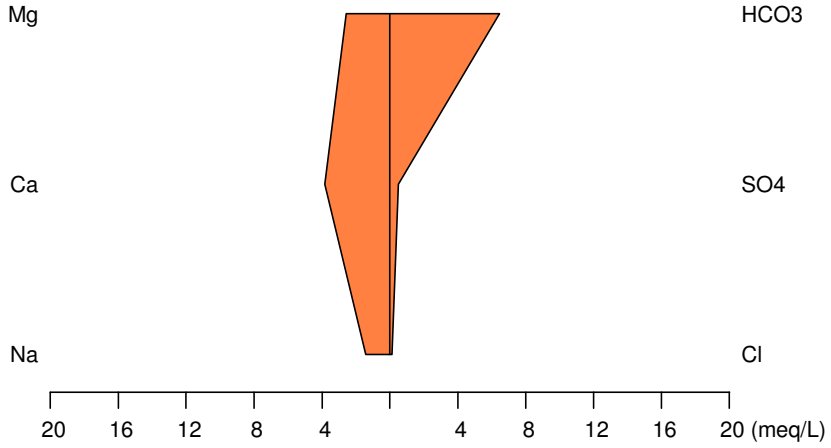
CFMW-034,12/13/2016

Date: 12/13/2016
TDS (mg/l) = 383
El Cond. (uS/cm) =67600



CFMW-035,12/13/2016

Date: 12/13/2016
TDS (mg/l) = 417
El Cond. (uS/cm) =74500

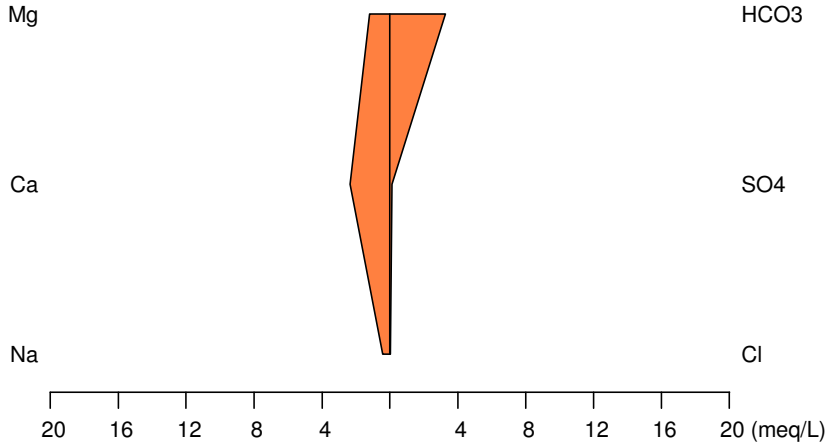


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

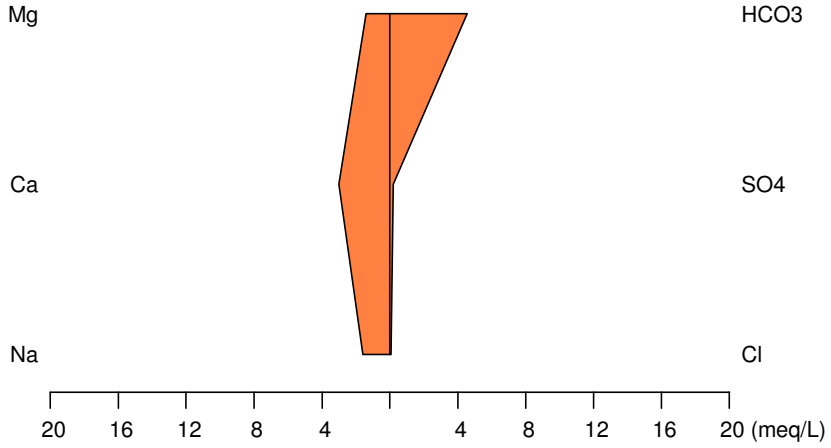
CFMW-037,12/8/2016

Date: 12/8/2016
TDS (mg/l) = 193
El Cond. (uS/cm) =40100



CFMW-038,12/9/2016

Date: 12/9/2016
TDS (mg/l) = 308
El Cond. (uS/cm) =56800

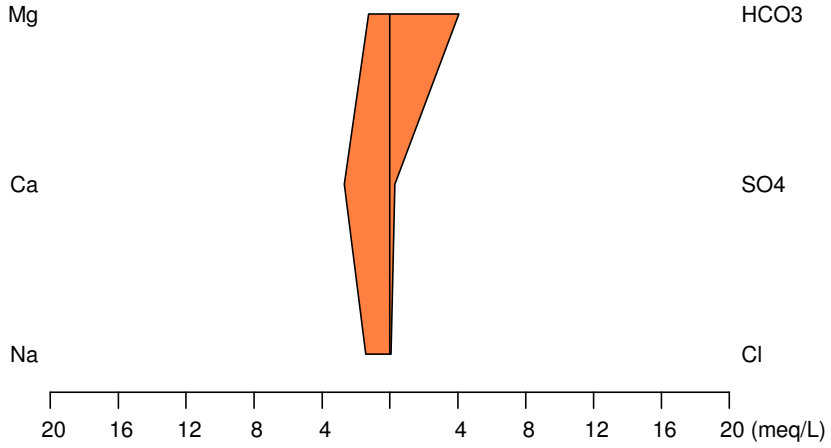


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

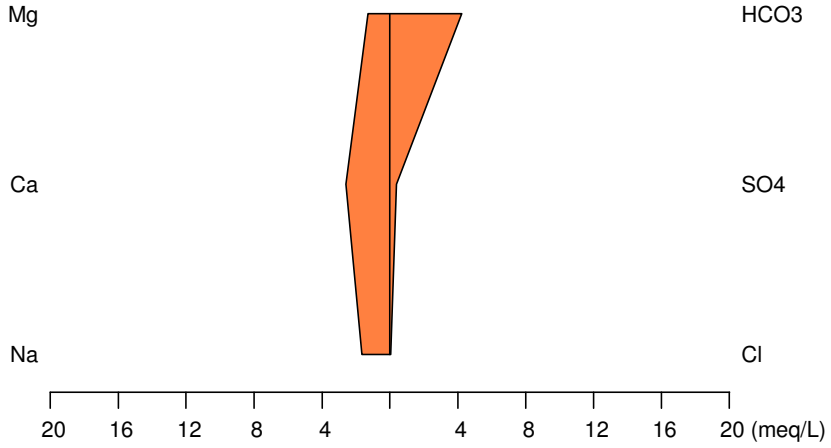
CFMW-040,12/13/2016

Date: 12/13/2016
TDS (mg/l) = 304
El Cond. (uS/cm) =52200



CFMW-043,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 323
El Cond. (uS/cm) =56200

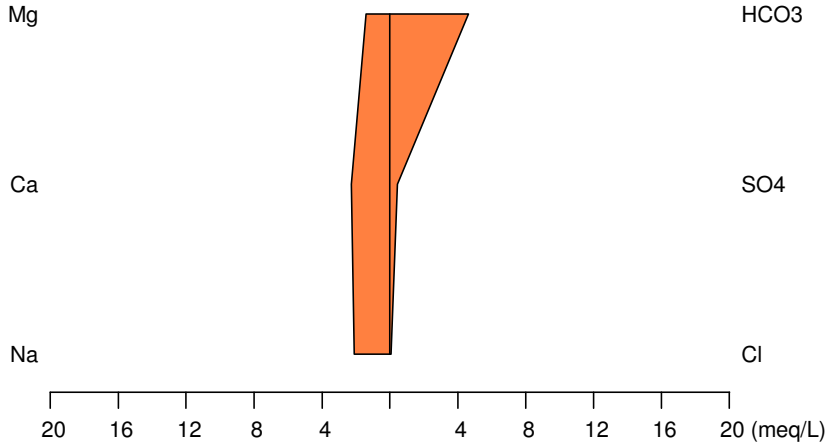


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

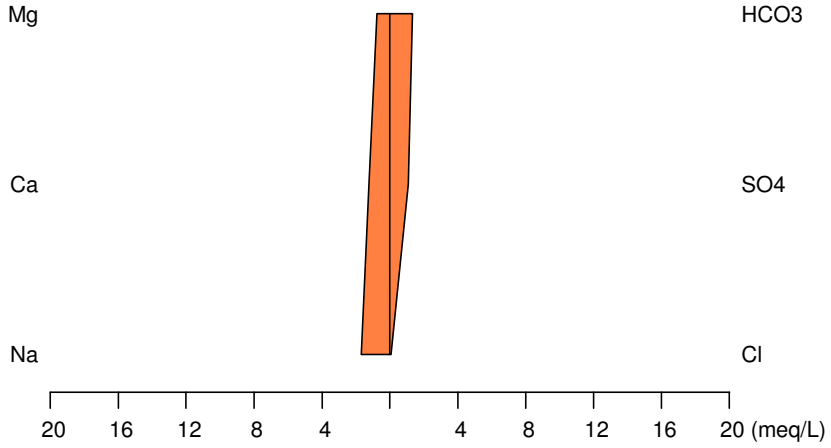
CFMW-044,12/9/2016

Date: 12/9/2016
TDS (mg/l) = 296
El Cond. (uS/cm) =66400



CFMW-044a,12/19/2016

Date: 12/19/2016
TDS (mg/l) = 215
El Cond. (uS/cm) =31200

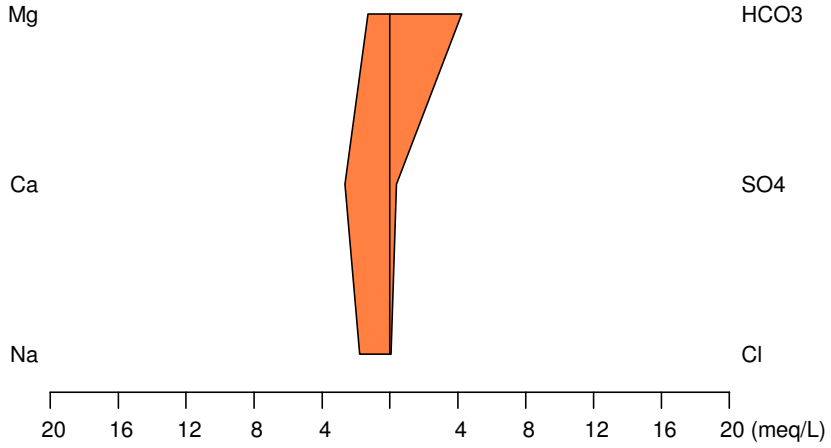


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

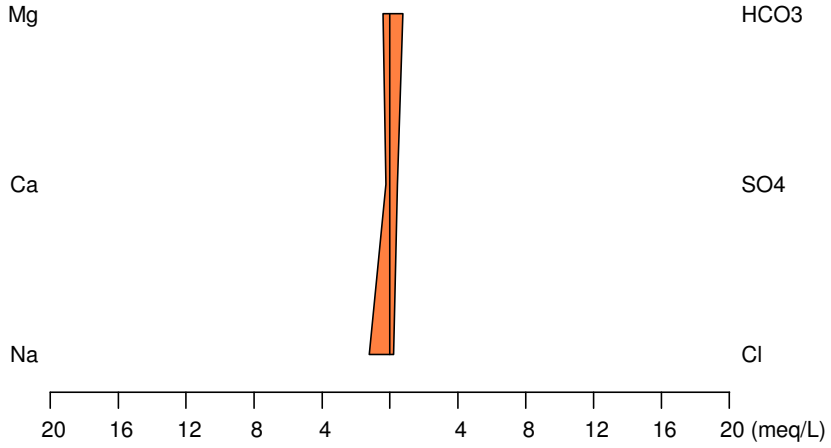
CFMW-045,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 323
El Cond. (uS/cm) =59500



CFMW-045a,12/9/2016

Date: 12/9/2016
TDS (mg/l) = 97
El Cond. (uS/cm) =25000

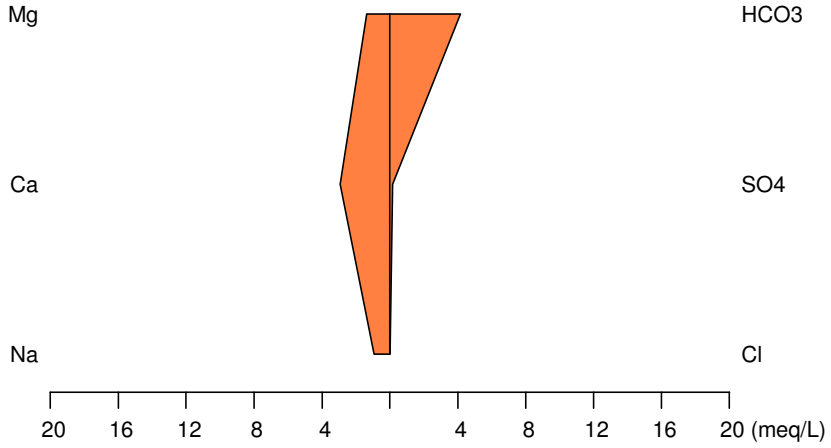


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

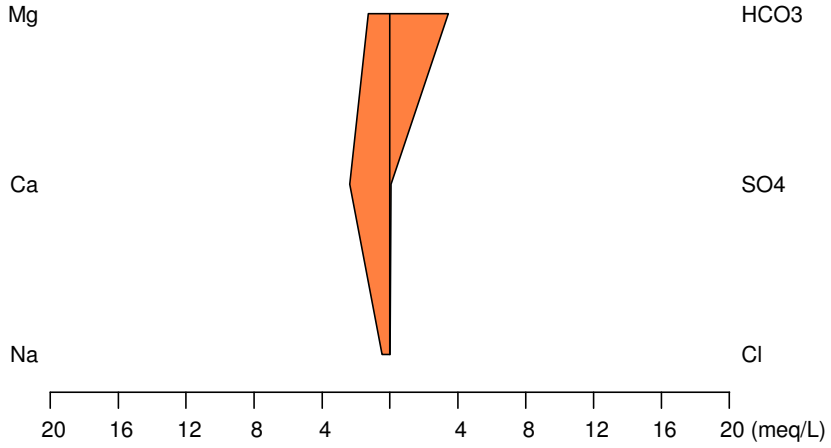
CFMW-047,12/15/2016

Date: 12/15/2016
TDS (mg/l) = 302
El Cond. (uS/cm) =53200



CFMW-049,12/15/2016

Date: 12/15/2016
TDS (mg/l) = 221
El Cond. (uS/cm) =41500

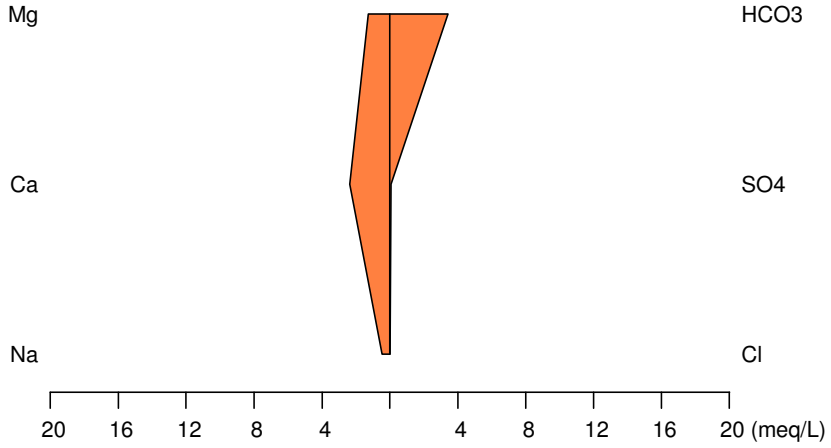


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

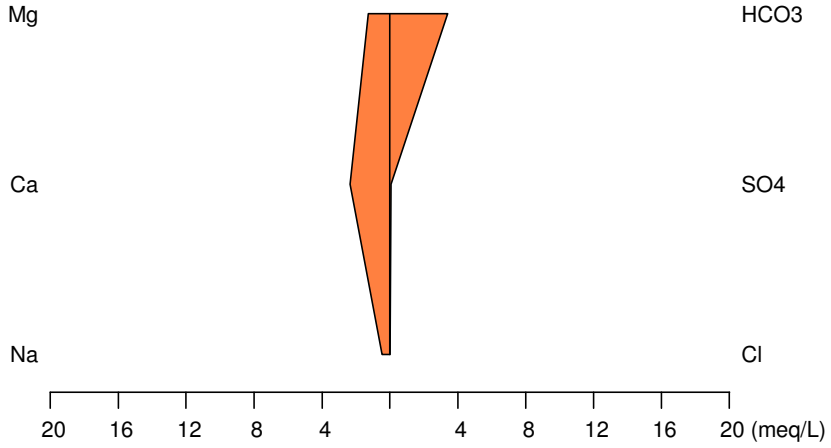
CFMW-049,12/15/2016

Date: 12/15/2016
TDS (mg/l) = 230
El Cond. (uS/cm) =41500



CFMW-050,12/15/2016

Date: 12/15/2016
TDS (mg/l) = 230
El Cond. (uS/cm) =41500

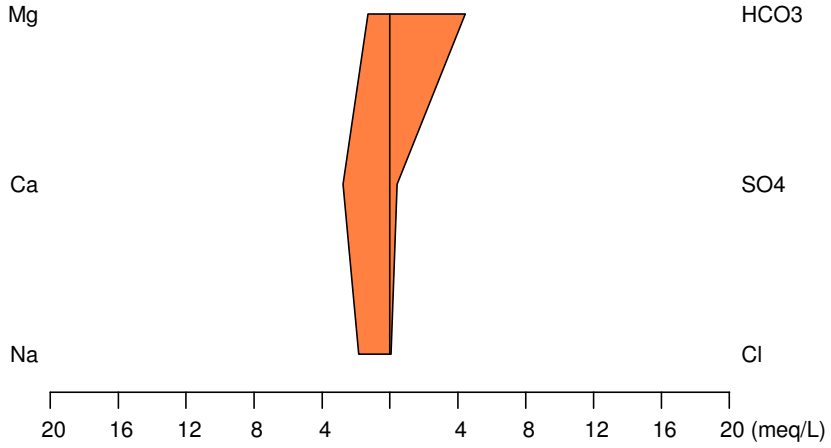


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

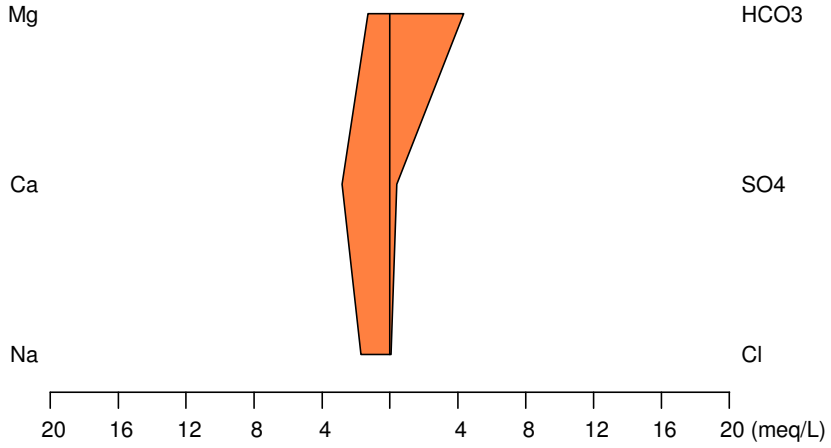
CFMW-053,12/12/2016

Date: 12/12/2016
TDS (mg/l) = 310
El Cond. (uS/cm) =57700



CFMW-054,12/12/2016

Date: 12/12/2016
TDS (mg/l) = 321
El Cond. (uS/cm) =55800

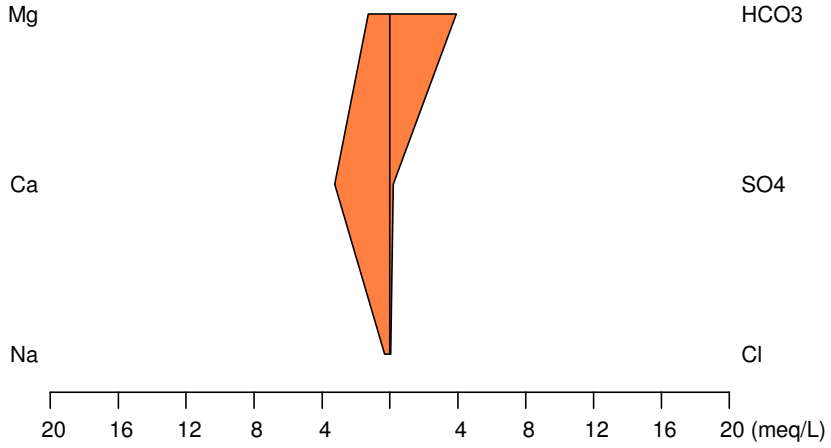


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

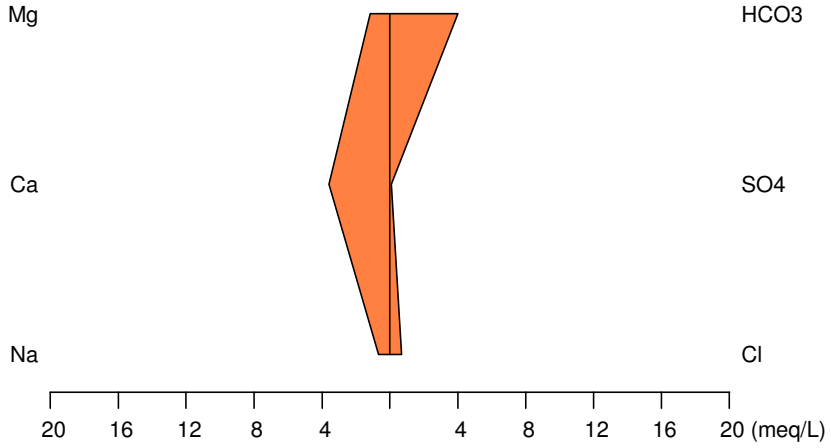
CFMW-056b,12/12/2016

Date: 12/12/2016
TDS (mg/l) = 238
El Cond. (uS/cm) =47000



CFMW-059,12/12/2016

Date: 12/12/2016
TDS (mg/l) = 306
El Cond. (uS/cm) =55800

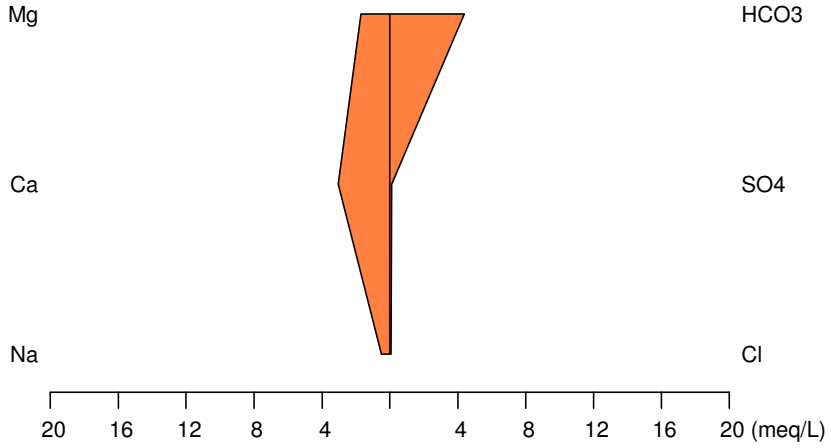


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

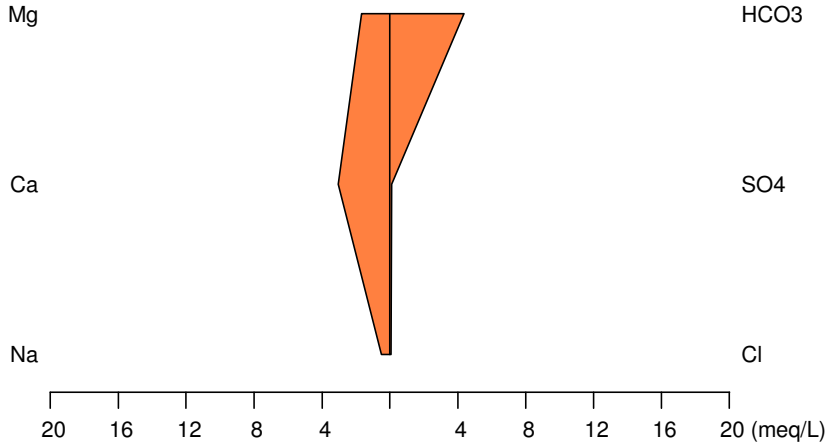
CFMW-061,12/7/2016

Date: 12/7/2016
TDS (mg/l) = 296
El Cond. (uS/cm) =52600



CFMW-061,12/7/2016

Date: 12/7/2016
TDS (mg/l) = 266
El Cond. (uS/cm) =52600

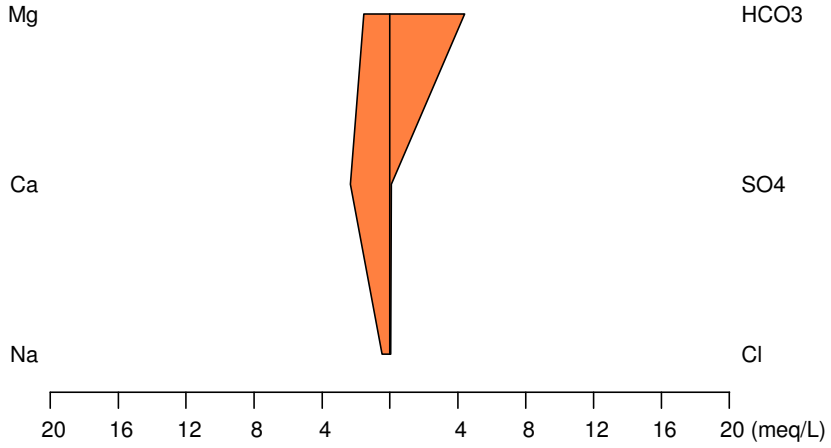


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

CFMW-064,12/7/2016

Date: 12/7/2016
TDS (mg/l) = 183
El Cond. (uS/cm) =43400

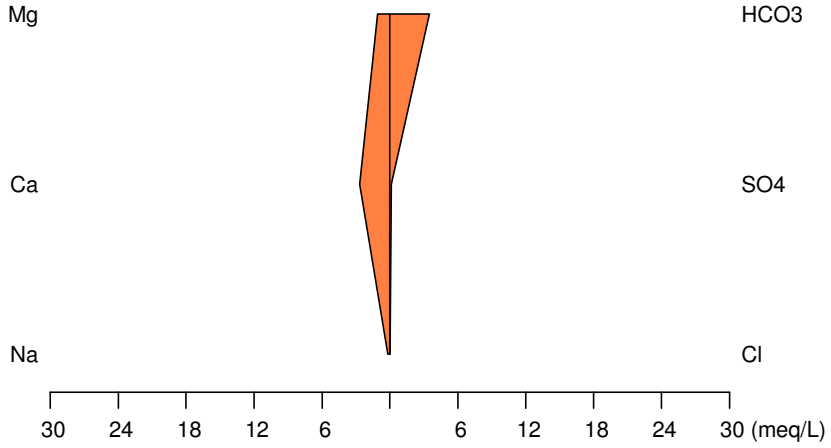


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

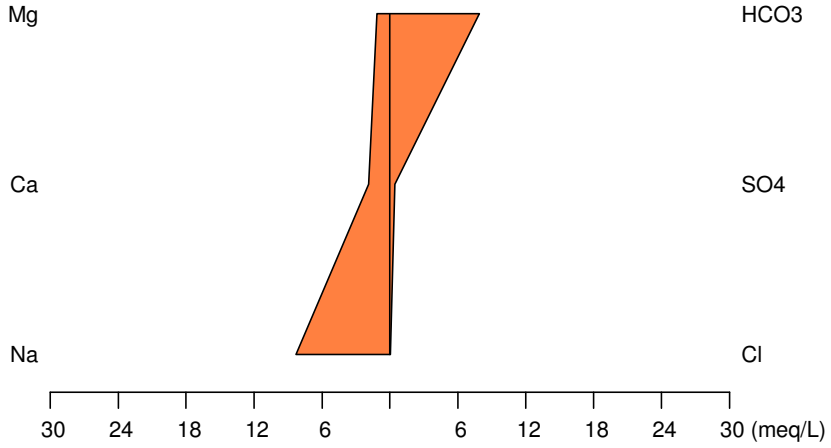
CFMW-001,3/20/2017

Date: 3/20/2017
TDS (mg/l) = 174
El Cond. (uS/cm) =174000



CFMW-002,3/24/2017

Date: 3/24/2017
TDS (mg/l) = 704
El Cond. (uS/cm) =704000

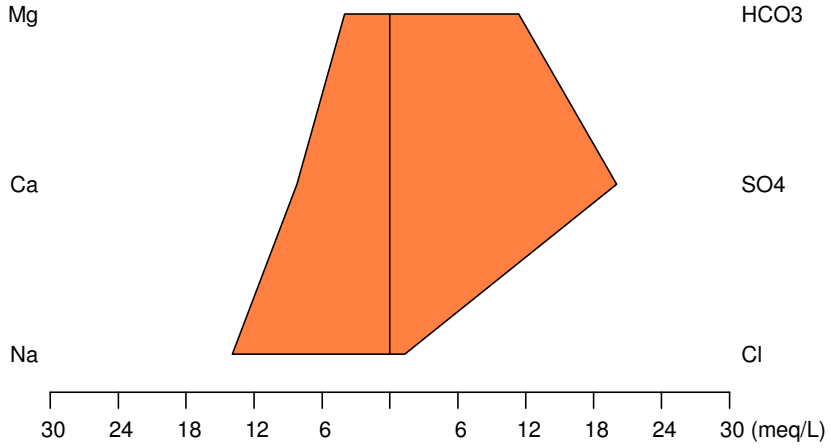


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

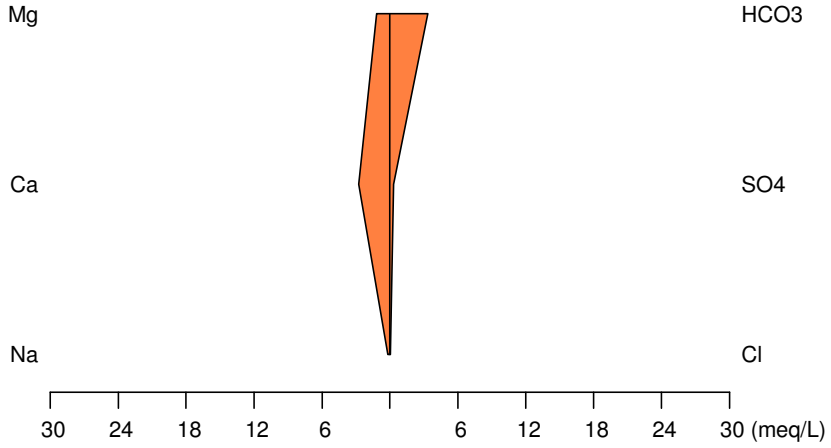
CFMW-003,3/22/2017

Date: 3/22/2017
TDS (mg/l) = 1950
El Cond. (uS/cm) =1950000



CFMW-007,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 242
El Cond. (uS/cm) =242000

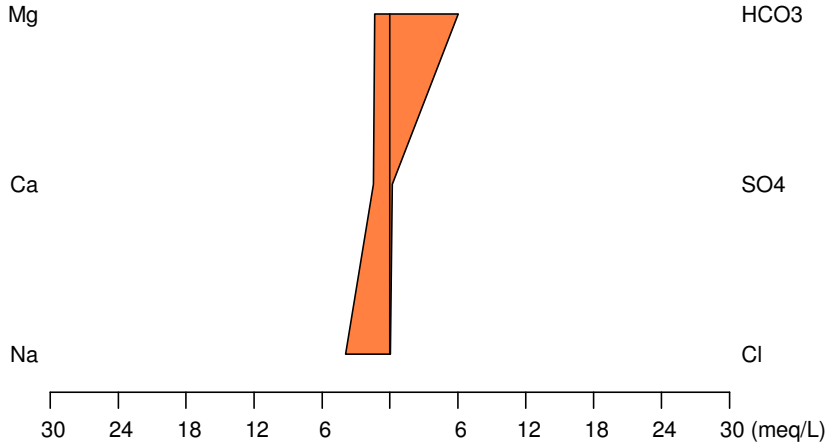


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

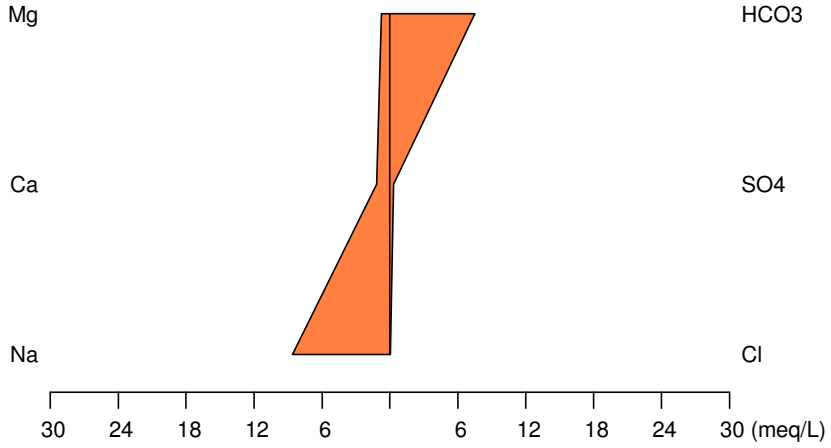
CFMW-008,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 396
El Cond. (uS/cm) =396000



CFMW-010,3/24/2017

Date: 3/24/2017
TDS (mg/l) = 632
El Cond. (uS/cm) =632000

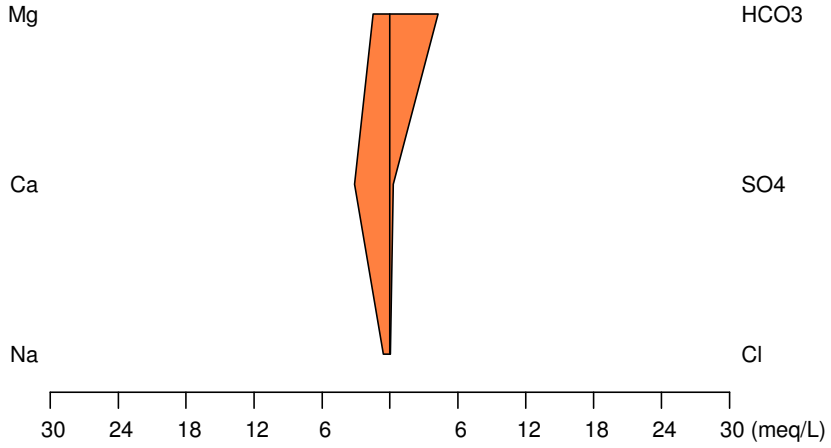


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

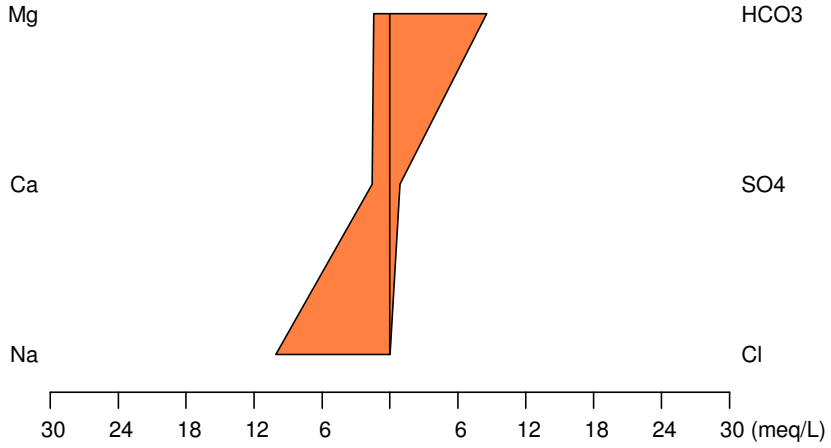
CFMW-011,3/27/2017

Date: 3/27/2017
TDS (mg/l) = 270
El Cond. (uS/cm) =270000



CFMW-012,3/22/2017

Date: 3/22/2017
TDS (mg/l) = 836
El Cond. (uS/cm) =836000

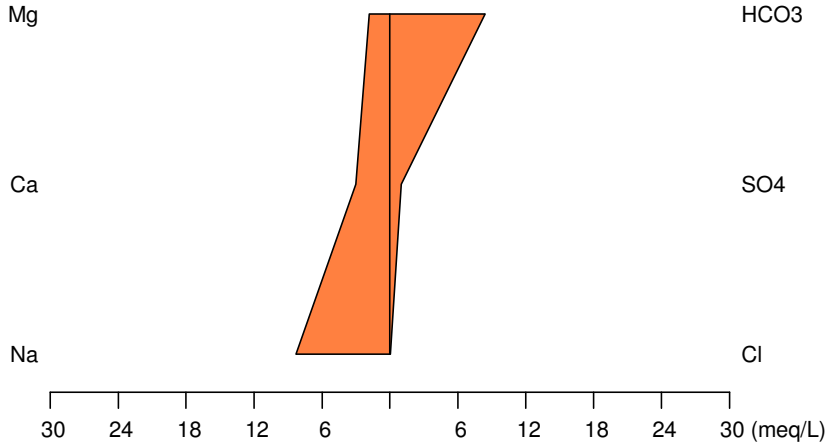


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

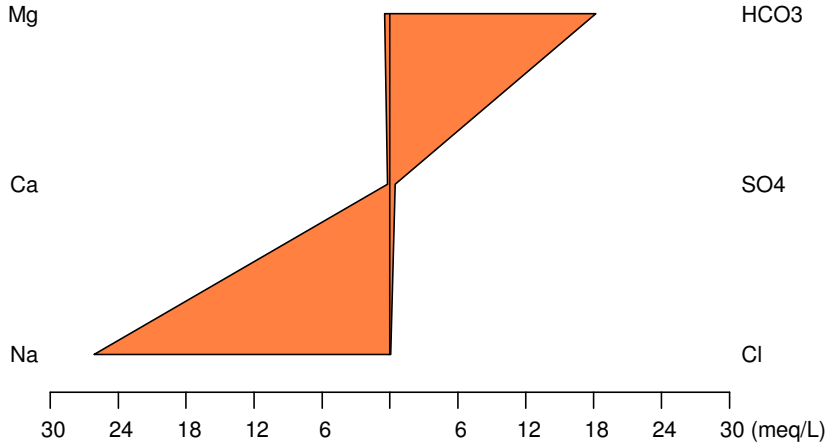
CFMW-014,3/29/2017

Date: 3/29/2017
TDS (mg/l) = 772
El Cond. (uS/cm) =772000



CFMW-015,3/29/2017

Date: 3/29/2017
TDS (mg/l) = 1650
El Cond. (uS/cm) =1650000

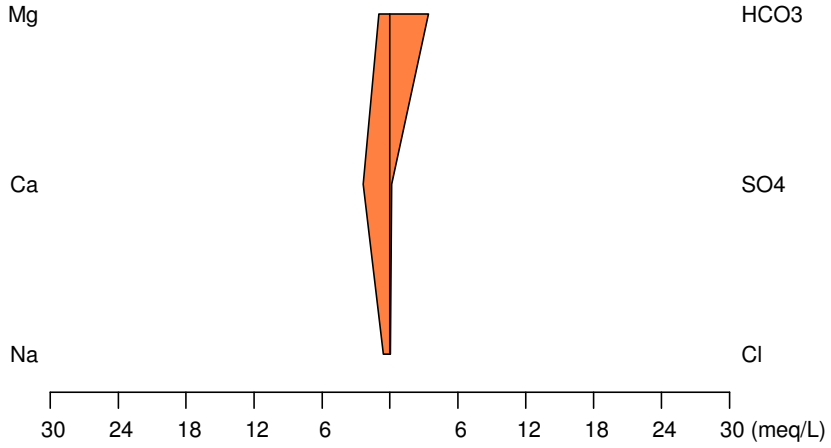


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

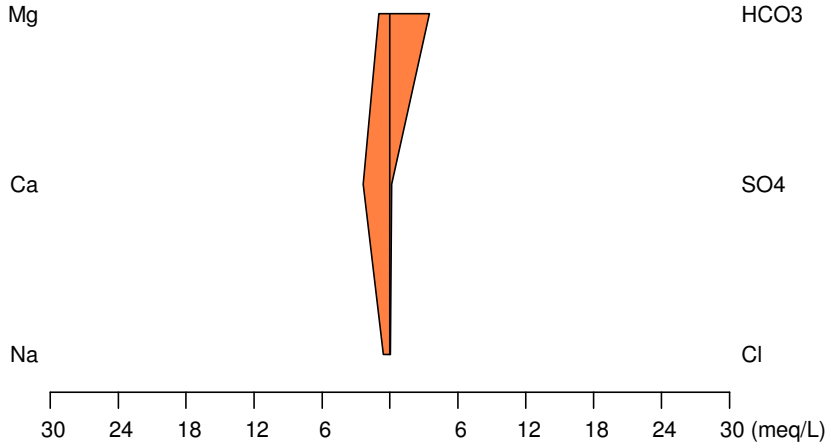
CFMW-016,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 235
El Cond. (uS/cm) =235000



CFMW-016,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 234
El Cond. (uS/cm) =234000

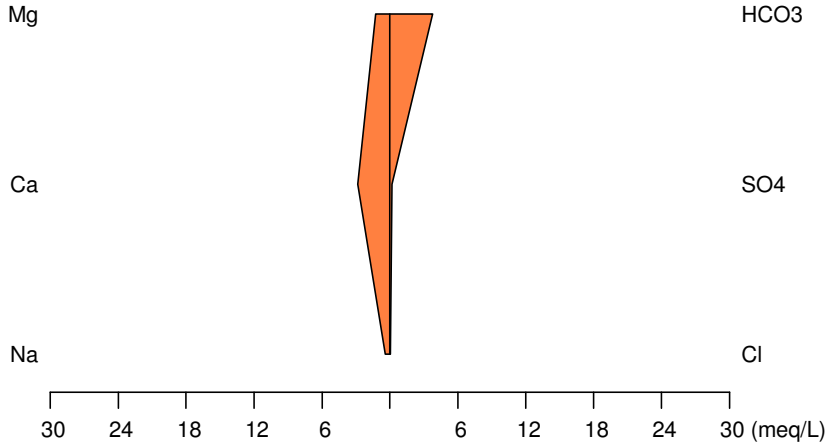


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

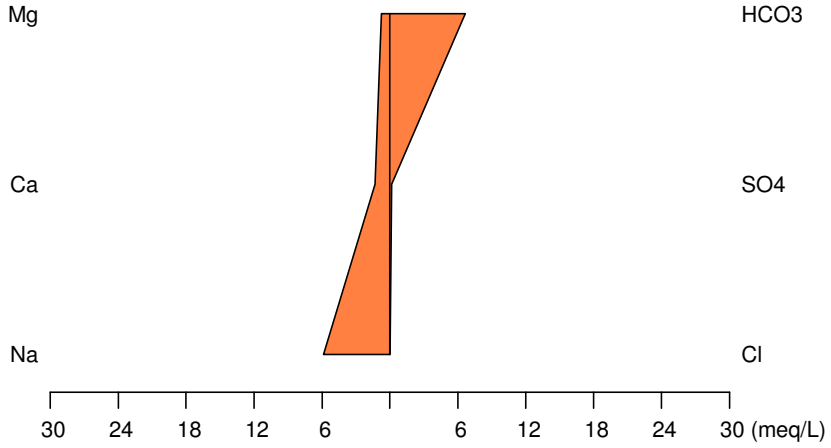
CFMW-016a,3/27/2017

Date: 3/27/2017
TDS (mg/l) = 252
El Cond. (uS/cm) =252000



CFMW-017,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 516
El Cond. (uS/cm) =516000

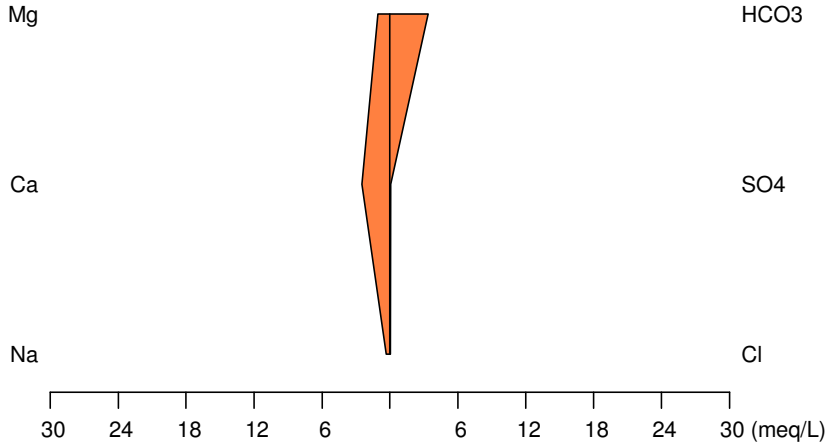


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

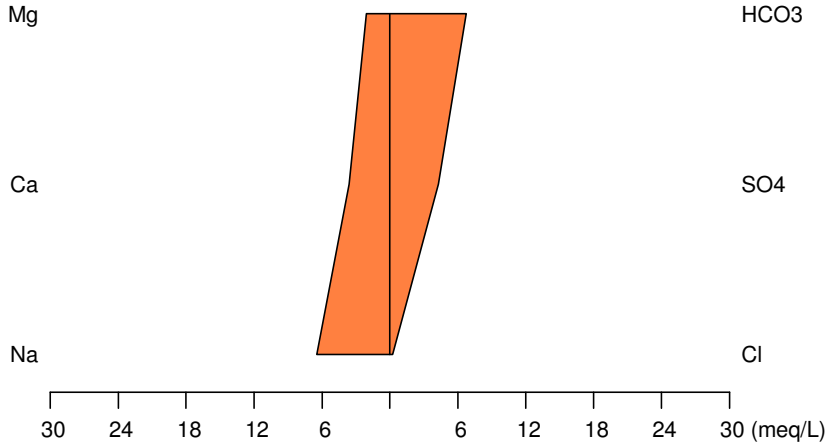
CFMW-018,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 220
El Cond. (uS/cm) =220000



CFMW-019,3/29/2017

Date: 3/29/2017
TDS (mg/l) = 756
El Cond. (uS/cm) =756000

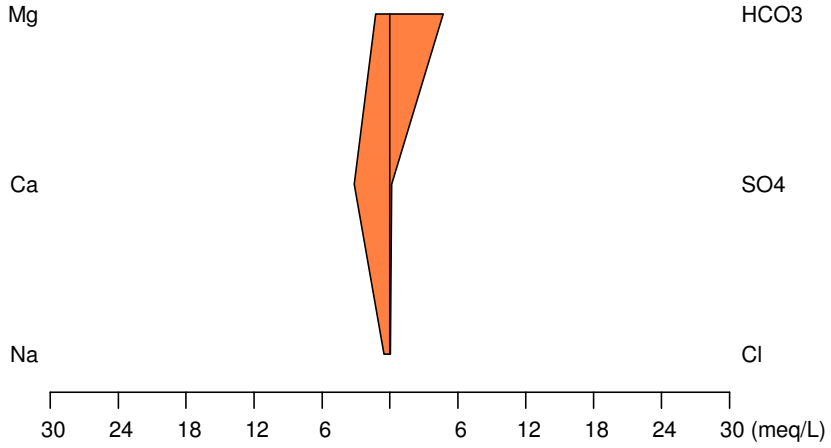


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

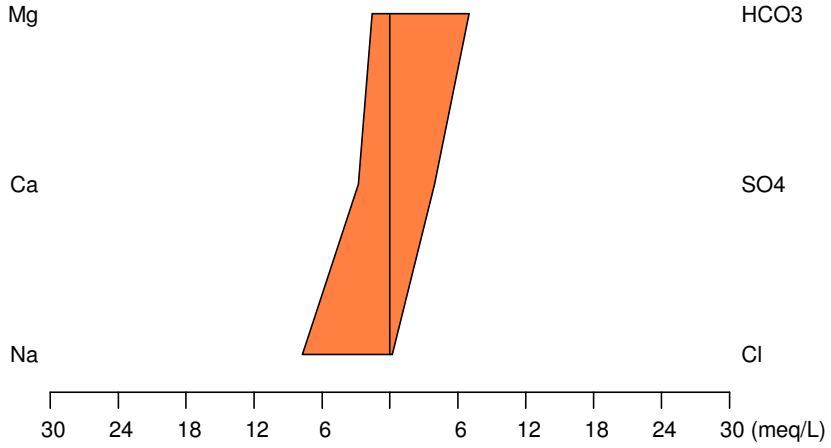
CFMW-020,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 304
El Cond. (uS/cm) =304000



CFMW-021,3/29/2017

Date: 3/29/2017
TDS (mg/l) = 756
El Cond. (uS/cm) =756000

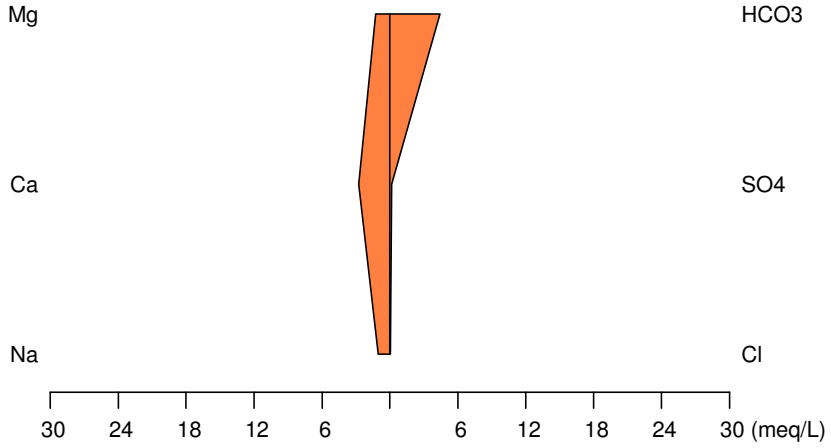


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

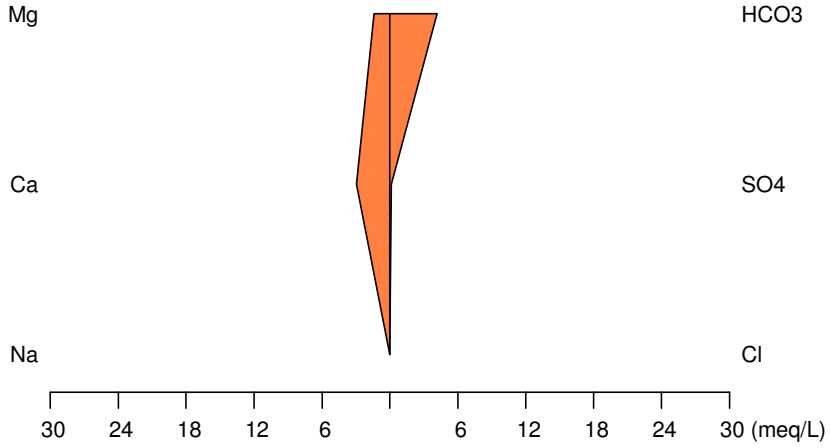
CFMW-022,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 301
El Cond. (uS/cm) =301000



CFMW-023,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 266
El Cond. (uS/cm) =266000

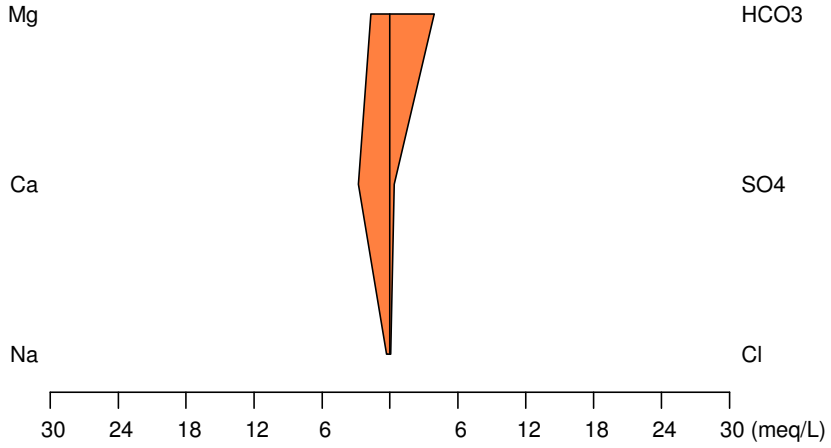


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

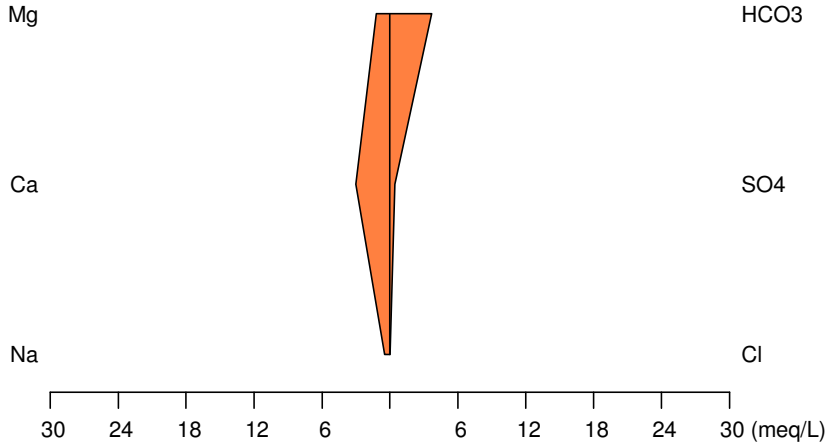
CFMW-025b,3/20/2017

Date: 3/20/2017
TDS (mg/l) = 230
El Cond. (uS/cm) =230000



CFMW-026,3/20/2017

Date: 3/20/2017
TDS (mg/l) = 217
El Cond. (uS/cm) =217000

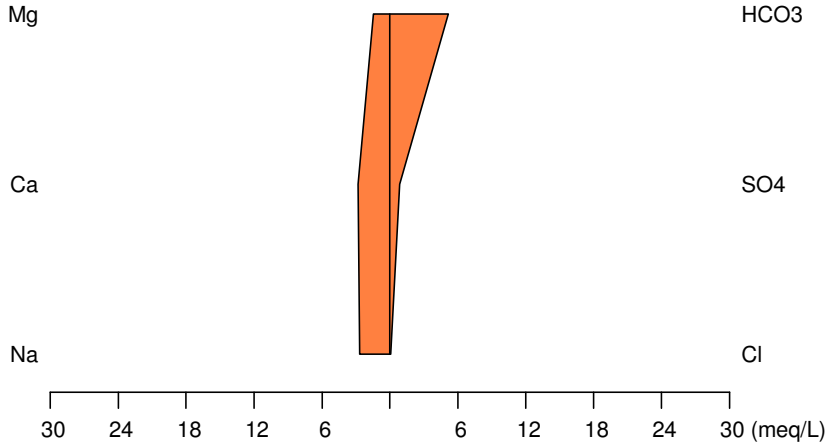


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

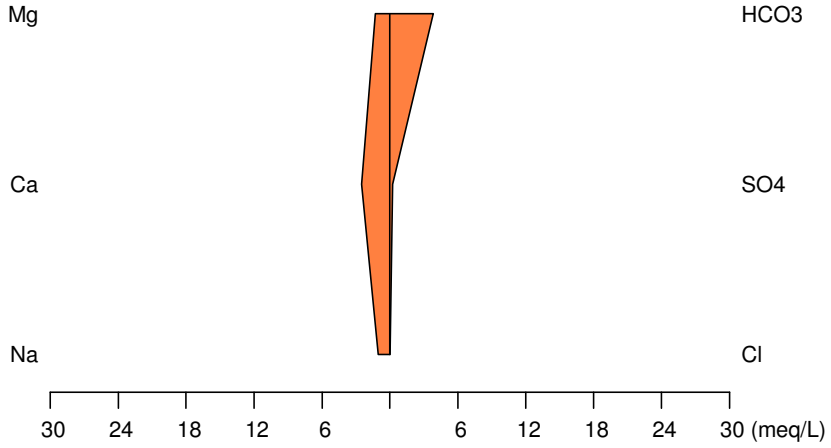
CFMW-027,3/27/2017

Date: 3/27/2017
TDS (mg/l) = 398
El Cond. (uS/cm) =398000



CFMW-028,3/20/2017

Date: 3/20/2017
TDS (mg/l) = 232
El Cond. (uS/cm) =232000

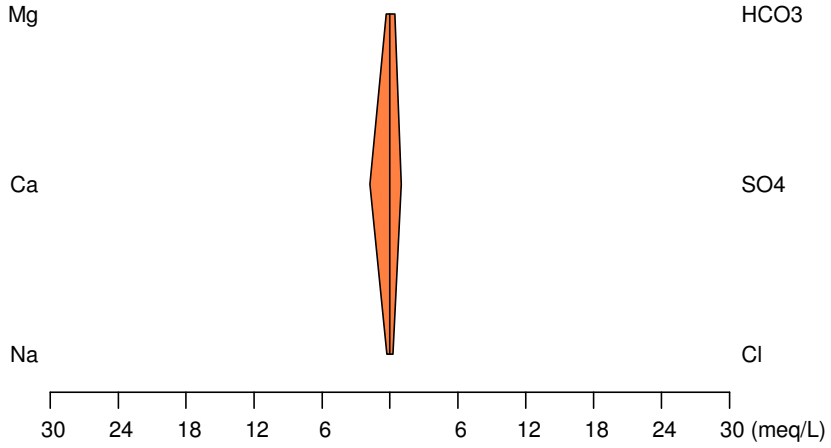


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

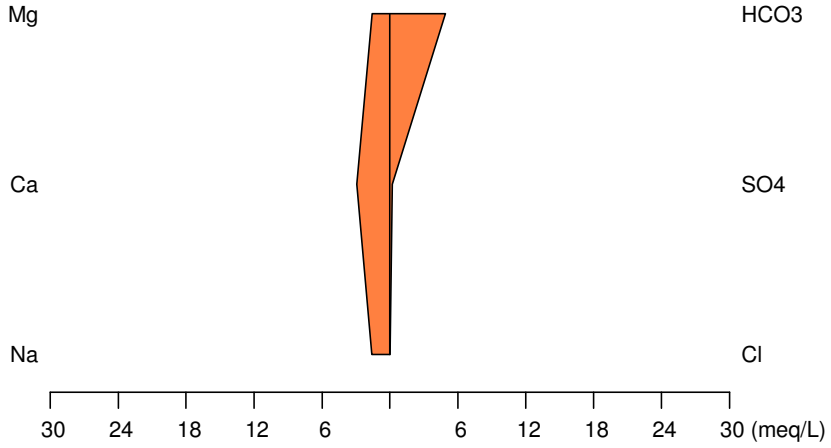
CFMW-028a,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 116
El Cond. (uS/cm) =116000



CFMW-029,3/24/2017

Date: 3/24/2017
TDS (mg/l) = 330
El Cond. (uS/cm) =330000

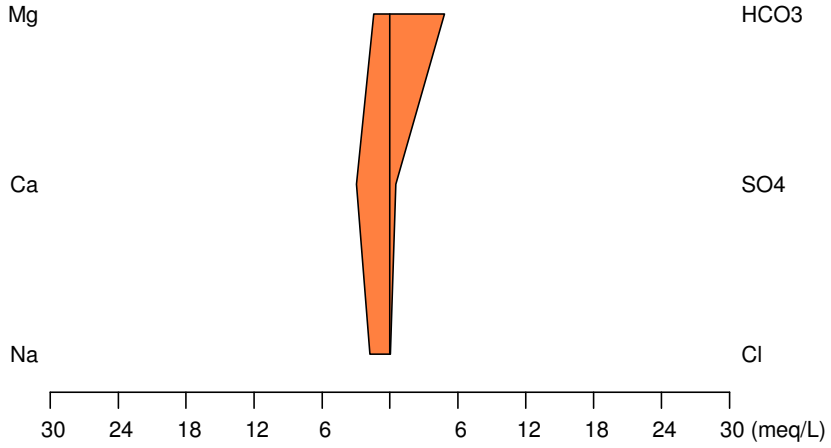


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

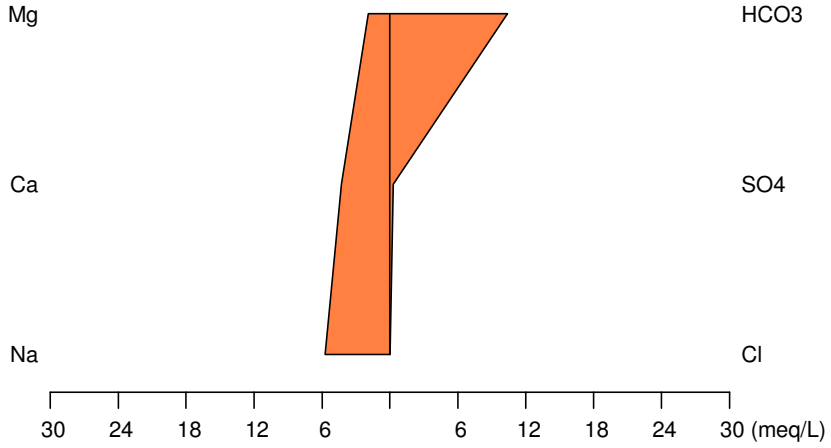
CFMW-031,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 331
El Cond. (uS/cm) =331000



CFMW-032,3/27/2017

Date: 3/27/2017
TDS (mg/l) = 570
El Cond. (uS/cm) =570000

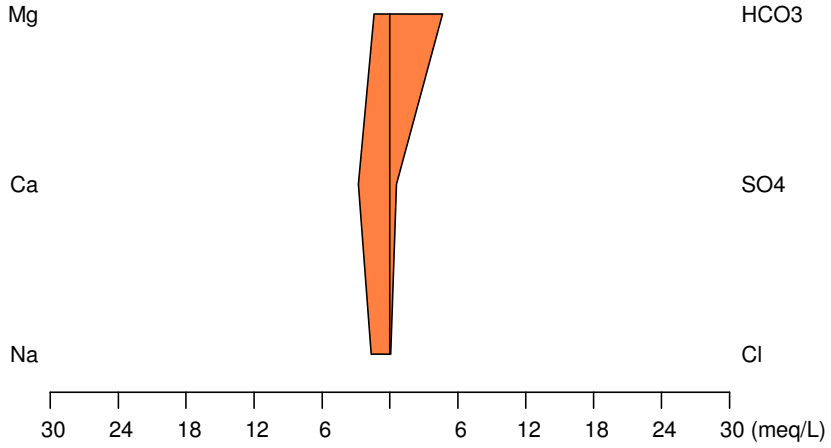


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

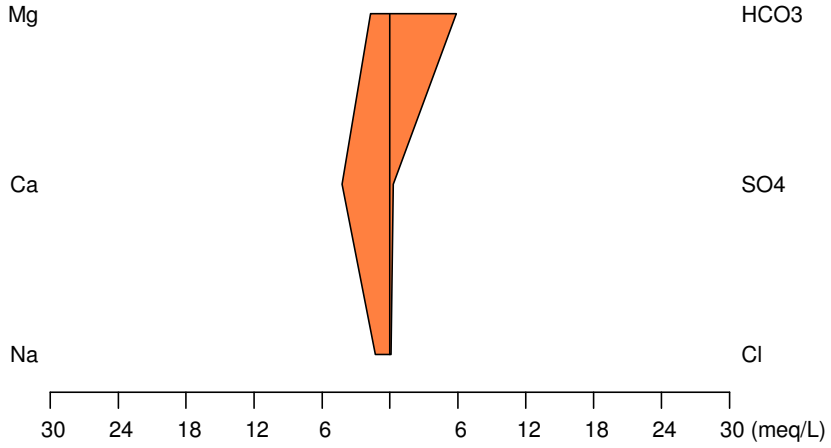
CFMW-033,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 333
El Cond. (uS/cm) =333000



CFMW-034,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 394
El Cond. (uS/cm) =394000

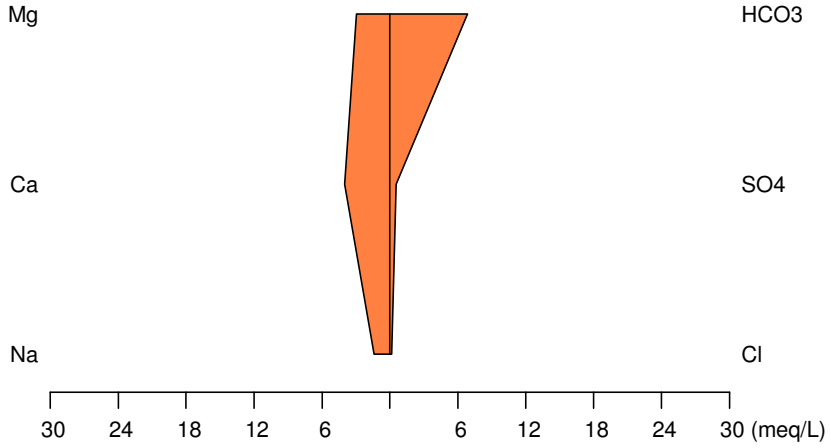


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

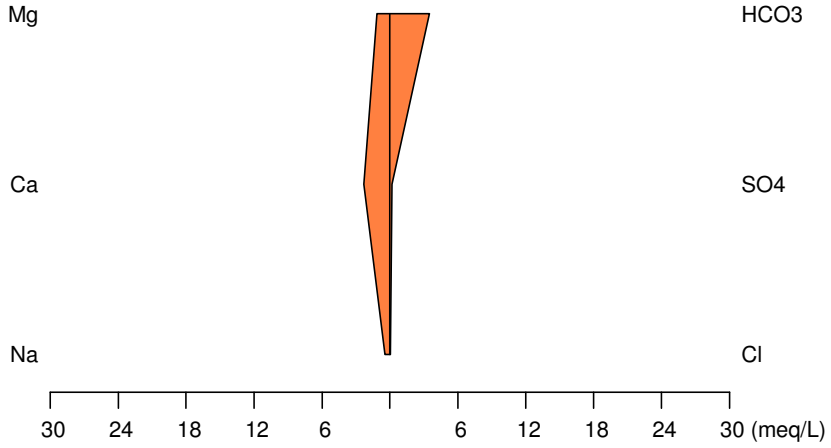
CFMW-035,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 442
El Cond. (uS/cm) =442000



CFMW-037,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 225
El Cond. (uS/cm) =225000

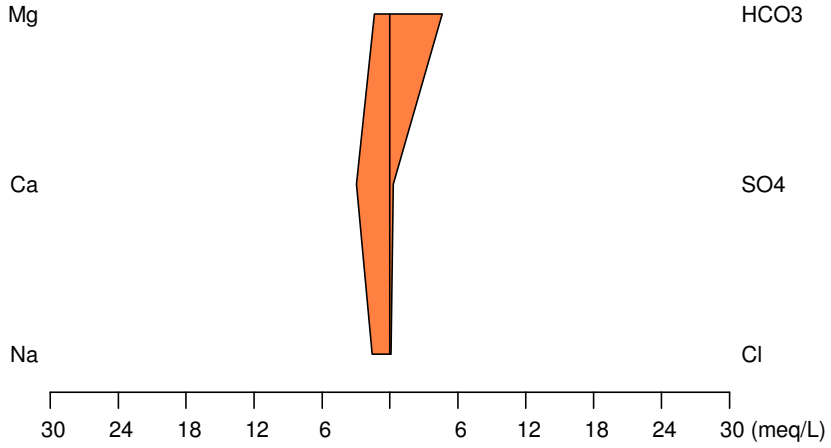


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

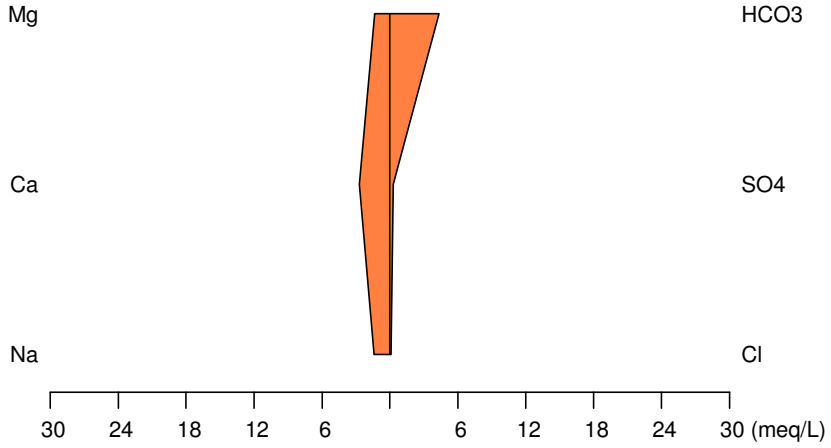
CFMW-038,3/24/2017

Date: 3/24/2017
TDS (mg/l) = 305
El Cond. (uS/cm) =305000



CFMW-040,3/30/2017

Date: 3/30/2017
TDS (mg/l) = 299
El Cond. (uS/cm) =299000

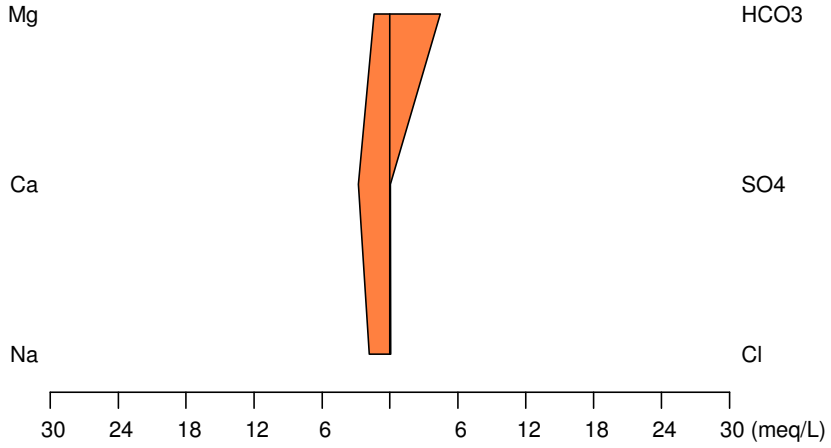


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

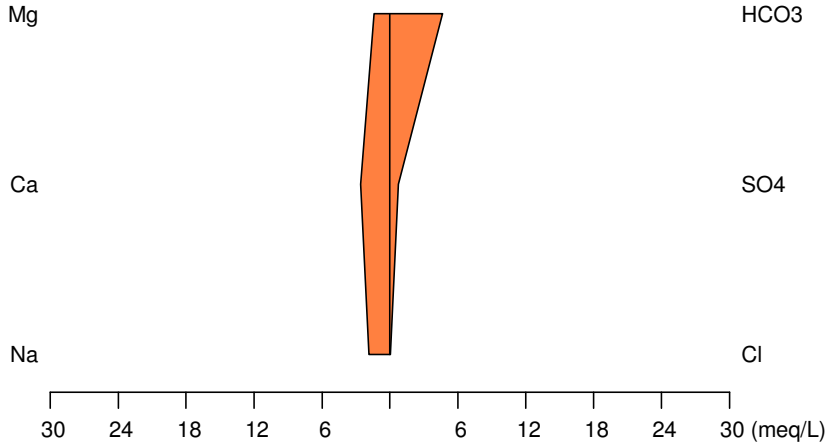
CFMW-043,3/20/2017

Date: 3/20/2017
TDS (mg/l) = 307
El Cond. (uS/cm) =307000



CFMW-044,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 369
El Cond. (uS/cm) =369000

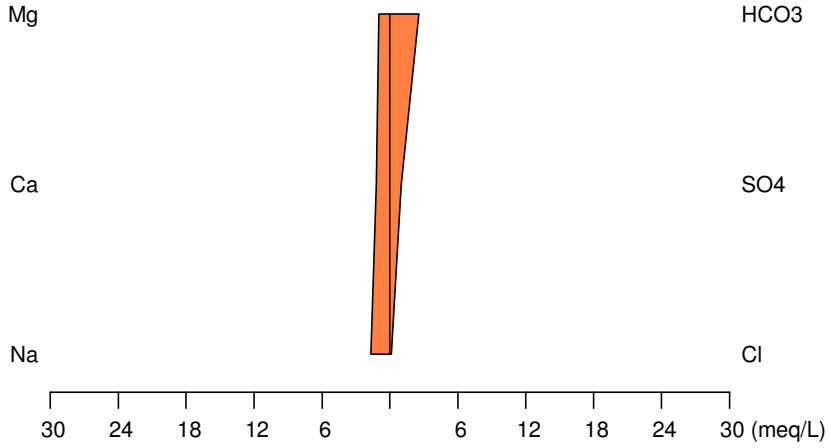


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

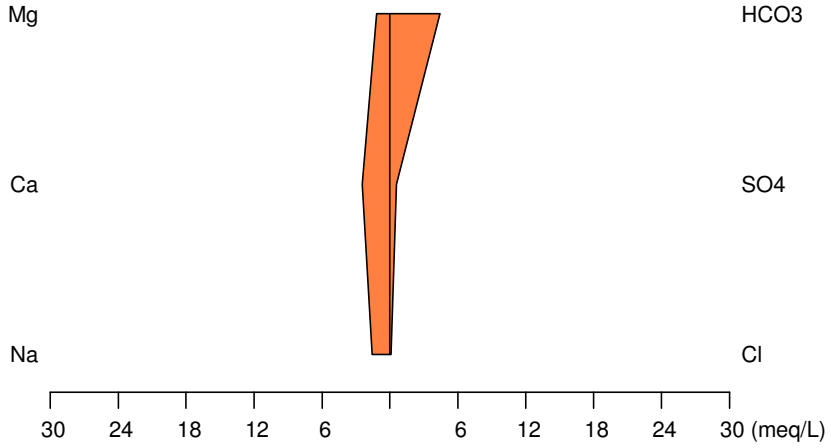
CFMW-044a,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 261
El Cond. (uS/cm) =261000



CFMW-045,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 316
El Cond. (uS/cm) =316000

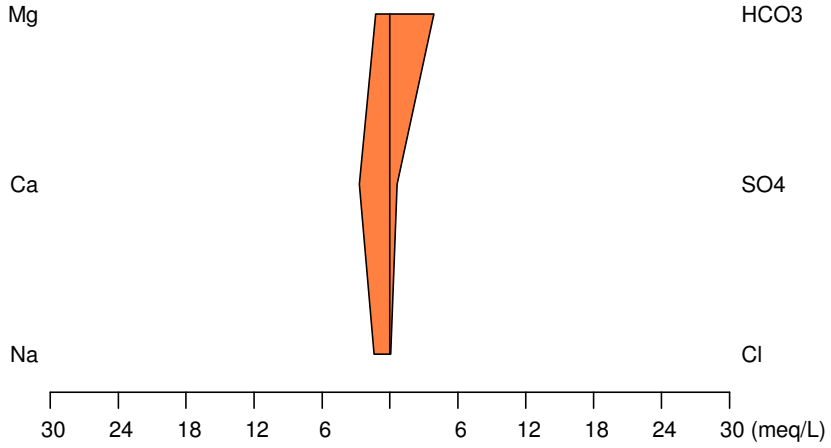


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

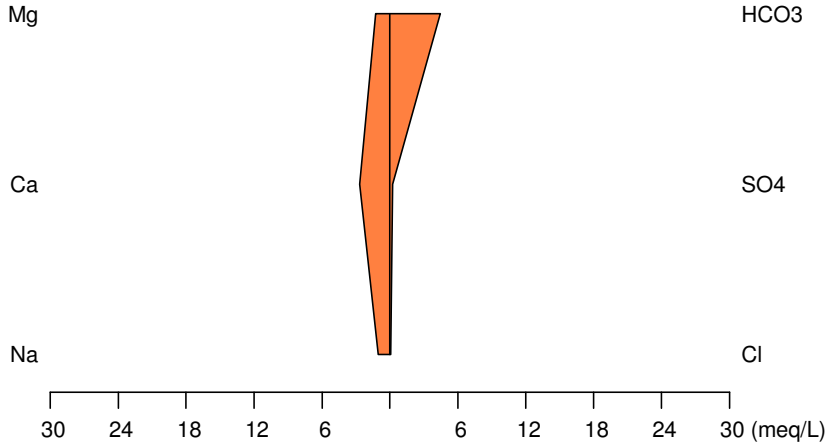
CFMW-045a,3/24/2017

Date: 3/24/2017
TDS (mg/l) = 289
El Cond. (uS/cm) =289000



CFMW-047,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 302
El Cond. (uS/cm) =302000

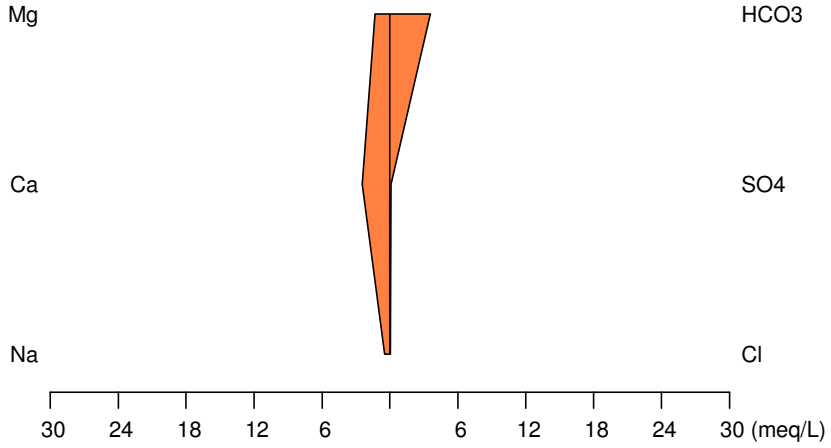


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

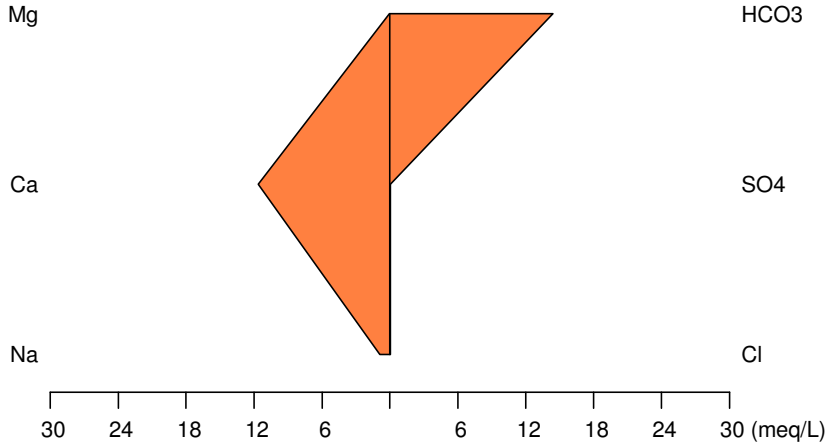
CFMW-049,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 205
El Cond. (uS/cm) =205000



CFMW-049a,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 895
El Cond. (uS/cm) =895000

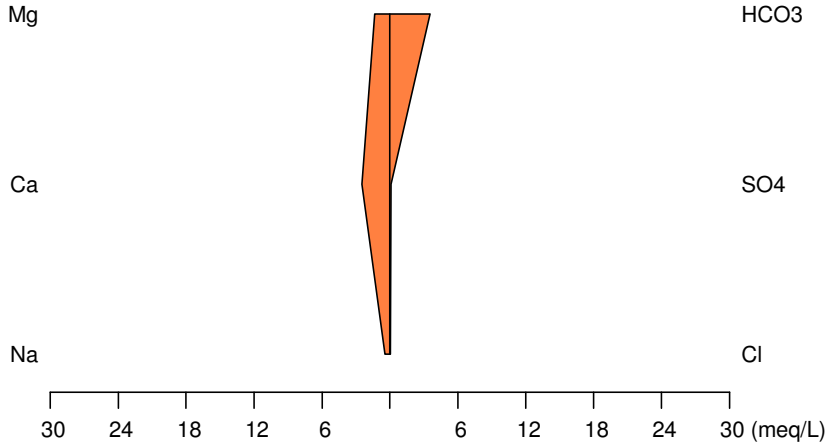


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

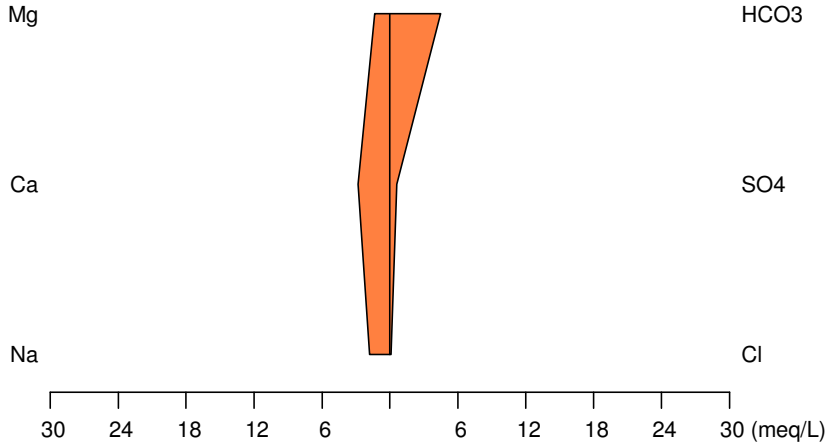
CFMW-050,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 211
El Cond. (uS/cm) =211000



CFMW-054,3/22/2017

Date: 3/22/2017
TDS (mg/l) = 336
El Cond. (uS/cm) =336000

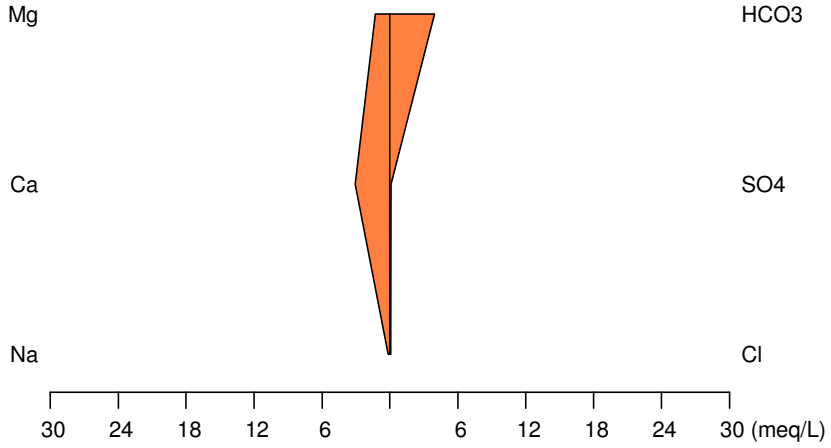


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

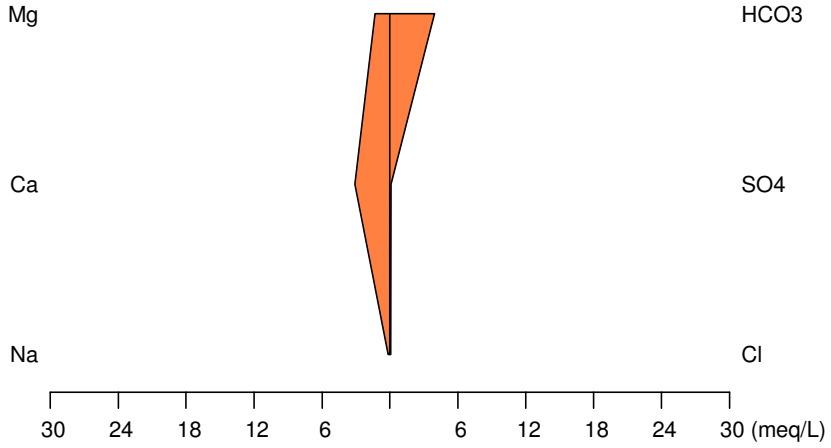
CFMW-056b,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 256
El Cond. (uS/cm) =256000



CFMW-056b,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 263
El Cond. (uS/cm) =263000

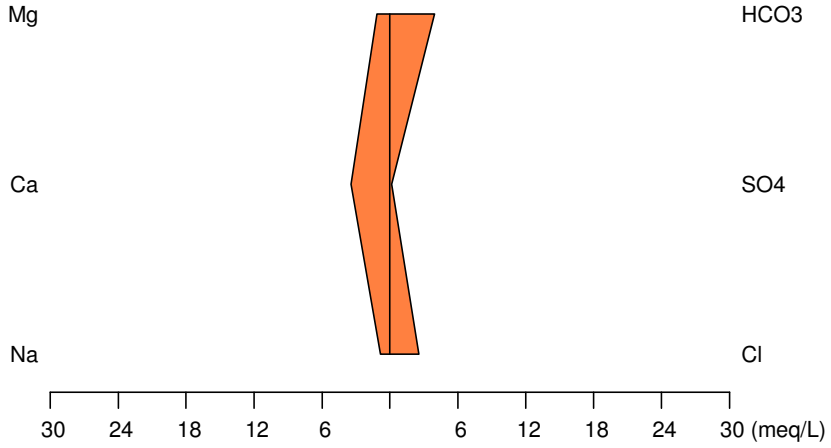


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

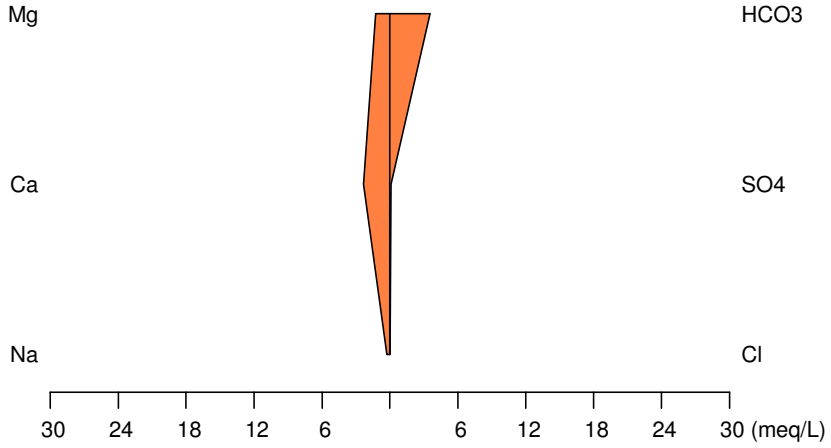
CFMW-059,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 314
El Cond. (uS/cm) =314000



CFMW-061,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 221
El Cond. (uS/cm) =221000

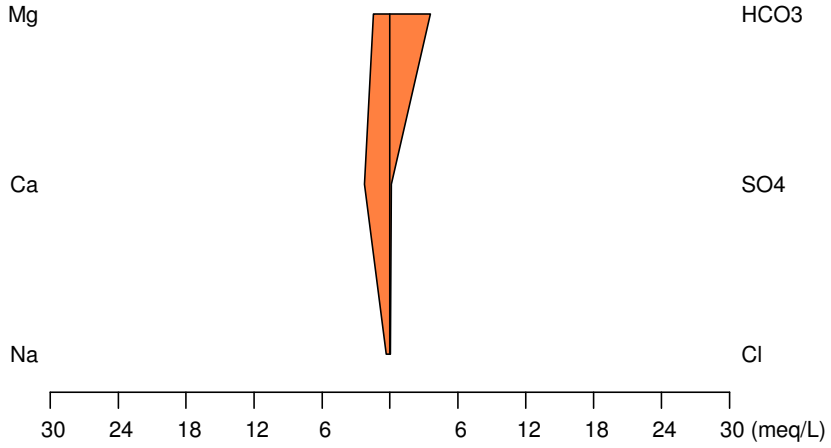


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

CFMW-064,3/23/2017

Date: 3/23/2017
TDS (mg/l) = 214
El Cond. (uS/cm) =214000

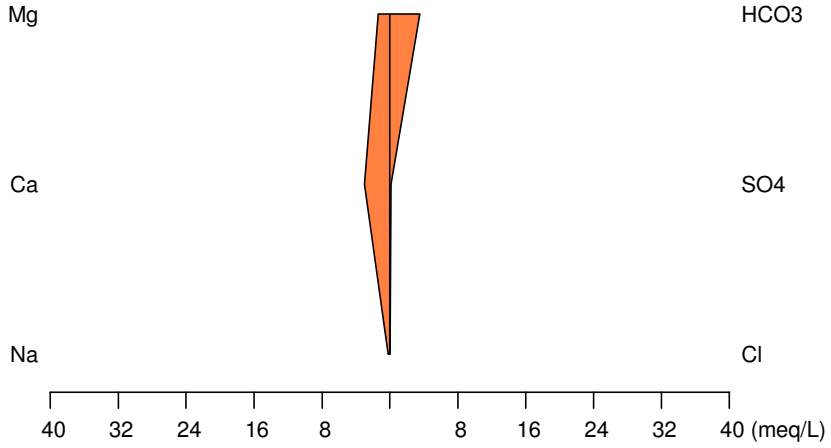


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

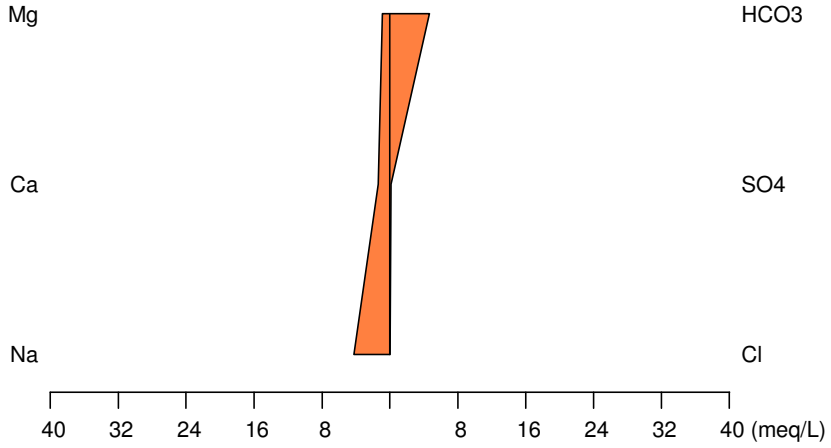
CFMW-001,6/19/2017

Date: 6/19/2017
TDS (mg/l) = 208
El Cond. (uS/cm) =4110



CFMW-002,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 408
El Cond. (uS/cm) =3770

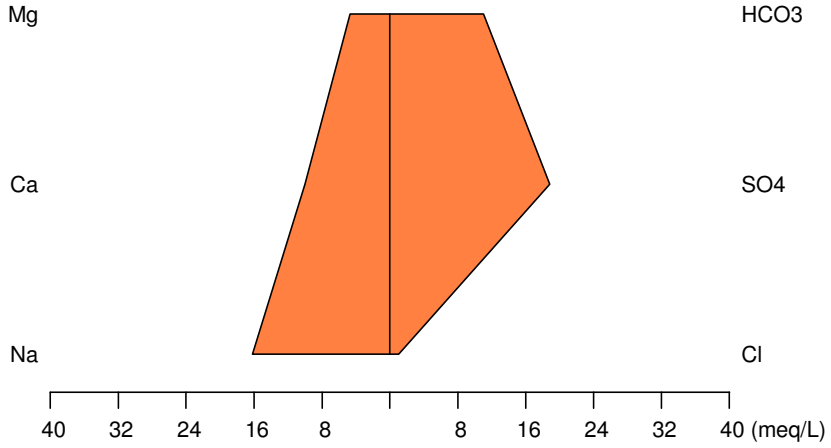


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

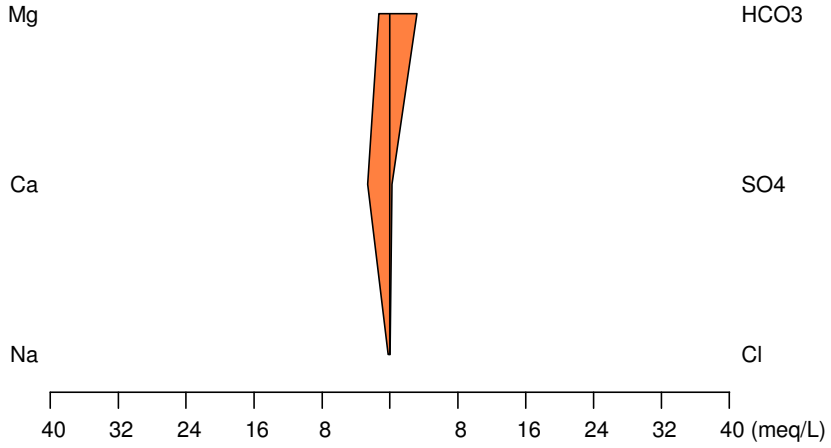
CFMW-003,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 2000
El Cond. (uS/cm) =25400



CFMW-007,6/19/2017

Date: 6/19/2017
TDS (mg/l) = 178
El Cond. (uS/cm) =3940

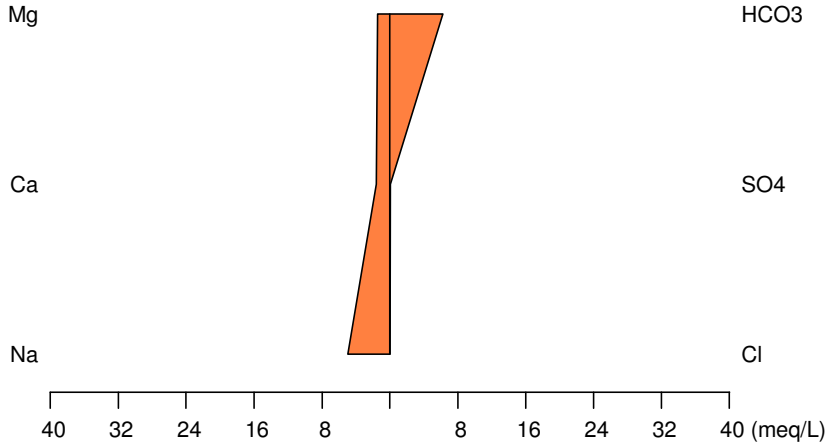


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

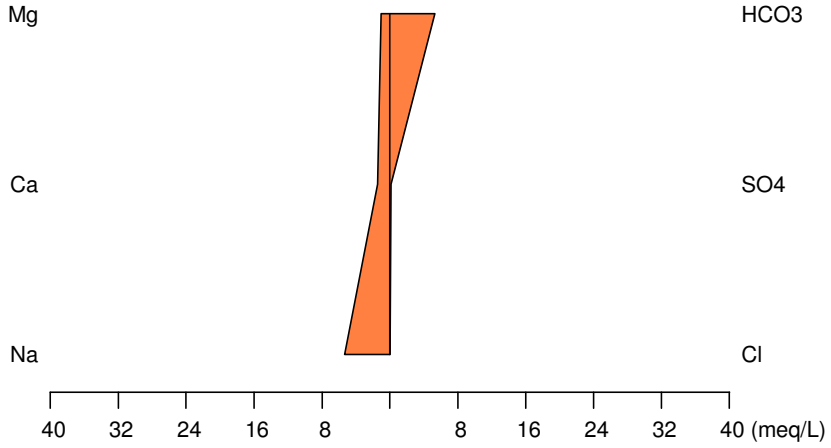
CFMW-008,6/20/2017

Date: 6/20/2017
TDS (mg/l) = 399
El Cond. (uS/cm) =7270



CFMW-010,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 457
El Cond. (uS/cm) =6580

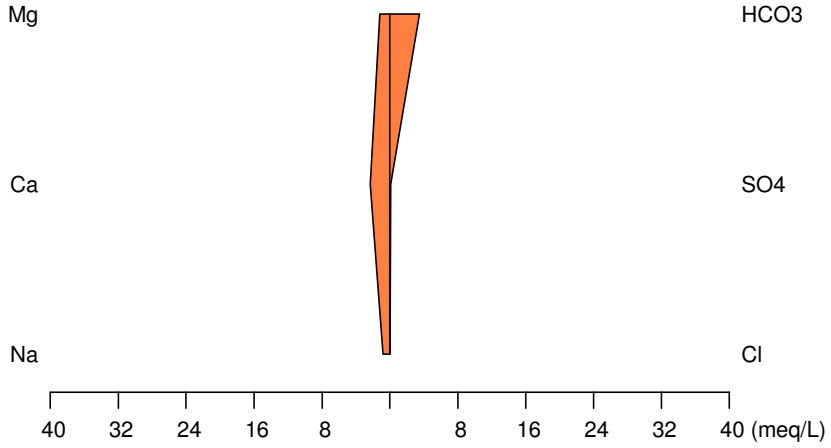


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

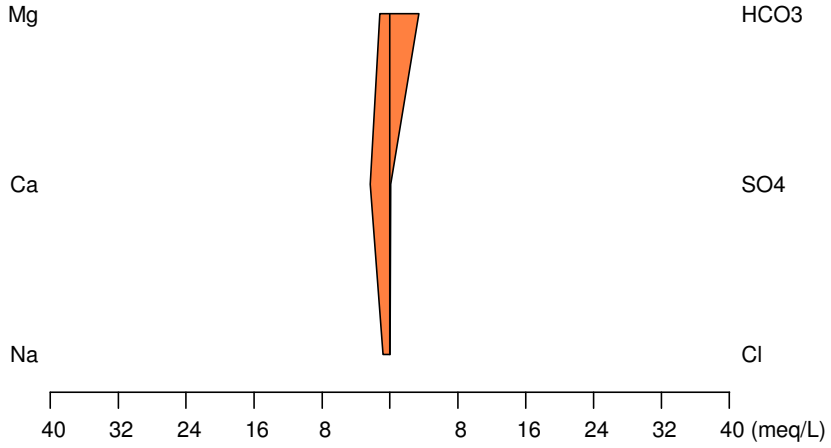
CFMW-011,6/28/2017

Date: 6/28/2017
TDS (mg/l) = 214
El Cond. (uS/cm) =3870



CFMW-011,6/28/2017

Date: 6/28/2017
TDS (mg/l) = 228
El Cond. (uS/cm) =3870

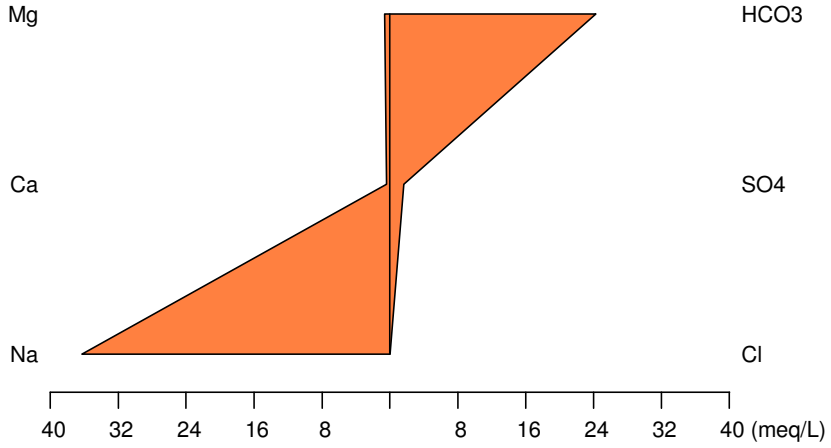


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

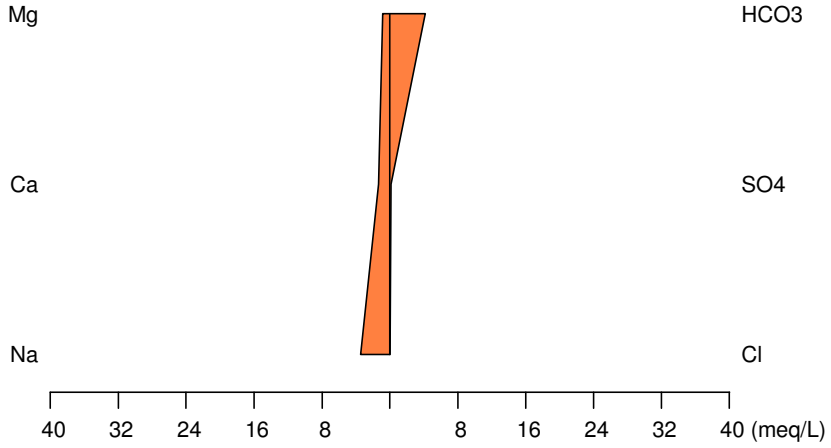
CFMW-012,6/23/2017

Date: 6/23/2017
TDS (mg/l) = 2440
El Cond. (uS/cm) =38600



CFMW-014,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 374
El Cond. (uS/cm) =4560

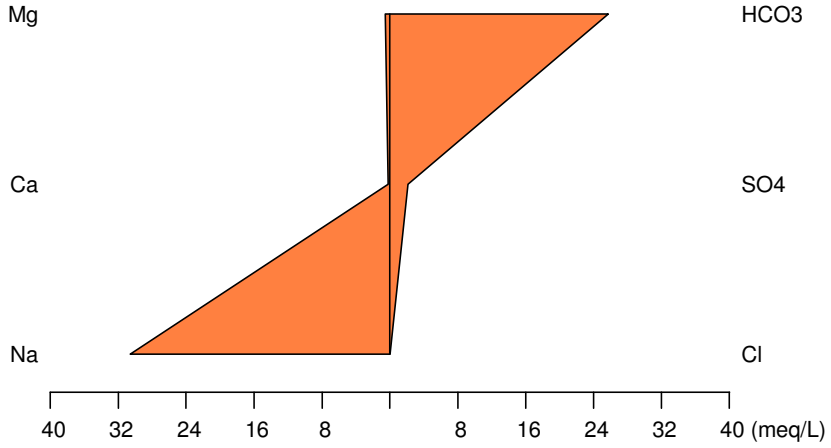


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

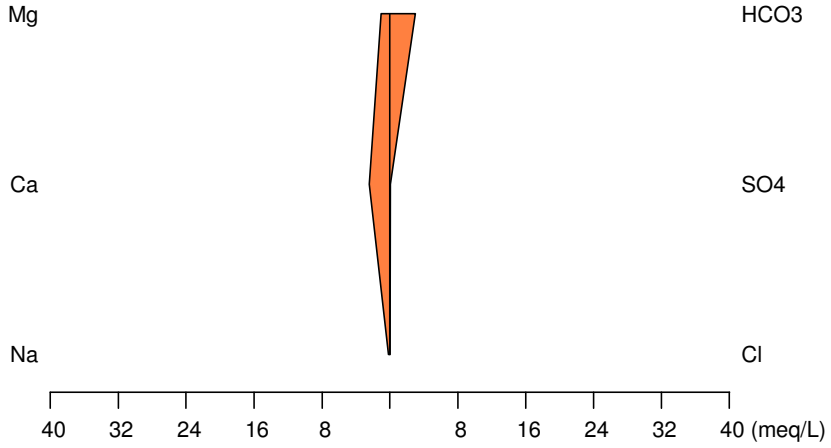
CFMW-015,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 2420
El Cond. (uS/cm) =32500



CFMW-016,6/29/2017

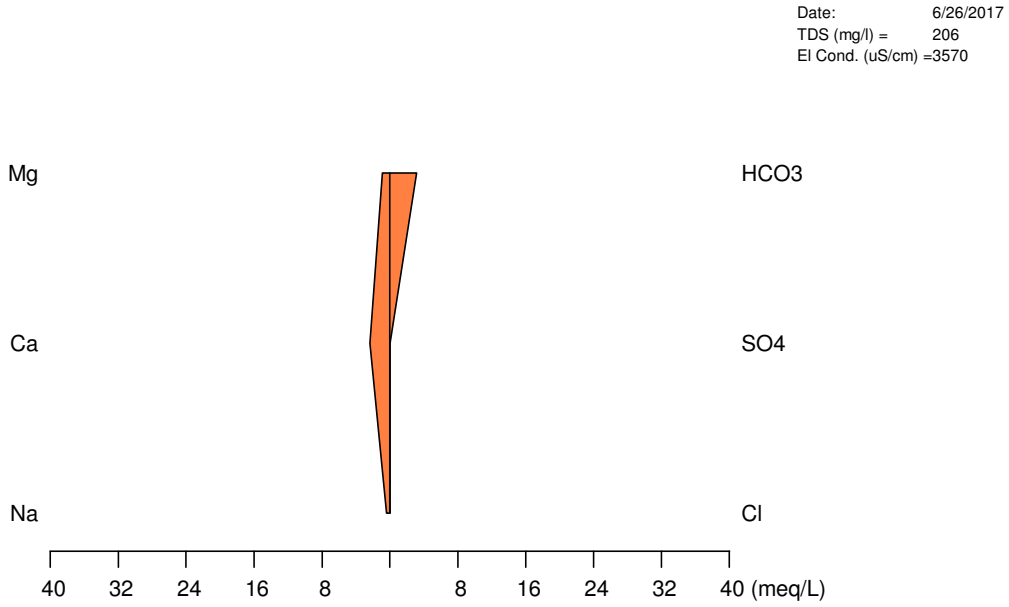
Date: 6/29/2017
TDS (mg/l) = 190
El Cond. (uS/cm) =3440



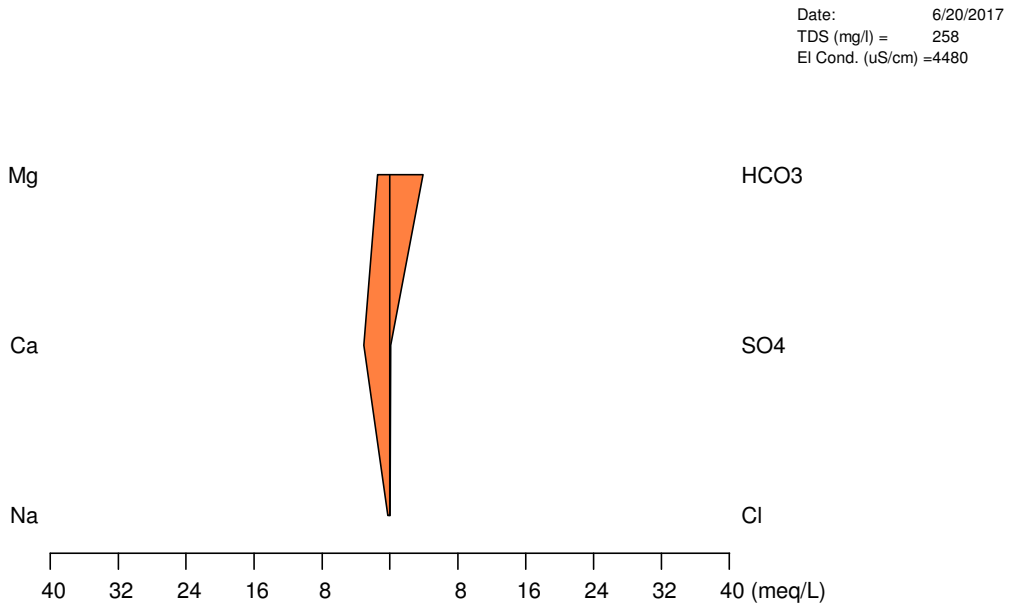
TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

CFMW-017,6/26/2017



CFMW-018,6/20/2017

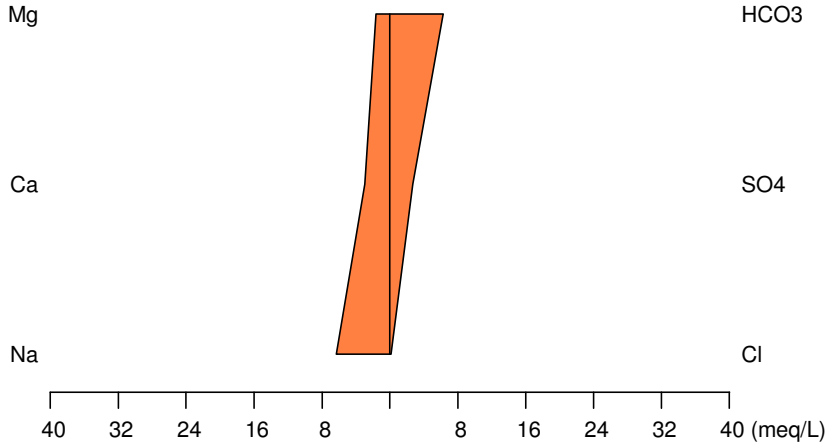


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

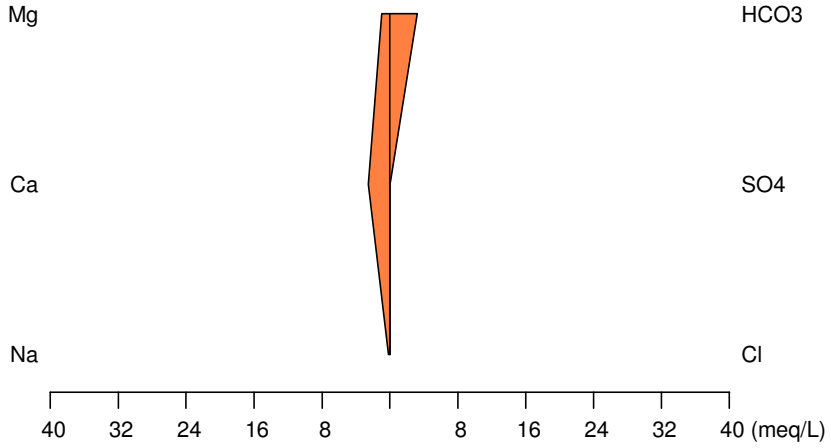
CFMW-019,6/29/2017

Date: 6/29/2017
TDS (mg/l) = 658
El Cond. (uS/cm) =10500



CFMW-020,6/26/2017

Date: 6/26/2017
TDS (mg/l) = 220
El Cond. (uS/cm) =3650

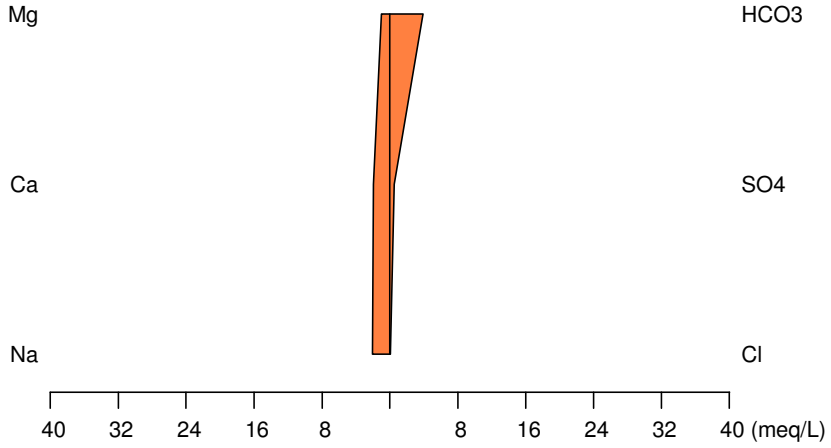


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

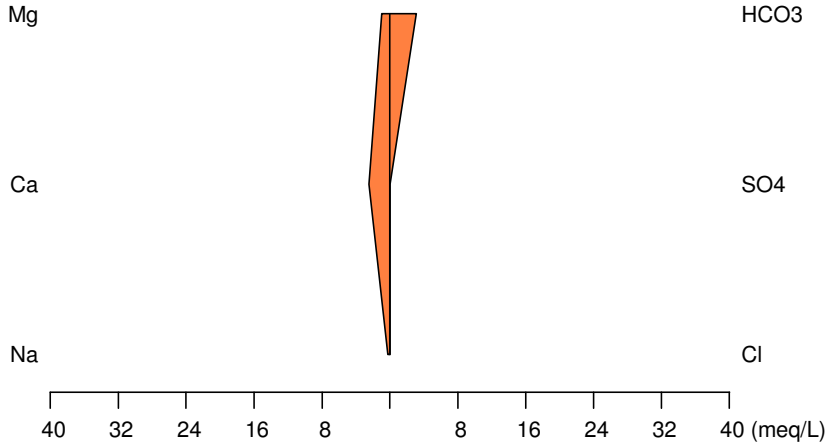
CFMW-021,6/26/2017

Date: 6/26/2017
TDS (mg/l) = 341



CFMW-022,6/26/2017

Date: 6/26/2017
TDS (mg/l) = 206
El Cond. (uS/cm) =3380

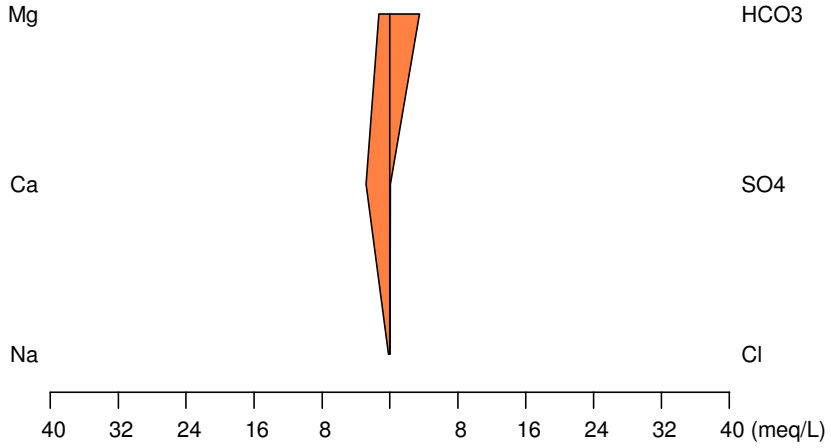


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

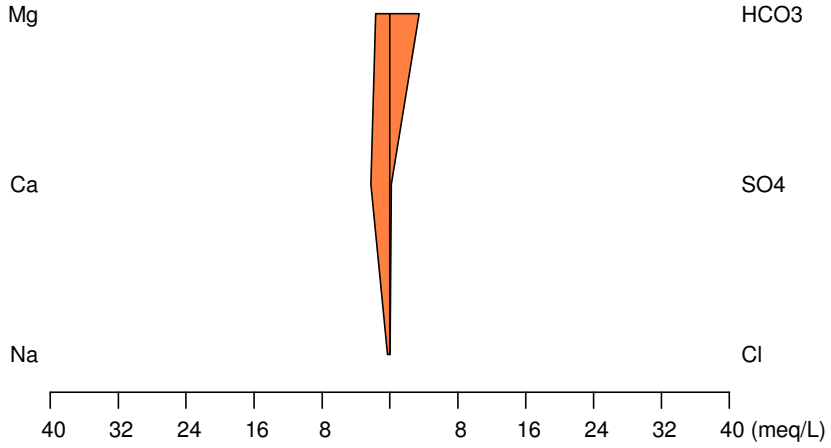
CFMW-023,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 226
El Cond. (uS/cm) =3960



CFMW-025b,6/22/2017

Date: 6/22/2017
TDS (mg/l) = 194
El Cond. (uS/cm) =4010

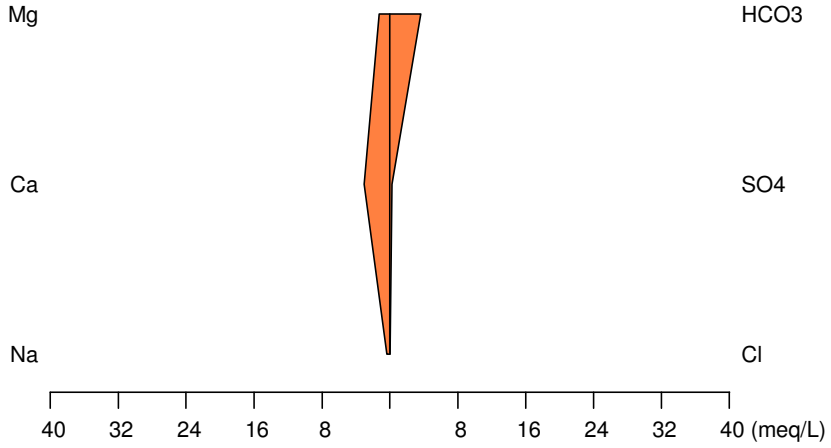


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

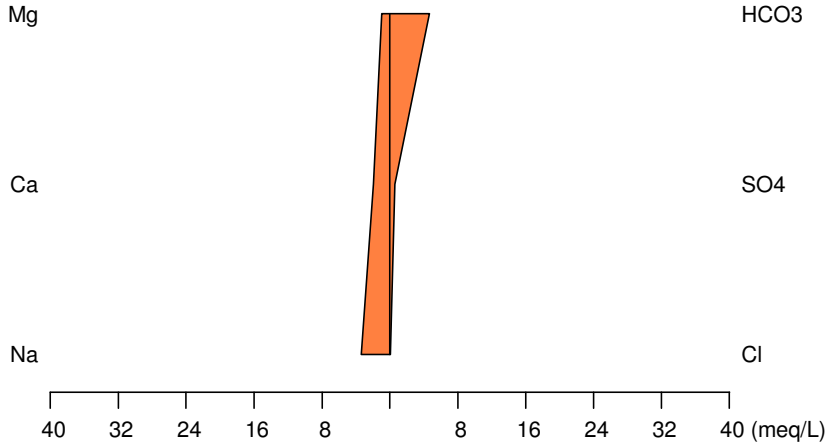
CFMW-026,6/22/2017

Date: 6/22/2017
TDS (mg/l) = 246
El Cond. (uS/cm) =4330



CFMW-027,6/26/2017

Date: 6/26/2017
TDS (mg/l) = 424
El Cond. (uS/cm) =5620

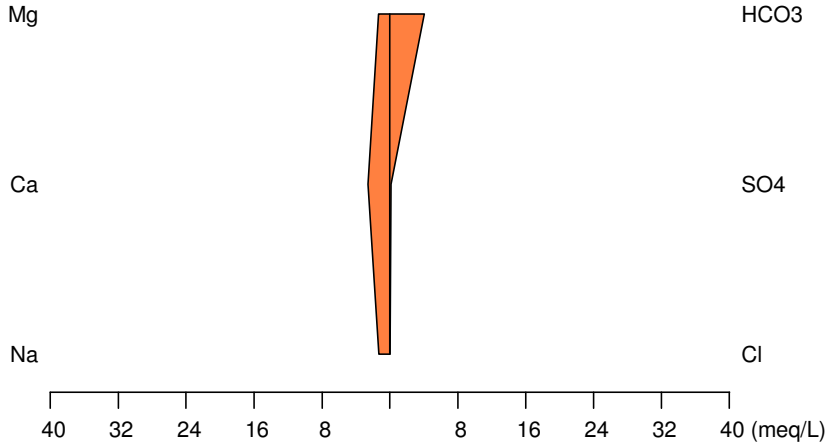


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

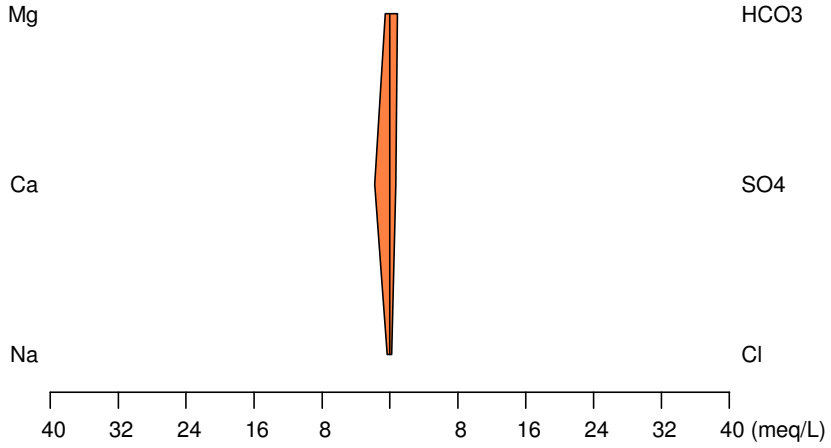
CFMW-028,6/26/2017

Date: 6/26/2017
TDS (mg/l) = 314
El Cond. (uS/cm) =4500



CFMW-028a,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 154
El Cond. (uS/cm) =2480

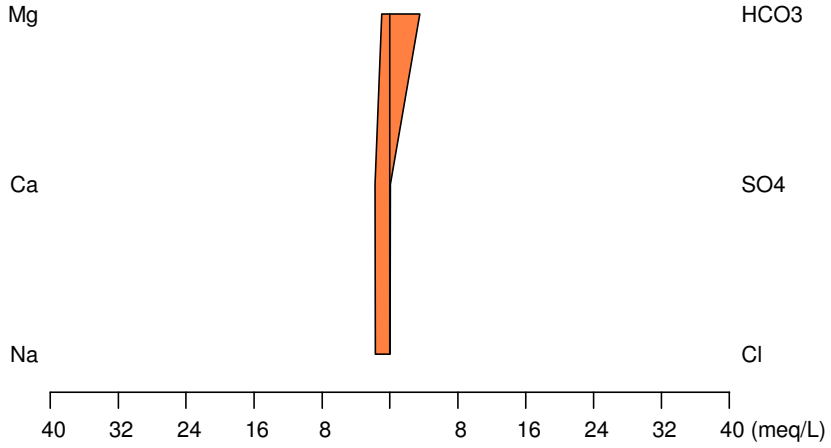


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

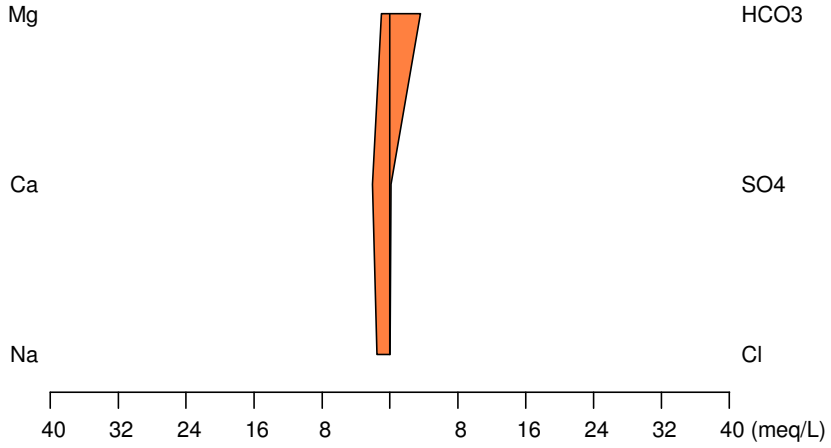
CFMW-029,6/26/2017

Date: 6/26/2017
TDS (mg/l) = 284
El Cond. (uS/cm) =3830



CFMW-031,6/21/2017

Date: 6/21/2017
TDS (mg/l) = 219
El Cond. (uS/cm) =3900

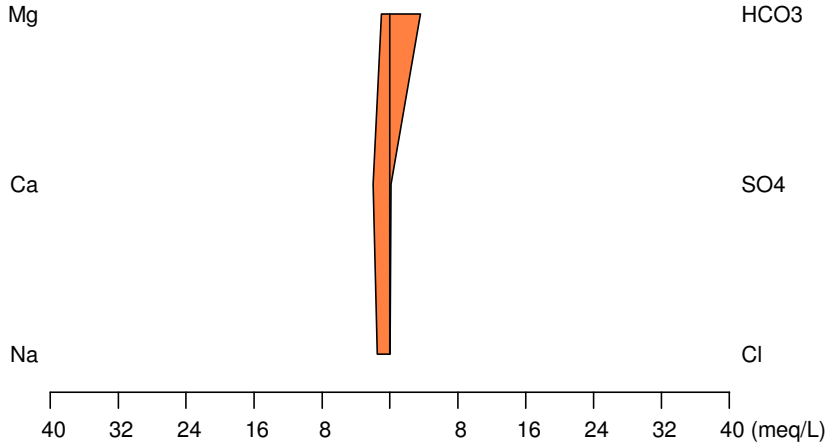


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

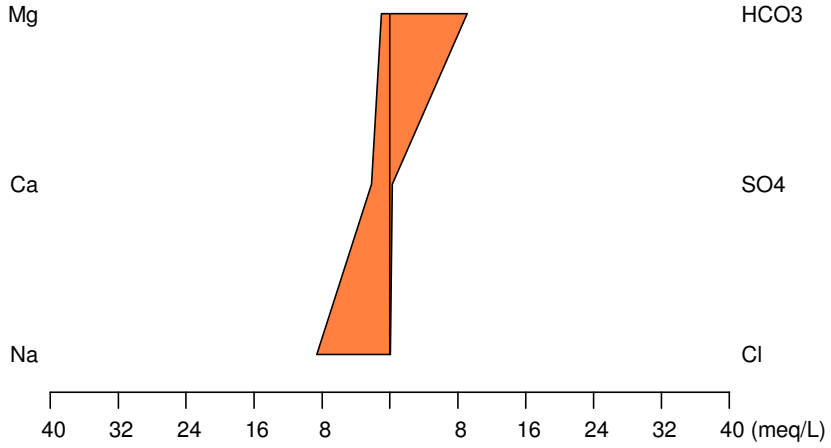
CFMW-031,6/21/2017

Date: 6/21/2017
TDS (mg/l) = 232
El Cond. (uS/cm) =3900



CFMW-032,6/20/2017

Date: 6/20/2017
TDS (mg/l) = 660
El Cond. (uS/cm) =10800

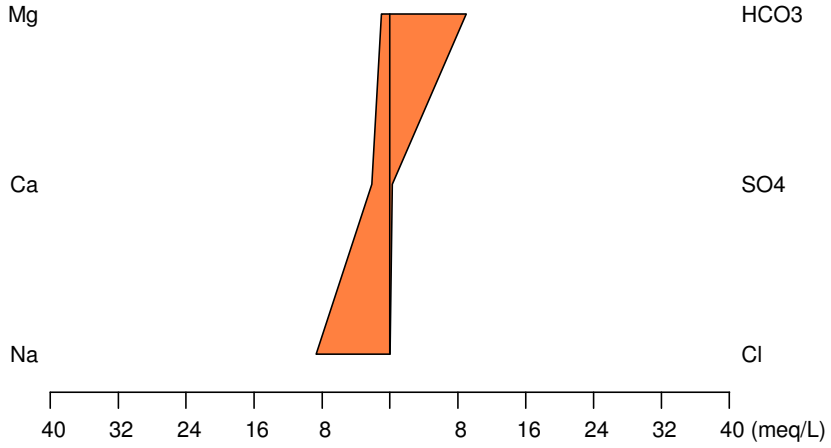


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

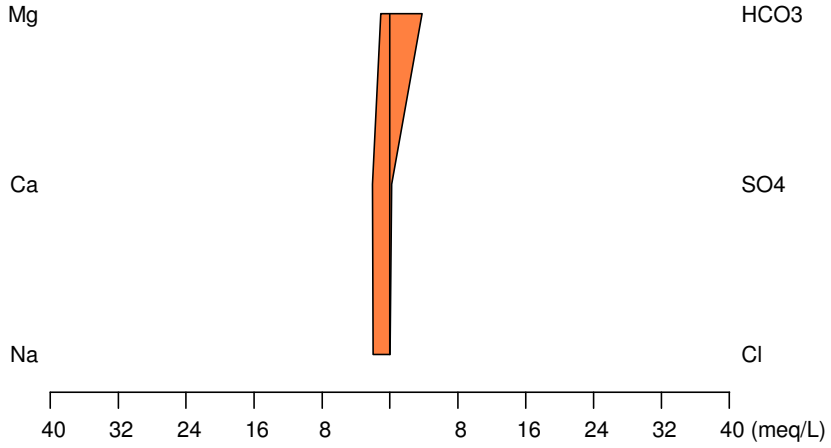
CFMW-032,6/20/2017

Date: 6/20/2017
TDS (mg/l) = 746
El Cond. (uS/cm) =10800



CFMW-033,6/19/2017

Date: 6/19/2017
TDS (mg/l) = 237
El Cond. (uS/cm) =4730

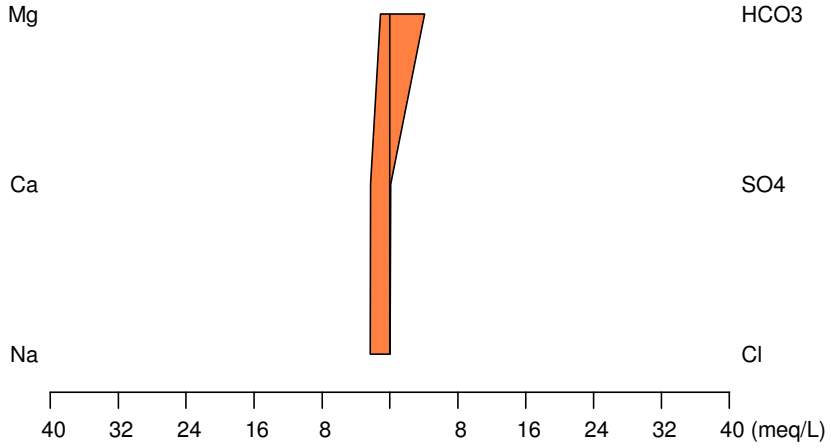


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

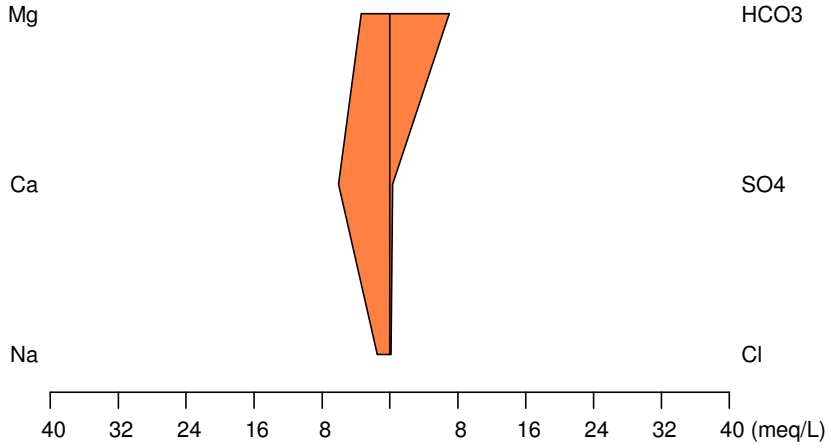
CFMW-034,6/19/2017

Date: 6/19/2017
TDS (mg/l) = 275
El Cond. (uS/cm) =4980



CFMW-035,6/20/2017

Date: 6/20/2017
TDS (mg/l) = 452
El Cond. (uS/cm) =7570

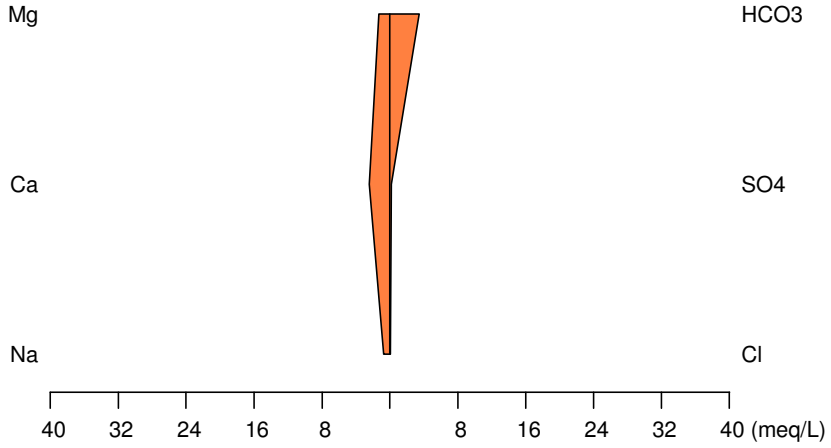


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

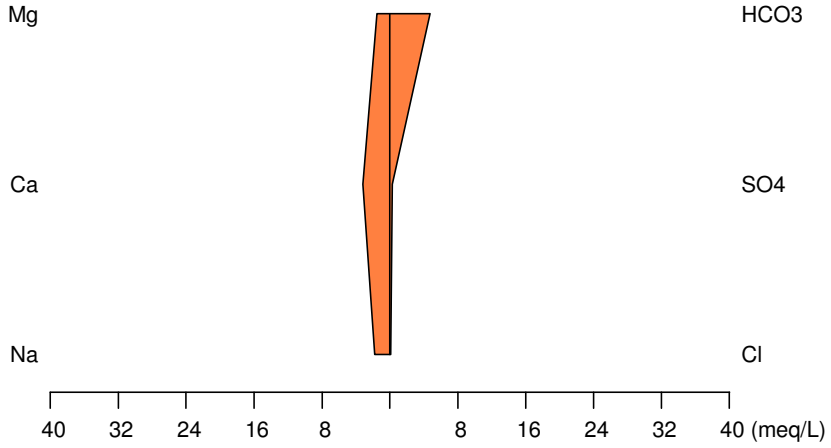
CFMW-037,6/20/2017

Date: 6/20/2017
TDS (mg/l) = 236
El Cond. (uS/cm) =4310



CFMW-038,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 347
El Cond. (uS/cm) =5760

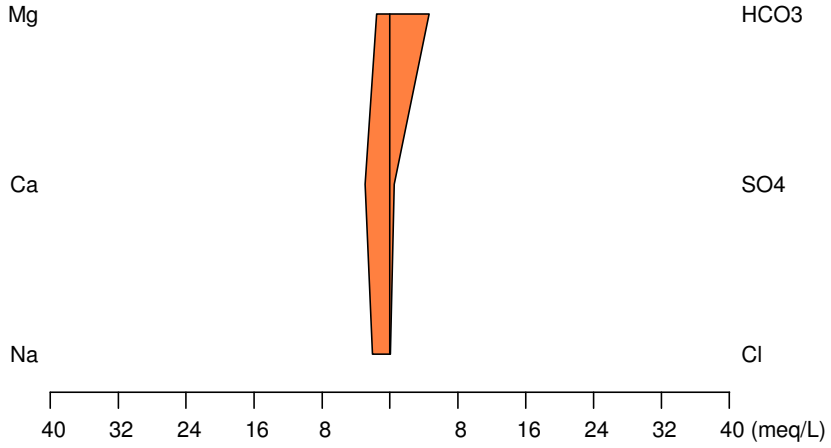


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

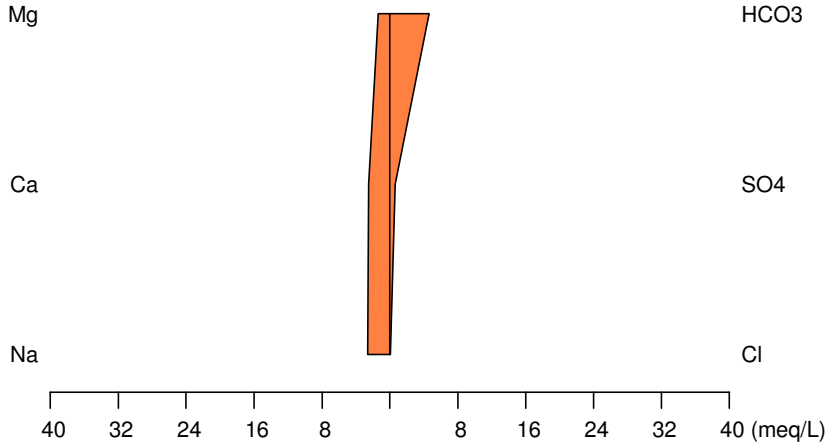
CFMW-040,6/20/2017

Date: 6/20/2017
TDS (mg/l) = 363
El Cond. (uS/cm) =5740



CFMW-042,6/20/2017

Date: 6/20/2017
TDS (mg/l) = 395
El Cond. (uS/cm) =5870

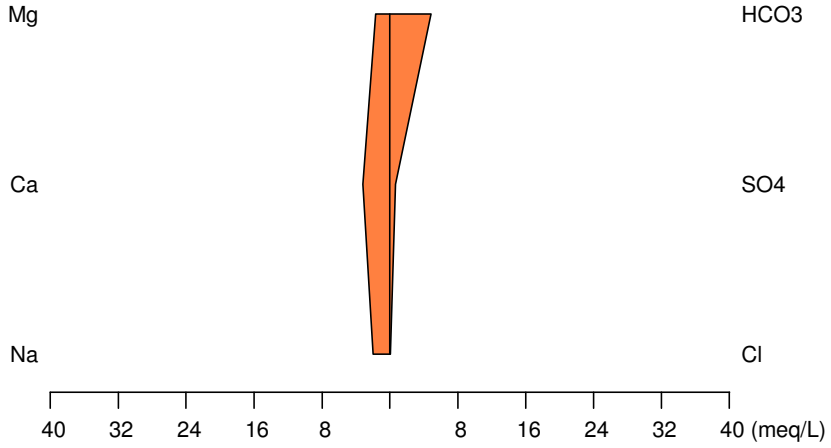


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

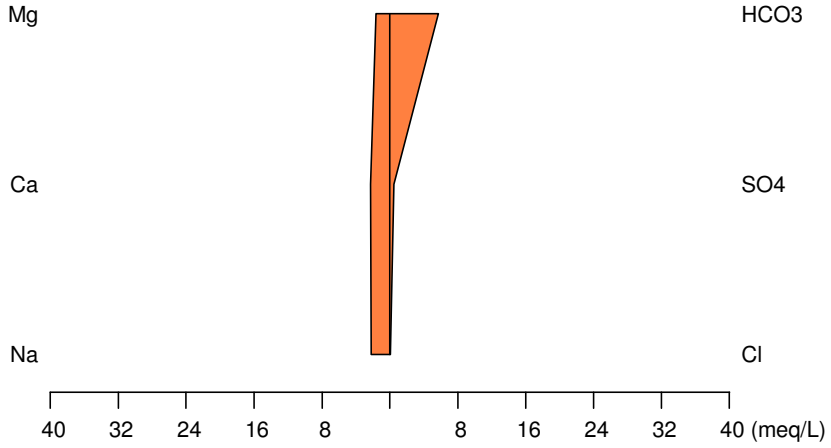
CFMW-043,6/21/2017

Date: 6/21/2017
TDS (mg/l) = 350
El Cond. (uS/cm) =6190



CFMW-044,6/21/2017

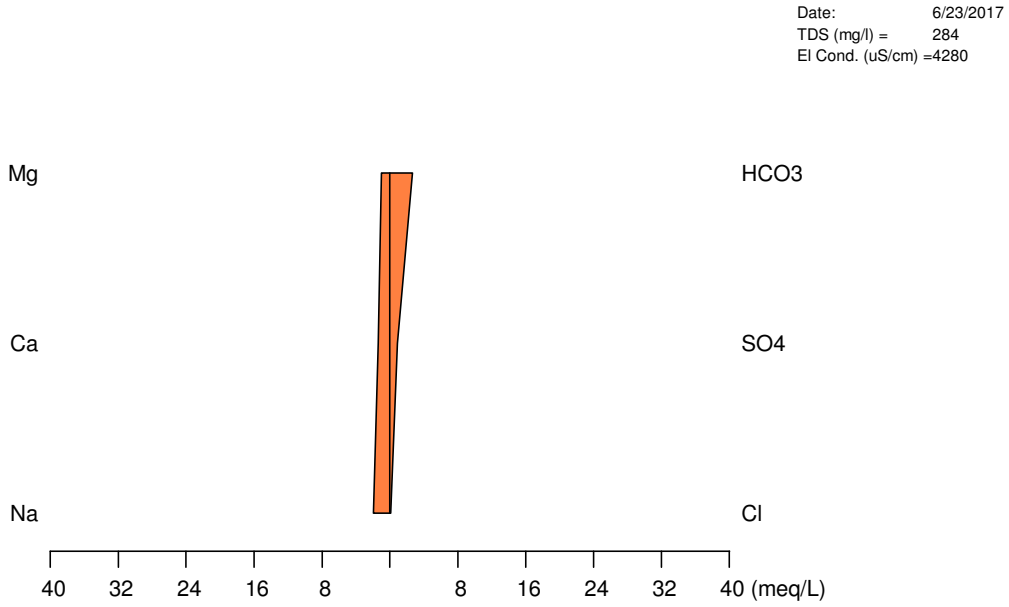
Date: 6/21/2017
TDS (mg/l) = 309
El Cond. (uS/cm) =7390



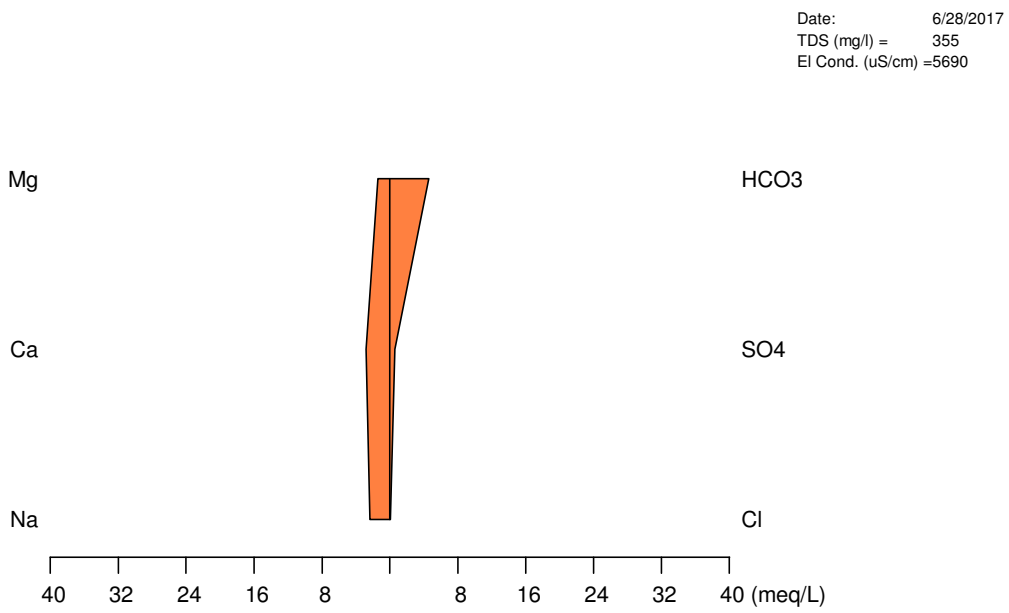
TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

CFMW-044a,6/23/2017



CFMW-045,6/28/2017

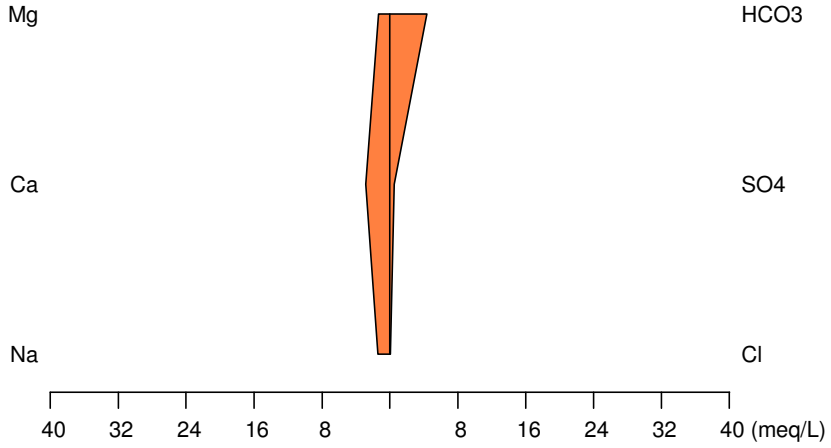


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

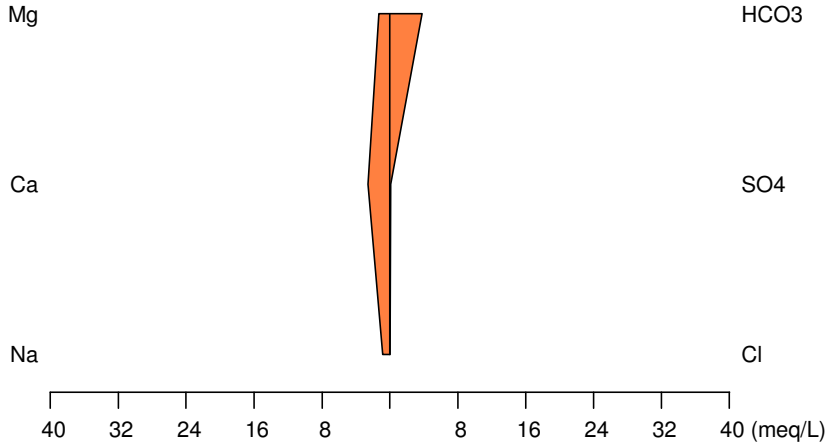
CFMW-045a,6/23/2017

Date: 6/23/2017
TDS (mg/l) = 336
El Cond. (uS/cm) =5430



CFMW-047,6/21/2017

Date: 6/21/2017
TDS (mg/l) = 245
El Cond. (uS/cm) =4840

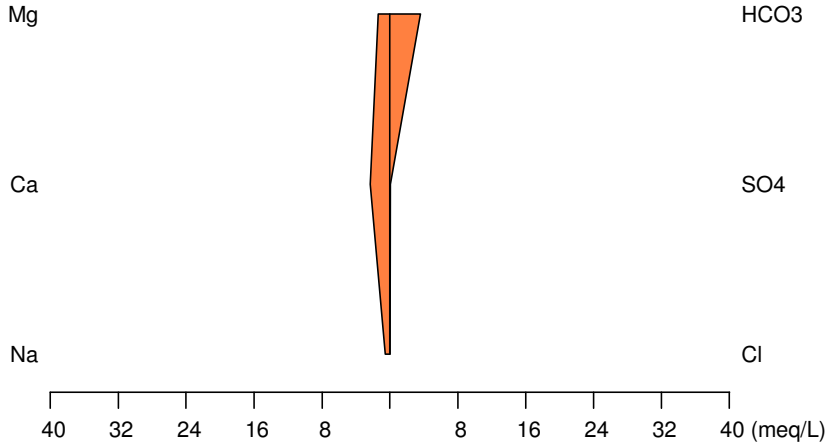


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

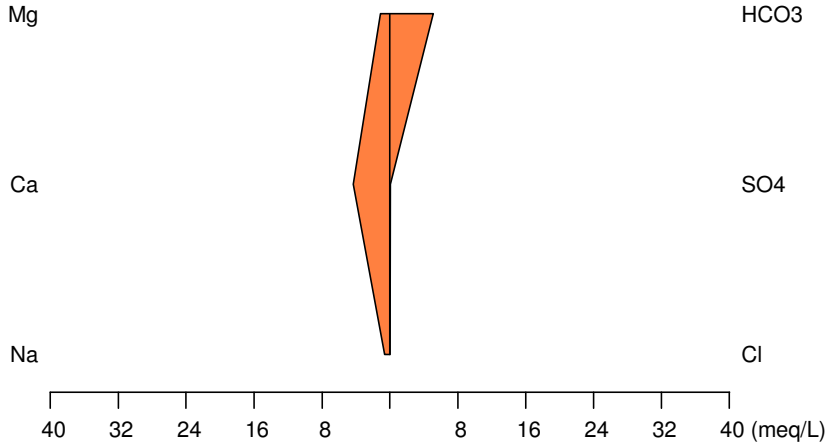
CFMW-049,6/21/2017

Date: 6/21/2017
TDS (mg/l) = 208
El Cond. (uS/cm) =4410



CFMW-049a,6/21/2017

Date: 6/21/2017
TDS (mg/l) = 163
El Cond. (uS/cm) =10500

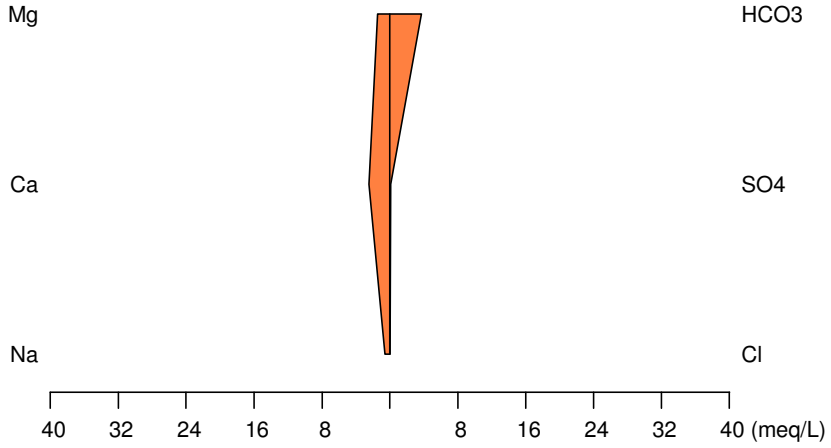


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

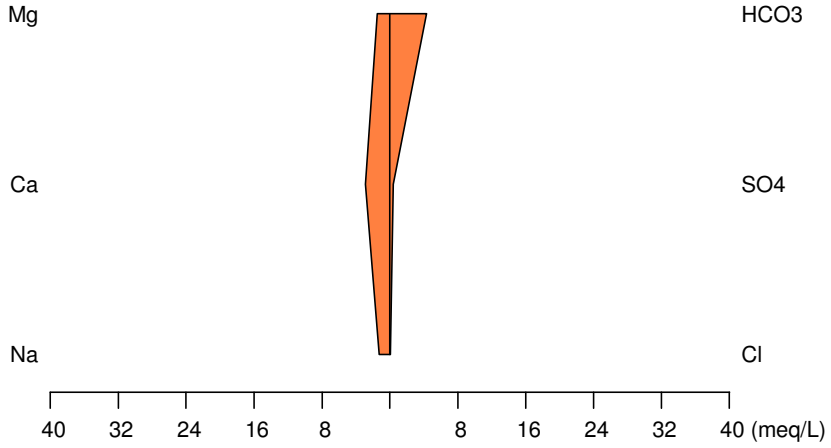
CFMW-050,6/21/2017

Date: 6/21/2017
TDS (mg/l) = 218
El Cond. (uS/cm) =4590



CFMW-053,6/28/2017

Date: 6/28/2017
TDS (mg/l) = 325
El Cond. (uS/cm) =5160

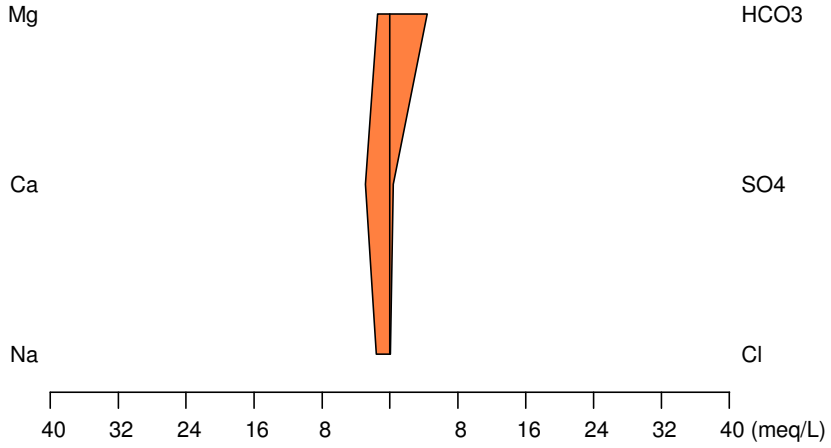


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

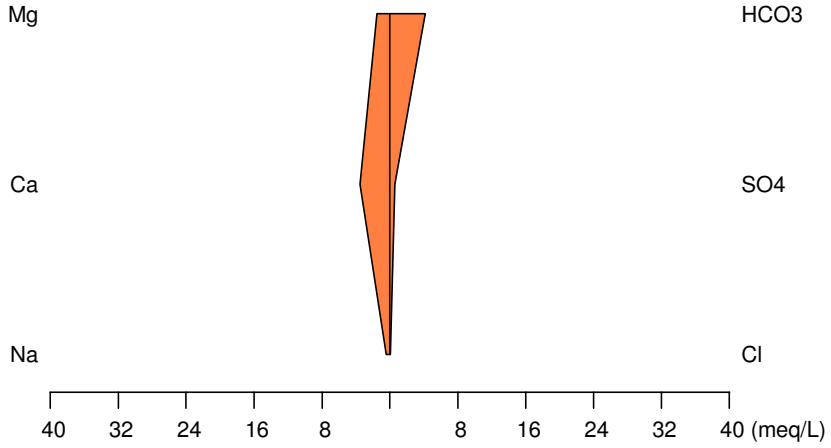
CFMW-054,6/21/2017

Date: 6/21/2017
TDS (mg/l) = 291
El Cond. (uS/cm) =5210



CFMW-056b,6/22/2017

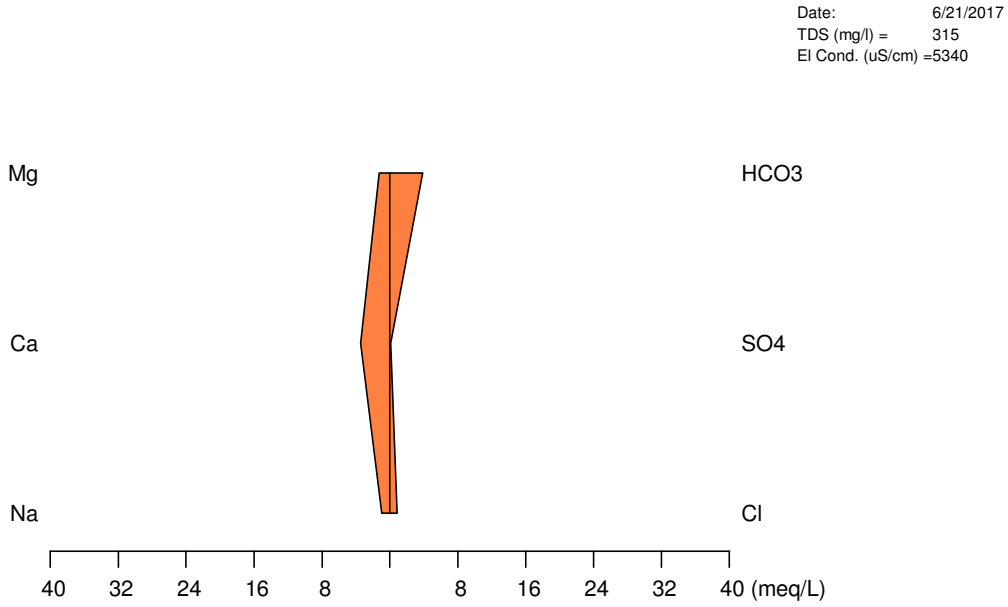
Date: 6/22/2017
TDS (mg/l) = 337
El Cond. (uS/cm) =5210



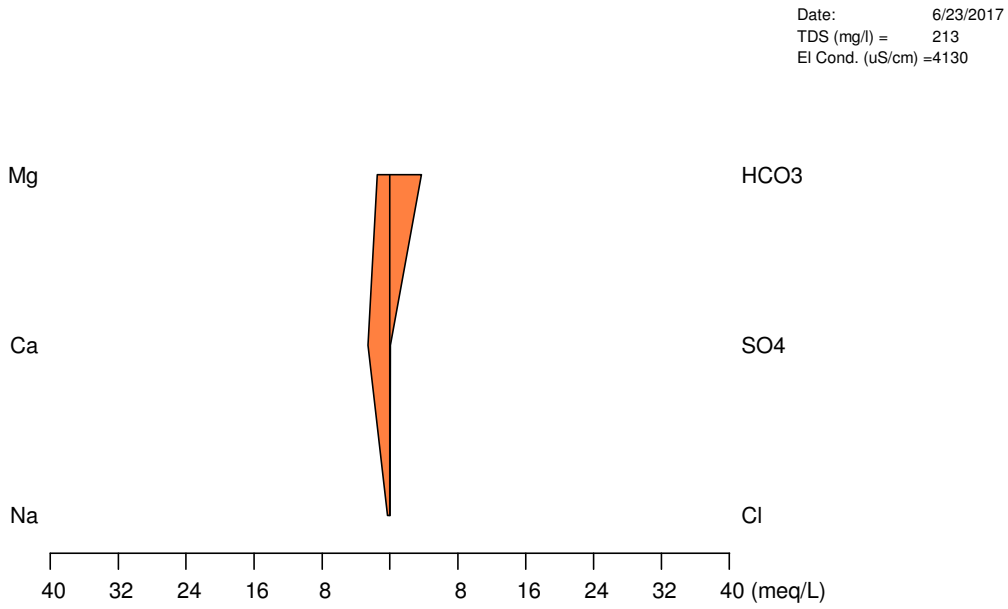
TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

CFMW-059,6/21/2017



CFMW-061,6/23/2017

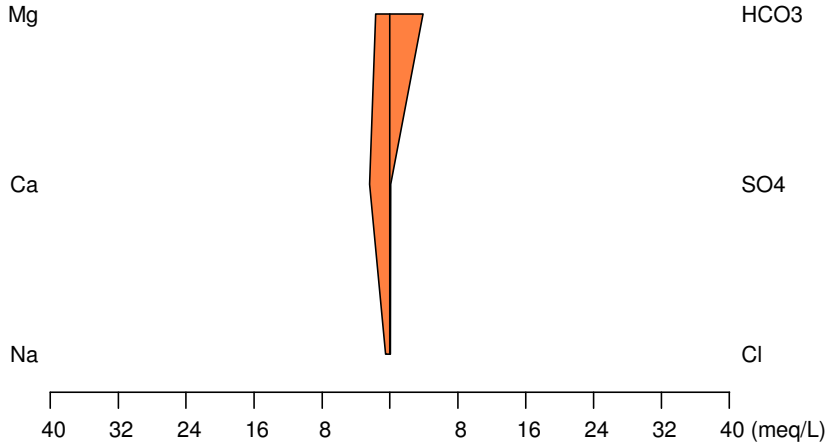


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

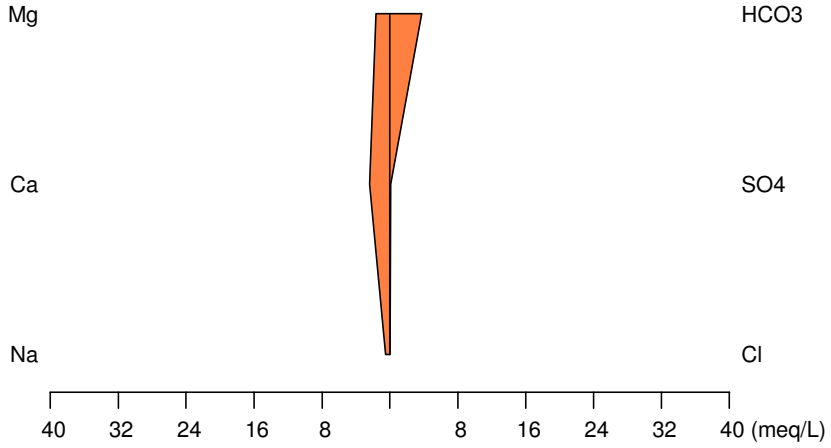
CFMW-064,6/23/2017

Date: 6/23/2017
TDS (mg/l) = 257
El Cond. (uS/cm) =4310



CFMW-064,6/23/2017

Date: 6/23/2017
TDS (mg/l) = 250
El Cond. (uS/cm) =4310



TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened in the Upper Hydrogeologic Unit

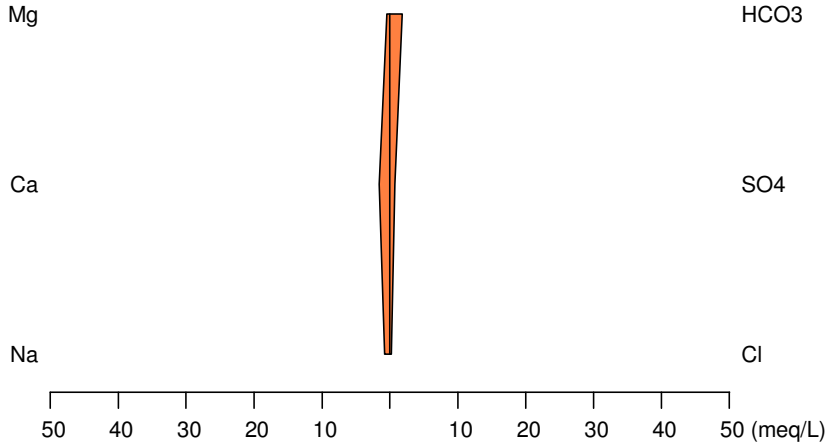
ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

APPENDIX O-2

Stiff Diagrams for Monitoring Wells Screened Below the Upper Hydrogeologic Unit

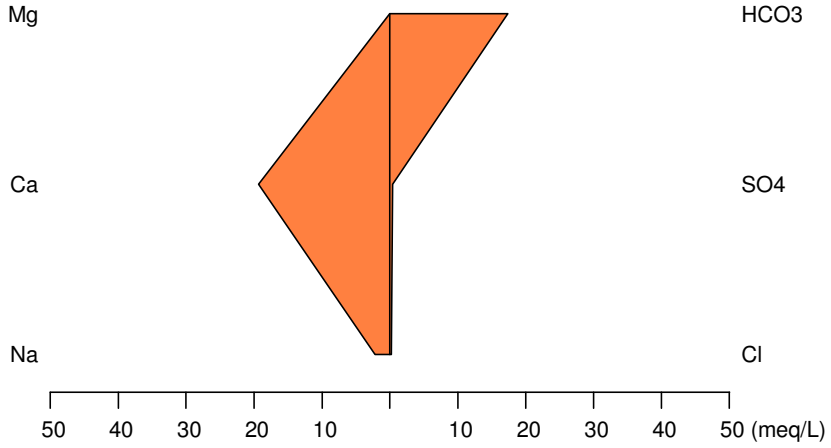
CFMW-003a,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 254
El Cond. (uS/cm) =28100



CFMW-008a,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 1210
El Cond. (uS/cm) =490000

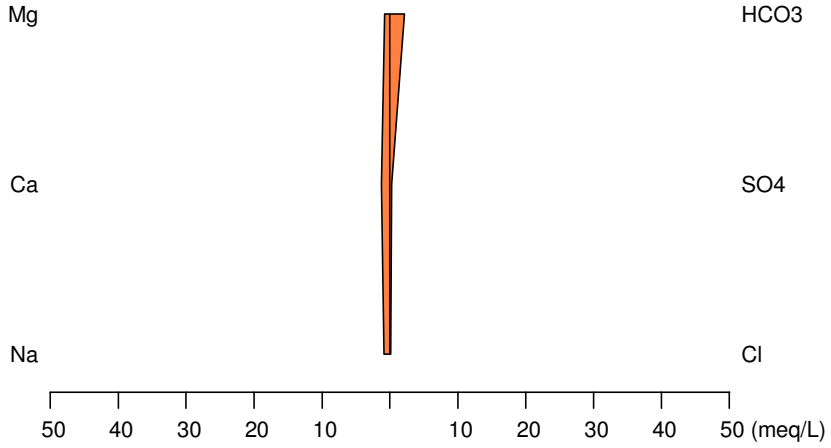


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

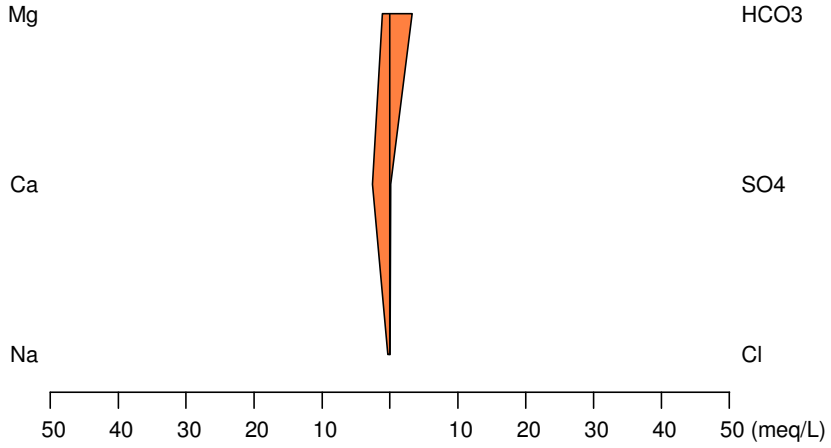
CFMW-011a,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 157
El Cond. (uS/cm) =27100



CFMW-012a,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 210
El Cond. (uS/cm) =37800

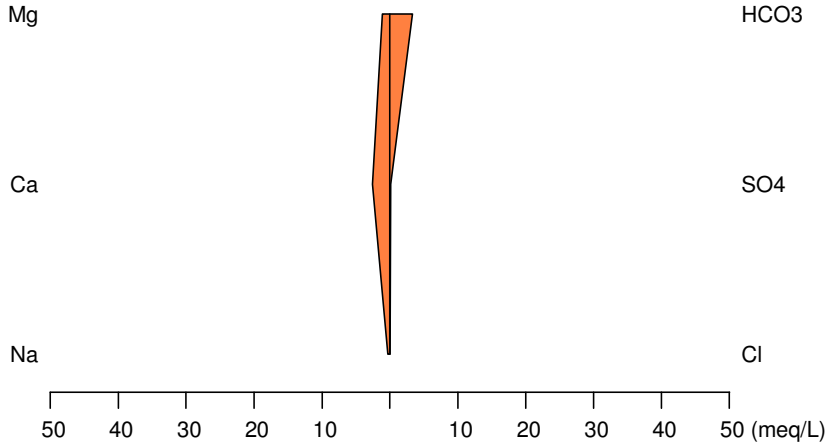


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

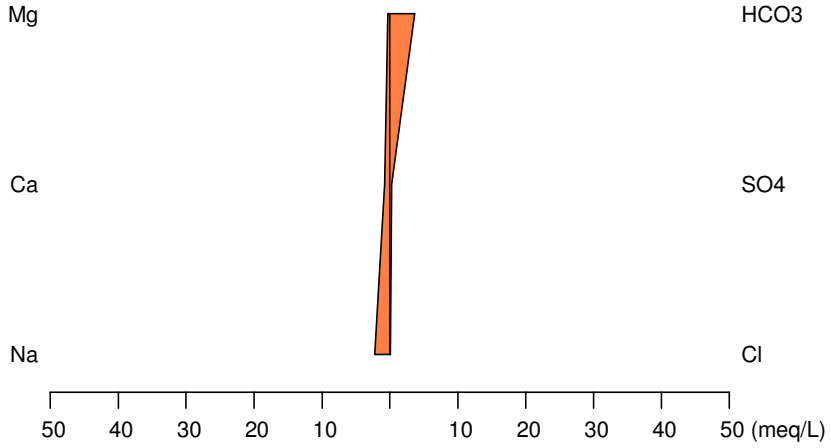
CFMW-012a,9/15/2016

Date: 9/15/2016
TDS (mg/l) = 214
El Cond. (uS/cm) =37800



CFMW-019a,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 234
El Cond. (uS/cm) =37400

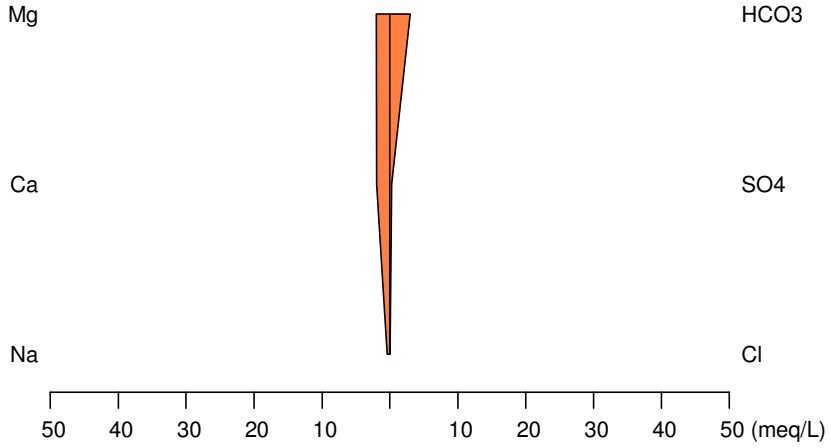


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

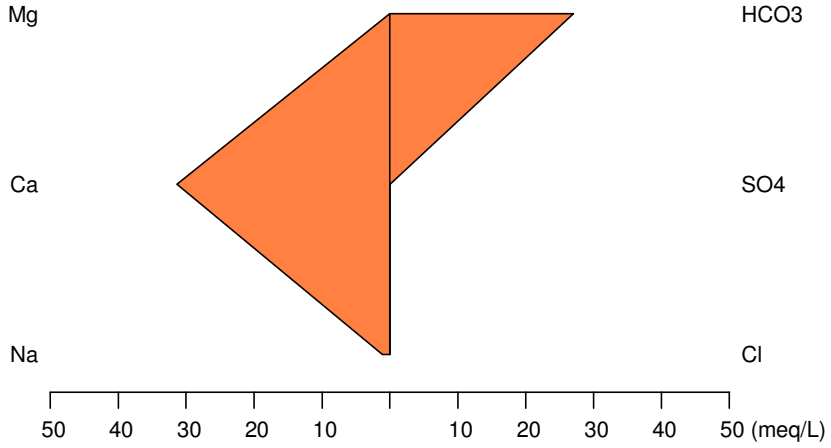
CFMW-025a,9/13/2016

Date: 9/13/2016
TDS (mg/l) = 216
El Cond. (uS/cm) =38600



CFMW-032a,9/16/2016

Date: 9/16/2016
TDS (mg/l) = 1610
El Cond. (uS/cm) =640000

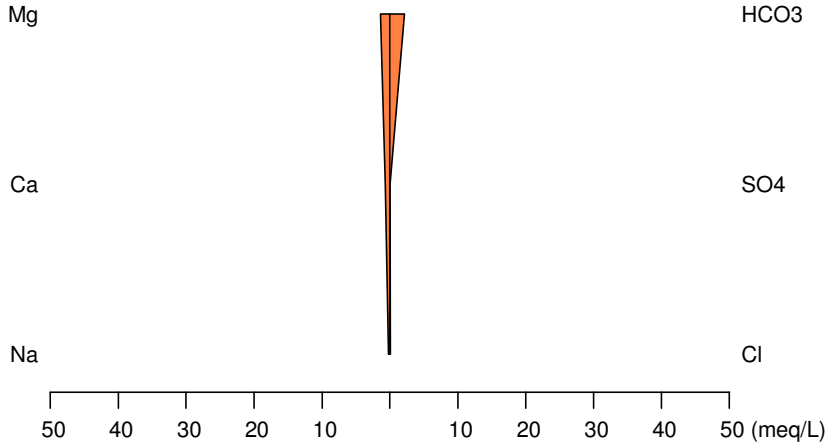


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

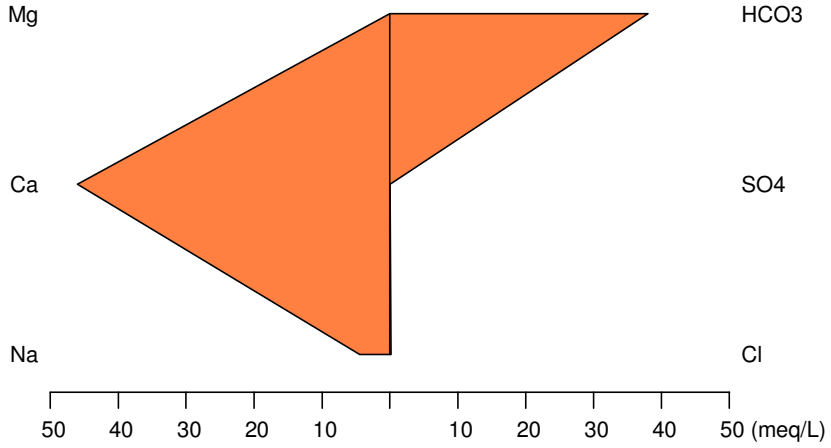
CFMW-044b,9/19/2016

Date: 9/19/2016
TDS (mg/l) = 98
El Cond. (uS/cm) =25500



CFMW-053a,9/19/2016

Date: 9/19/2016
TDS (mg/l) = 2280
El Cond. (uS/cm) =930000

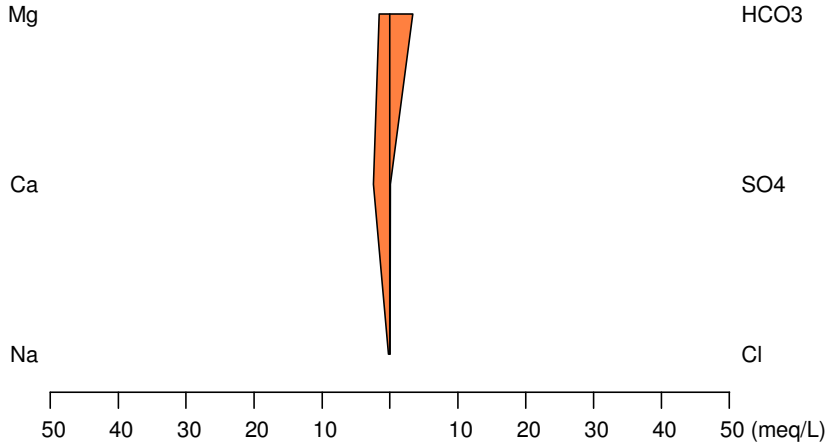


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

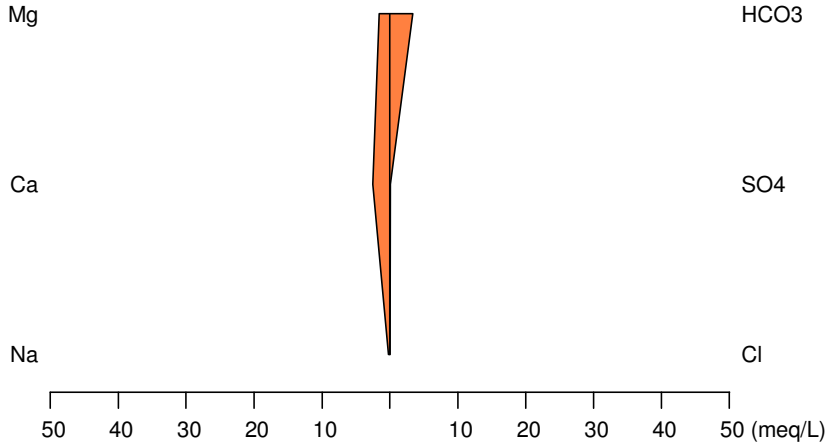
CFMW-056,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 222
El Cond. (uS/cm) =37900



CFMW-056,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 202
El Cond. (uS/cm) =37900

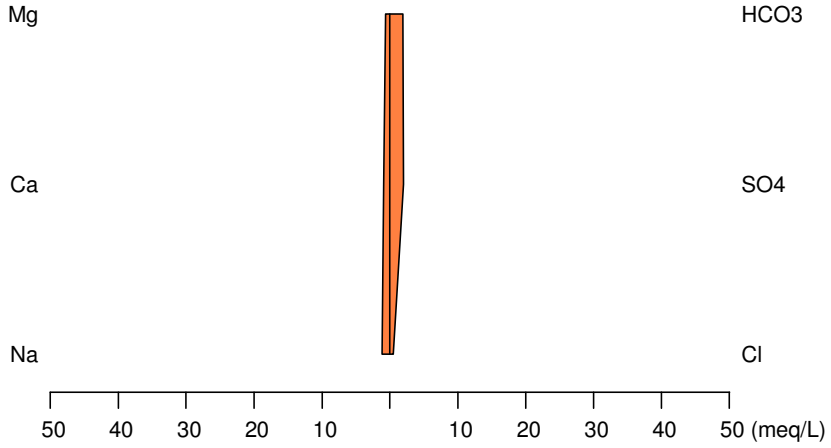


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

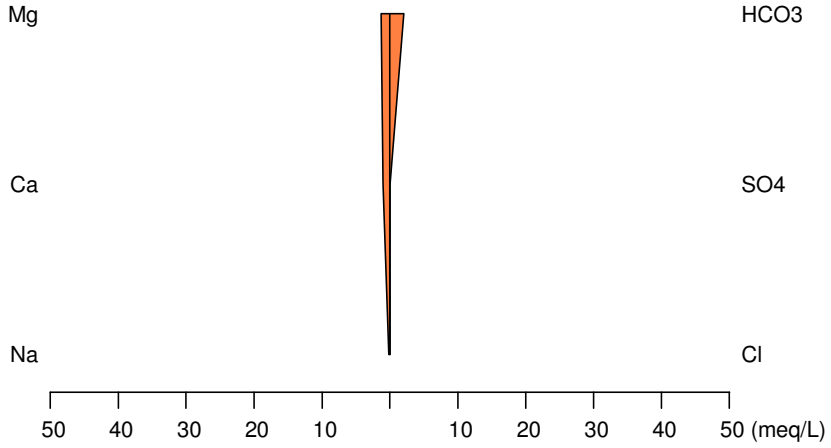
CFMW-056a,9/20/2016

Date: 9/20/2016
TDS (mg/l) = 242
El Cond. (uS/cm) =29800



CFMW-057,9/19/2016

Date: 9/19/2016
TDS (mg/l) = 110
El Cond. (uS/cm) =21200

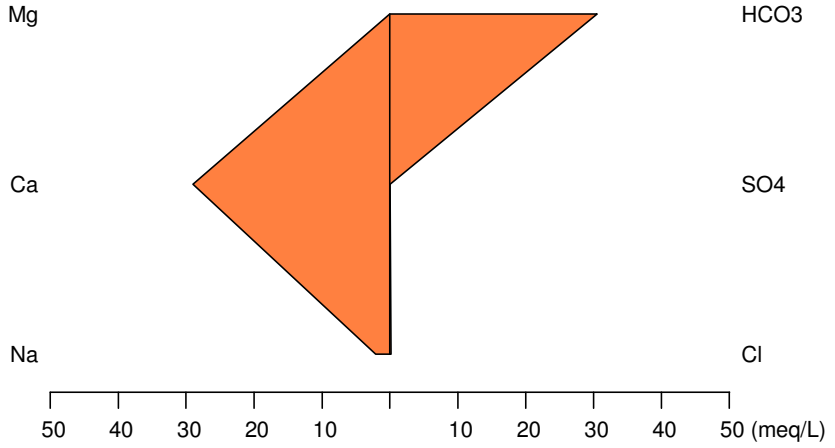


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

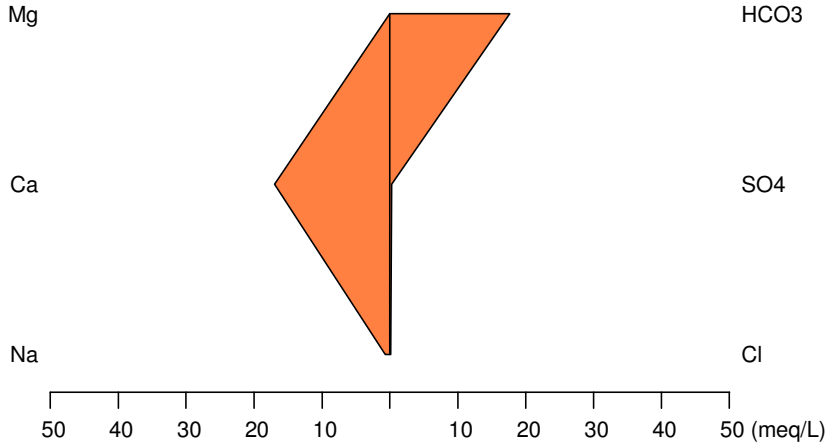
CFMW-057a,9/19/2016

Date: 9/19/2016
TDS (mg/l) = 1780
El Cond. (uS/cm) =832000



CFMW-059a,9/19/2016

Date: 9/19/2016
TDS (mg/l) = 920
El Cond. (uS/cm) =501000

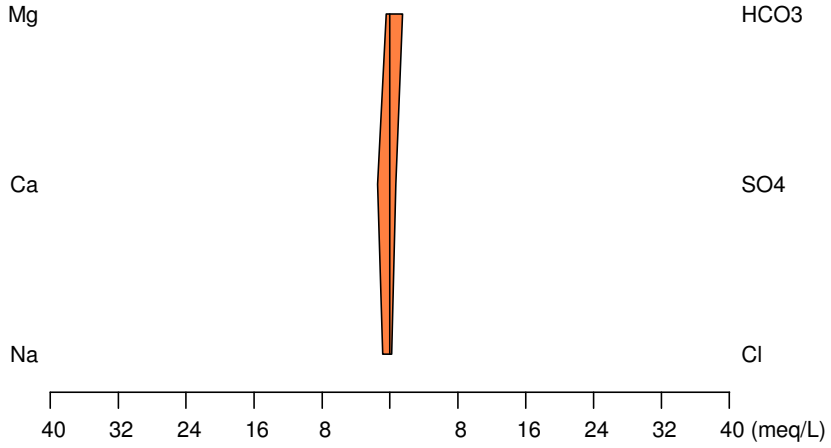


TITLE: Round 1Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

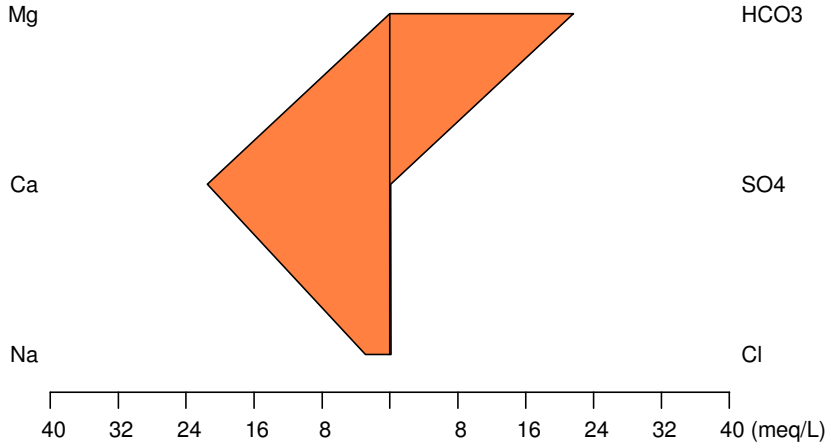
CFMW-003a,12/12/2016

Date: 12/12/2016
TDS (mg/l) = 234
El Cond. (uS/cm) =31200



CFMW-008a,12/16/2016

Date: 12/16/2016
TDS (mg/l) = 1140
El Cond. (uS/cm) =573000

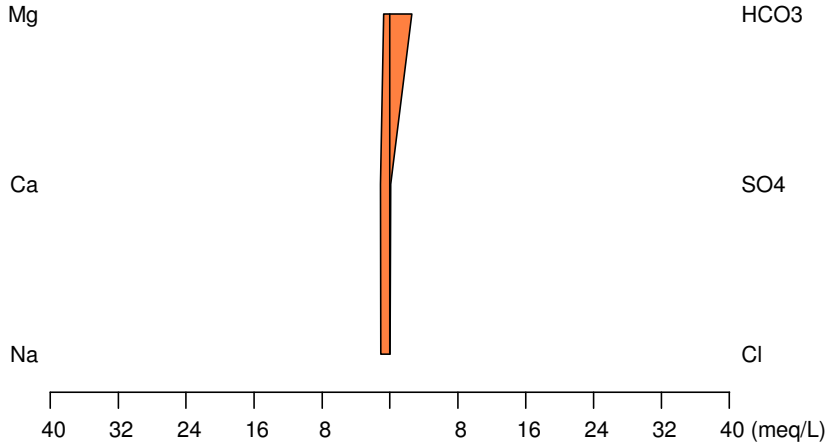


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

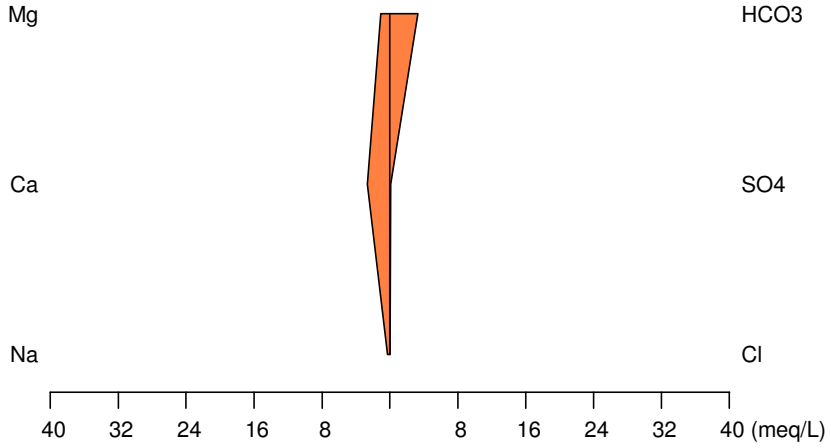
CFMW-011a,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 185
El Cond. (uS/cm) =39200



CFMW-012a,12/13/2016

Date: 12/13/2016
TDS (mg/l) = 206
El Cond. (uS/cm) =39800

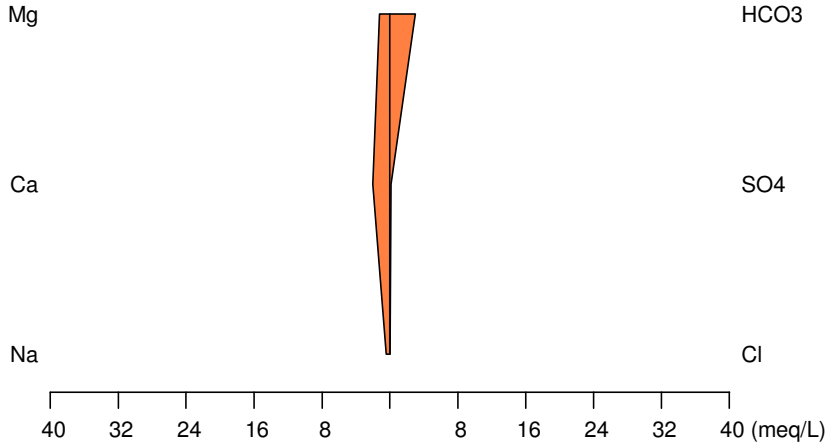


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

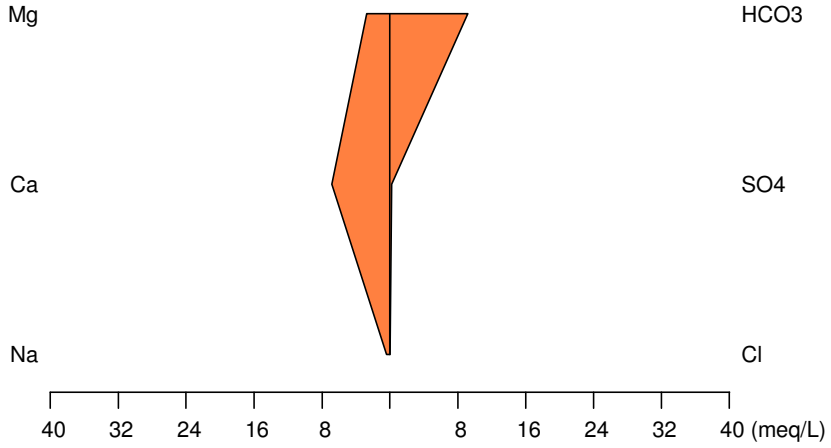
CFMW-019a,12/14/2016

Date: 12/14/2016
TDS (mg/l) = 199
El Cond. (uS/cm) =34200



CFMW-025a,12/5/2016

Date: 12/5/2016
TDS (mg/l) = 522
El Cond. (uS/cm) =115000

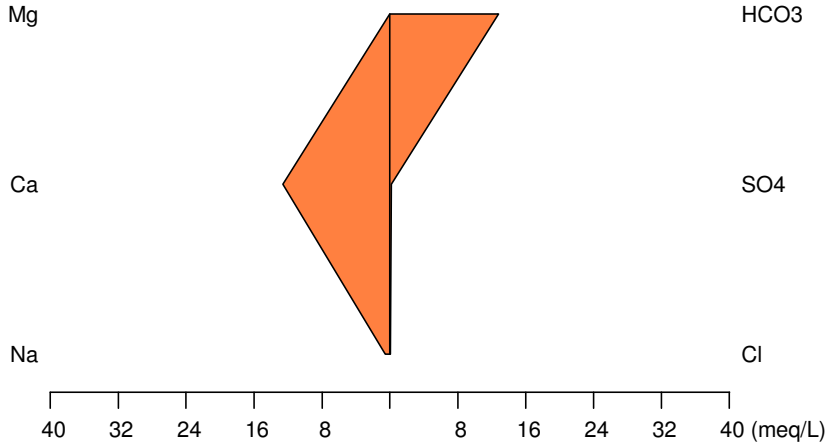


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

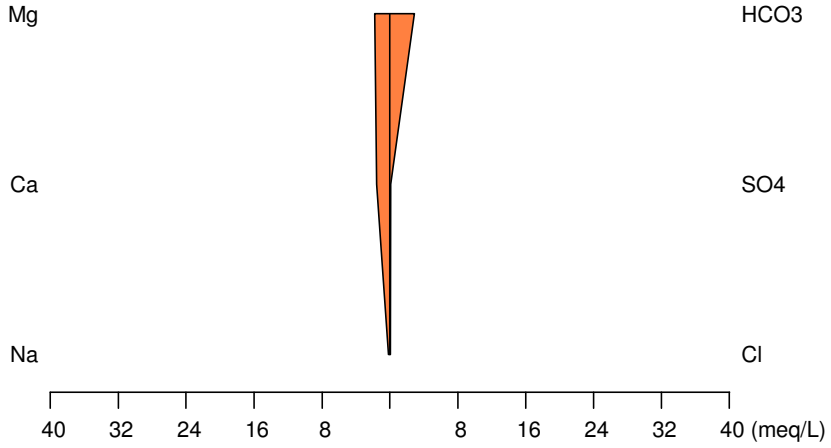
CFMW-032a,12/16/2016

Date: 12/16/2016
TDS (mg/l) = 900
El Cond. (uS/cm) =391000



CFMW-044b,12/19/2016

Date: 12/19/2016
TDS (mg/l) = 166
El Cond. (uS/cm) =30500

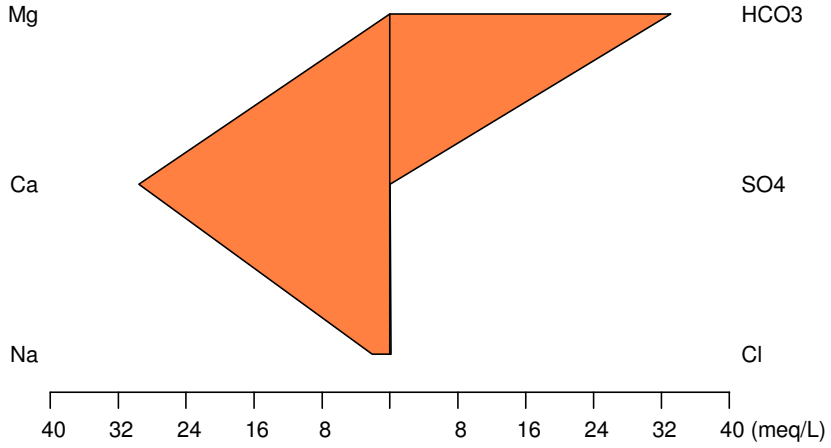


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

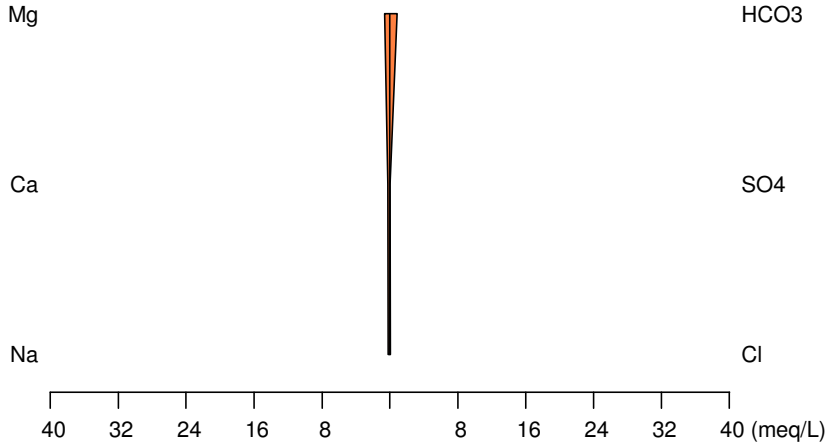
CFMW-053a,12/19/2016

Date: 12/19/2016
TDS (mg/l) = 2750
El Cond. (uS/cm) =552000



CFMW-056,12/13/2016

Date: 12/13/2016
TDS (mg/l) = 53
El Cond. (uS/cm) =12000

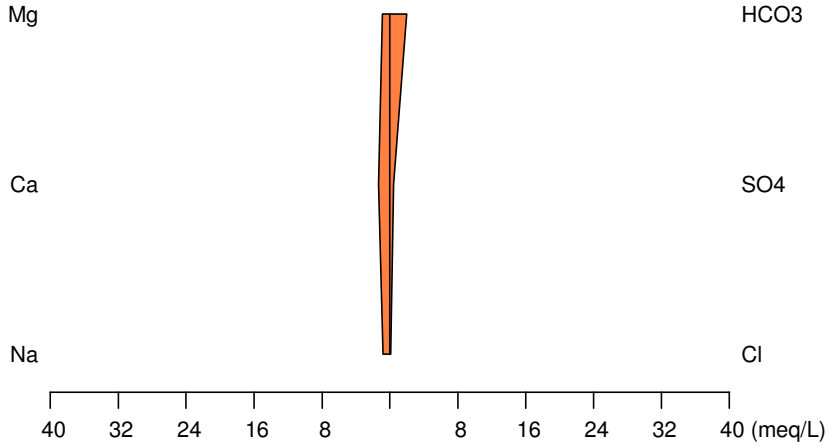


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

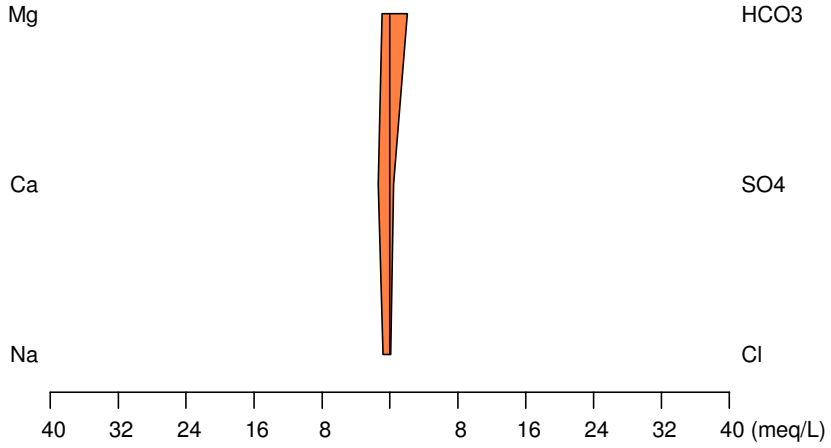
CFMW-056a,12/6/2016

Date: 12/6/2016
TDS (mg/l) = 179
El Cond. (uS/cm) =29800



CFMW-056a,12/6/2016

Date: 12/6/2016
TDS (mg/l) = 163
El Cond. (uS/cm) =29800

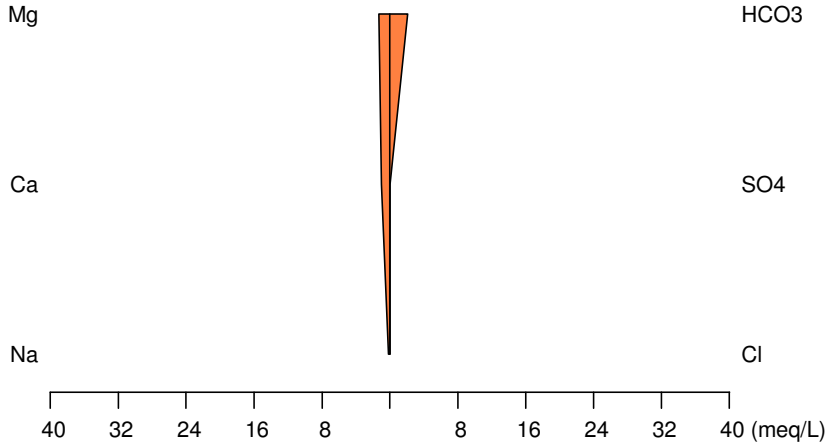


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

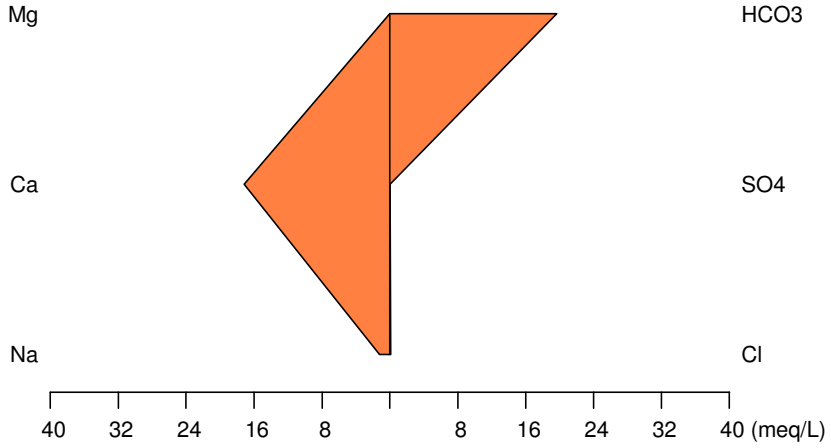
CFMW-057,12/5/2016

Date: 12/5/2016
TDS (mg/l) = 78
El Cond. (uS/cm) =26000



CFMW-057a,12/16/2016

Date: 12/16/2016
TDS (mg/l) = 1080
El Cond. (uS/cm) =289000

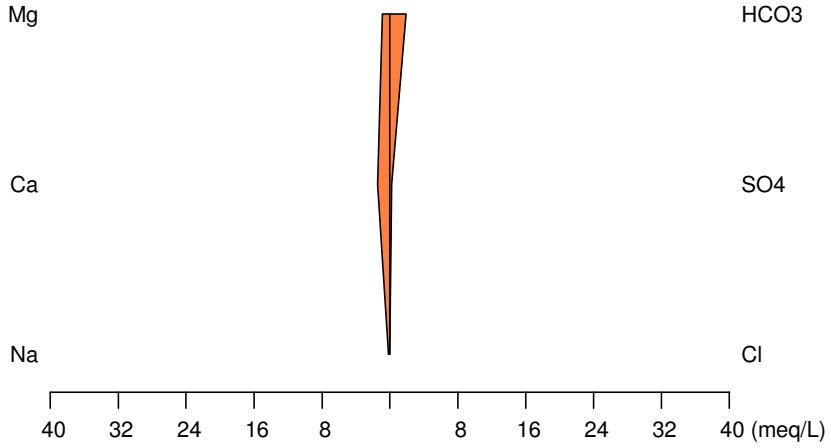


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

CFMW-059a,12/16/2016

Date: 12/16/2016
TDS (mg/l) = 158
El Cond. (uS/cm) =25800

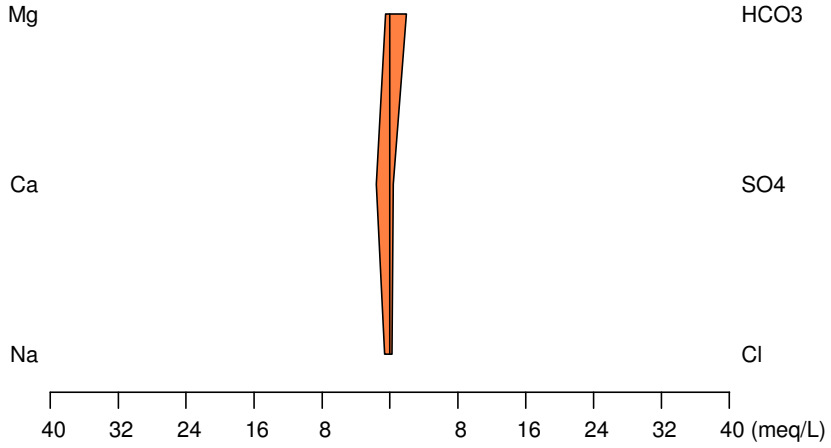


TITLE: Round 2 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

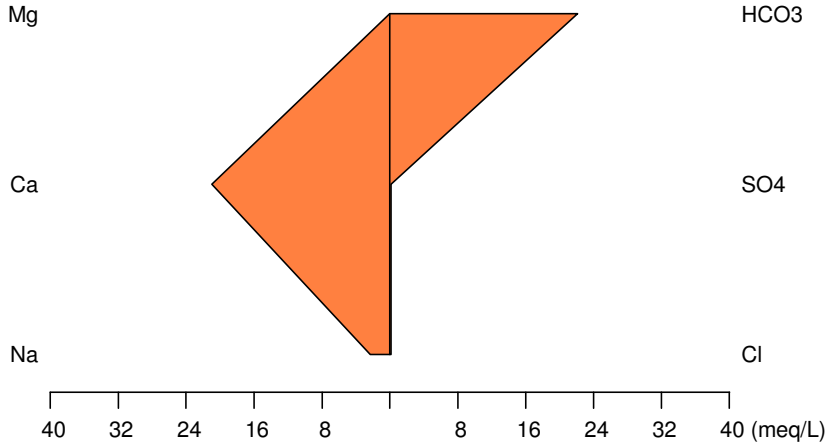
CFMW-003a,3/20/2017

Date: 3/20/2017
TDS (mg/l) = 198
El Cond. (uS/cm) =198000



CFMW-008a,3/28/2017

Date: 3/28/2017
TDS (mg/l) = 1800
El Cond. (uS/cm) =1800000

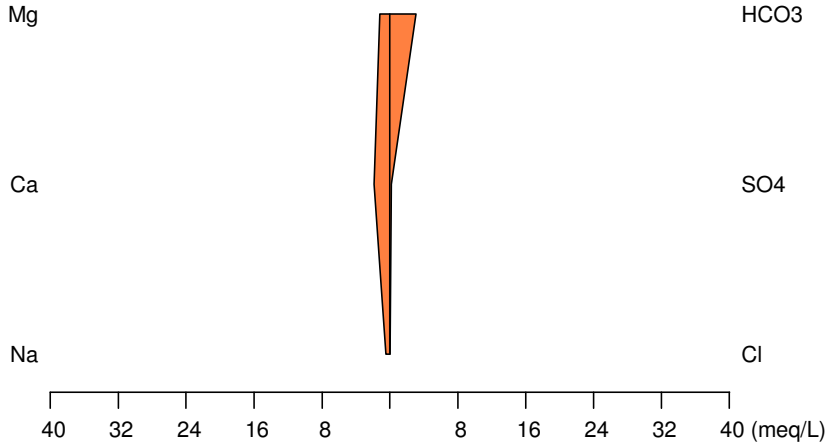


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

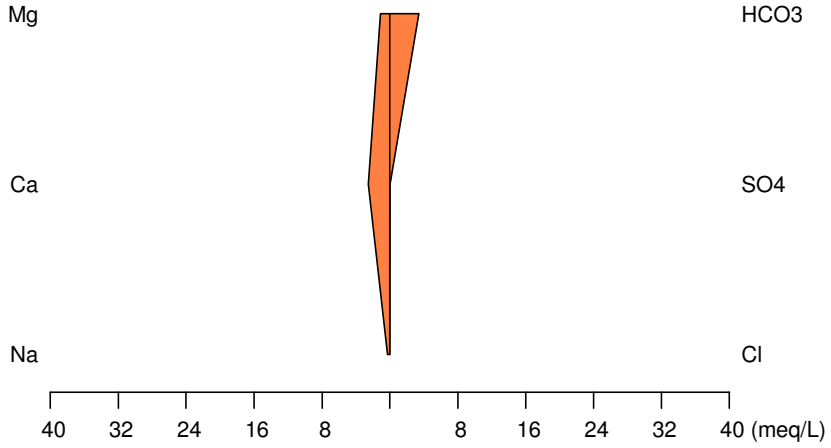
CFMW-011a,3/21/2017

Date: 3/21/2017
TDS (mg/l) = 211
El Cond. (uS/cm) =211000



CFMW-012a,3/20/2017

Date: 3/20/2017
TDS (mg/l) = 193
El Cond. (uS/cm) =193000

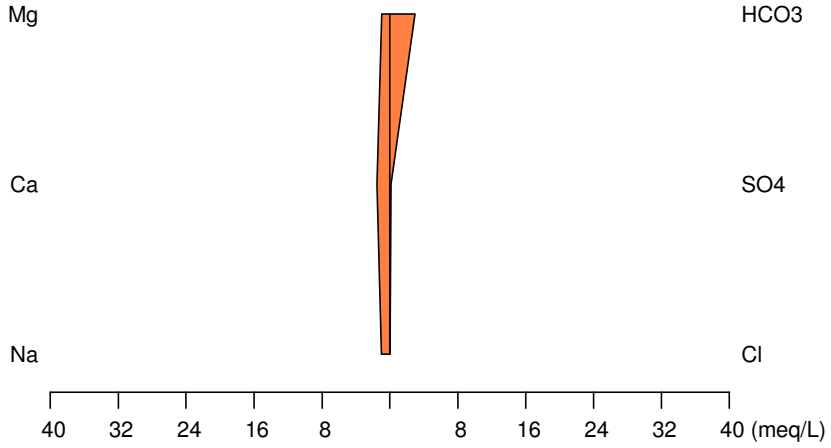


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

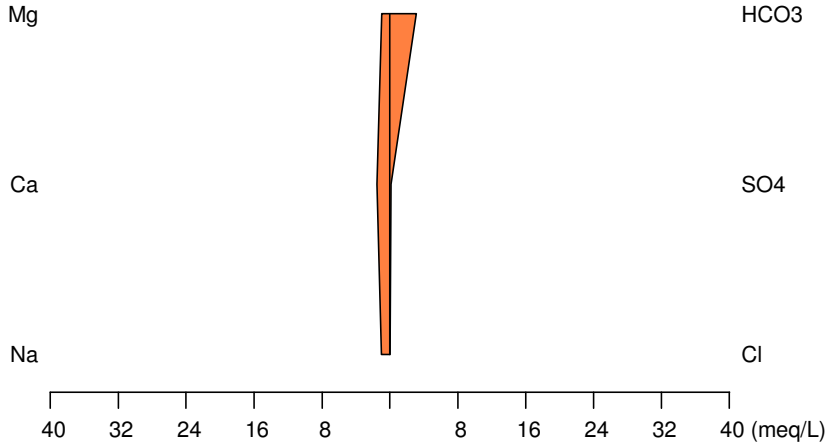
CFMW-019a,3/27/2017

Date: 3/27/2017
TDS (mg/l) = 199
El Cond. (uS/cm) =199000



CFMW-019a,3/27/2017

Date: 3/27/2017
TDS (mg/l) = 180
El Cond. (uS/cm) =180000

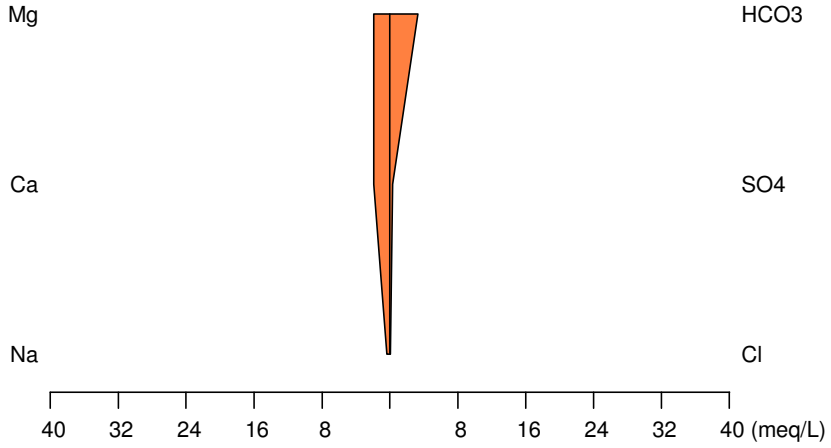


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

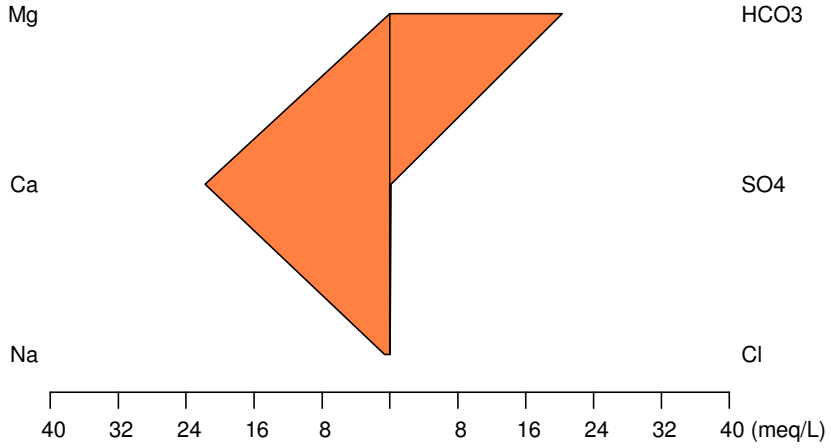
CFMW-025a,3/24/2017

Date: 3/24/2017
TDS (mg/l) = 219
El Cond. (uS/cm) =219000



CFMW-032a,3/29/2017

Date: 3/29/2017
TDS (mg/l) = 1200
El Cond. (uS/cm) =1200000

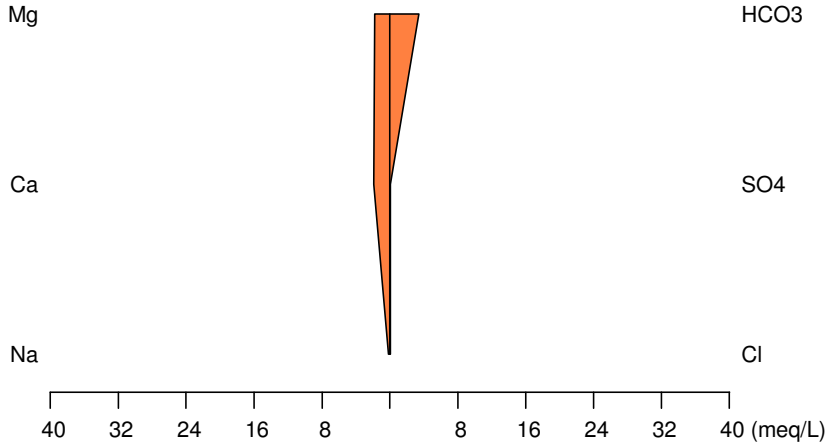


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

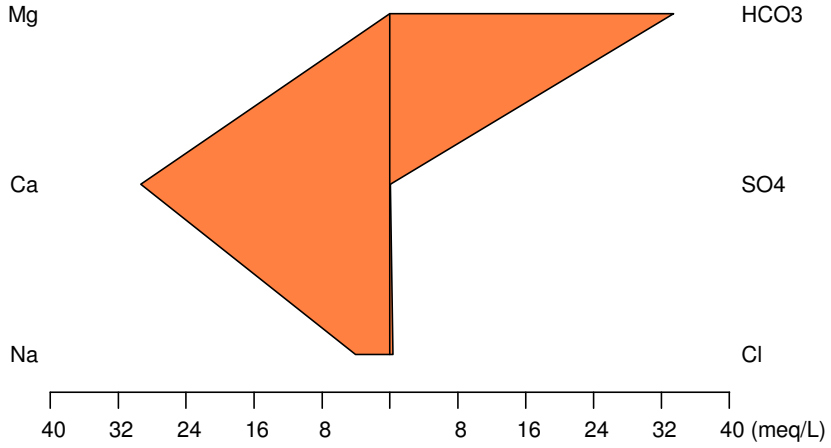
CFMW-044b,3/24/2017

Date: 3/24/2017
TDS (mg/l) = 208
El Cond. (uS/cm) =208000



CFMW-053a,3/27/2017

Date: 3/27/2017
TDS (mg/l) = 2300
El Cond. (uS/cm) =2300000

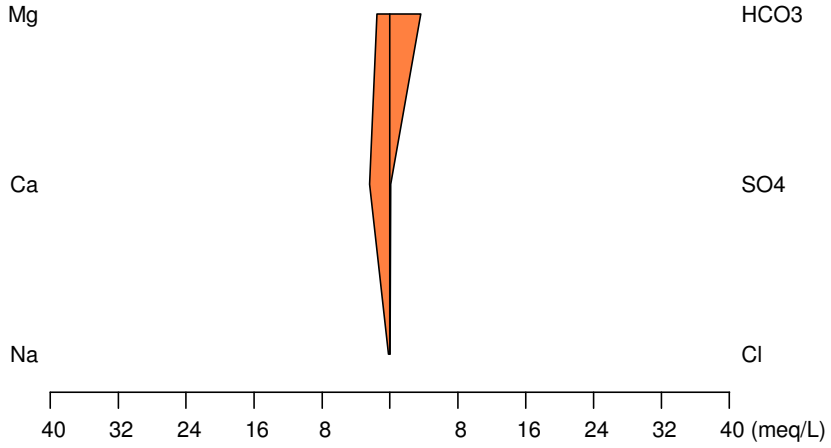


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

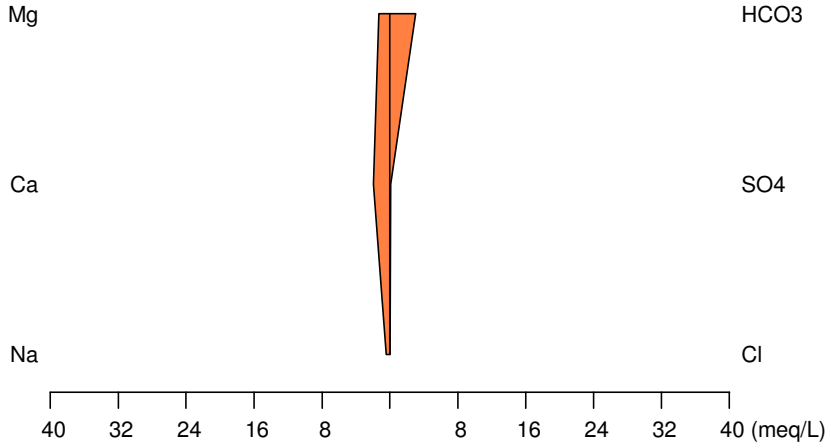
CFMW-056,3/22/2017

Date: 3/22/2017
TDS (mg/l) = 211
El Cond. (uS/cm) =211000



CFMW-056a,3/30/2017

Date: 3/30/2017
TDS (mg/l) = 199
El Cond. (uS/cm) =199000

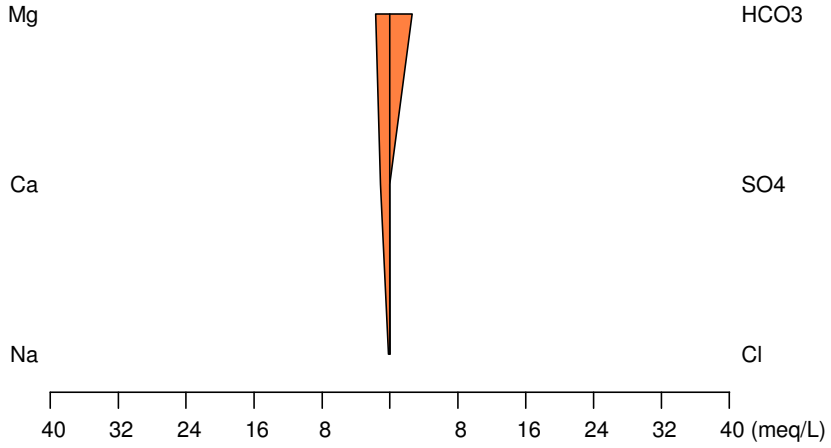


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

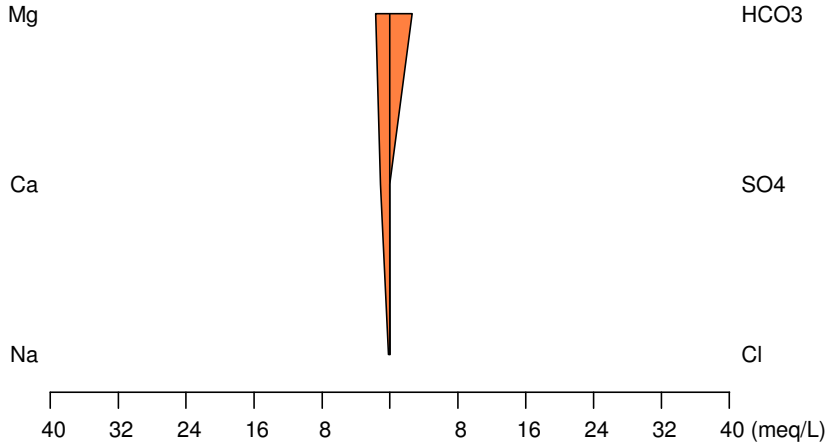
CFMW-057,3/29/2017

Date: 3/29/2017
TDS (mg/l) = 128
El Cond. (uS/cm) =128000



CFMW-057,3/29/2017

Date: 3/29/2017
TDS (mg/l) = 127
El Cond. (uS/cm) =127000

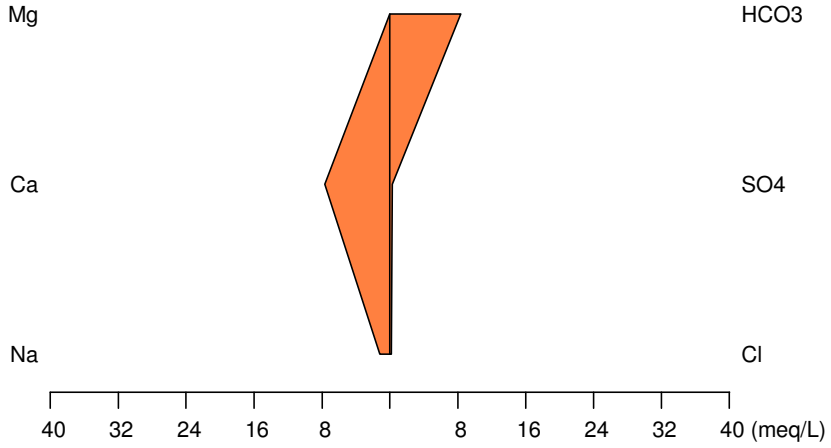


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

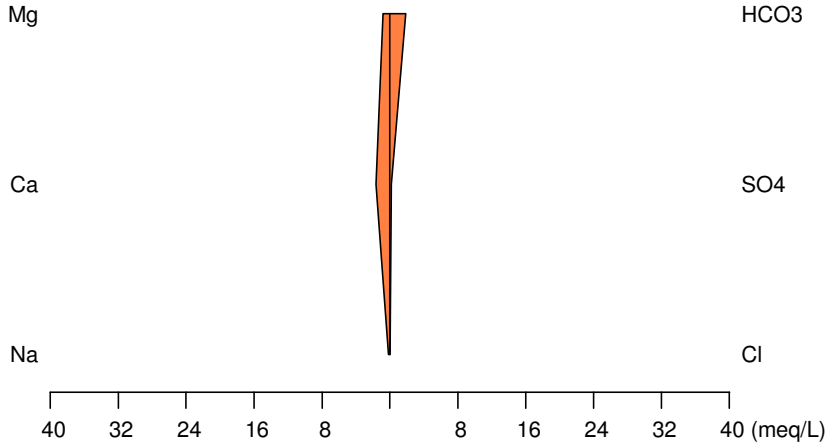
CFMW-057a,3/22/2017

Date: 3/22/2017
TDS (mg/l) = 680
El Cond. (uS/cm) =680000



CFMW-059a,3/29/2017

Date: 3/29/2017
TDS (mg/l) = 129
El Cond. (uS/cm) =129000

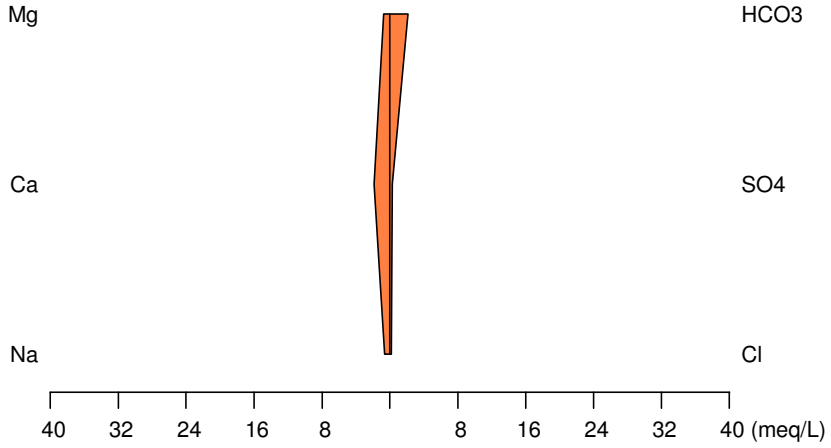


TITLE: Round 3 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

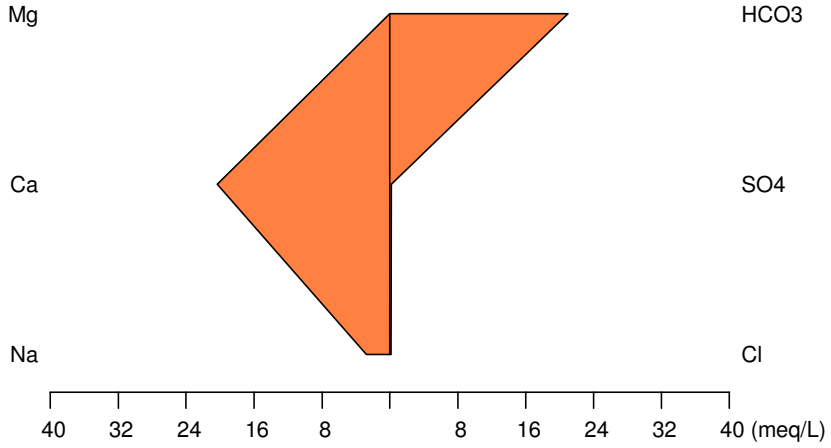
CFMW-003a,6/19/2017

Date: 6/19/2017
TDS (mg/l) = 143
El Cond. (uS/cm) =2900



CFMW-008a,6/28/2017

Date: 6/28/2017
TDS (mg/l) = 1300
El Cond. (uS/cm) =56100

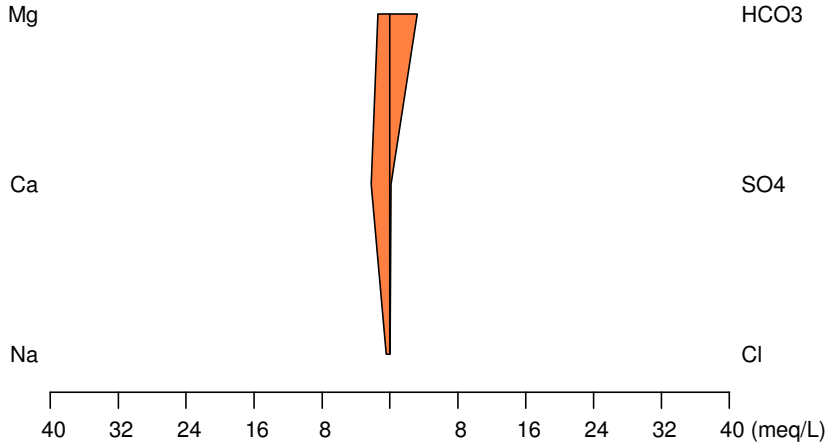


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

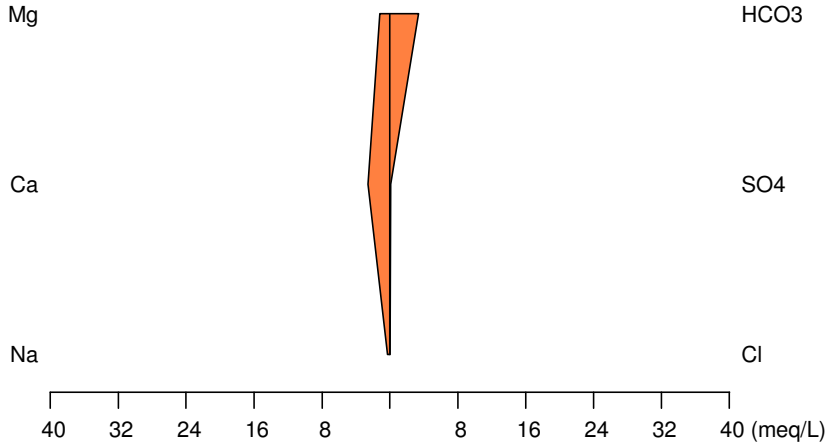
CFMW-011a,6/29/2017

Date: 6/29/2017
TDS (mg/l) = 237
El Cond. (uS/cm) =3830



CFMW-012a,6/20/2017

Date: 6/20/2017
TDS (mg/l) = 217
El Cond. (uS/cm) =3950

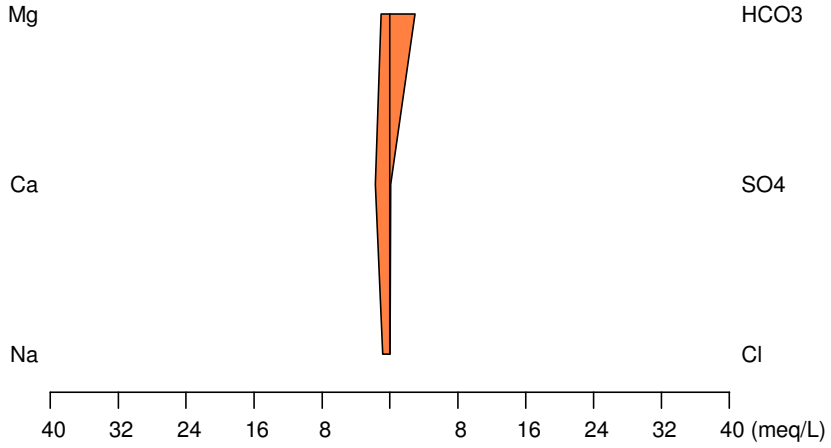


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

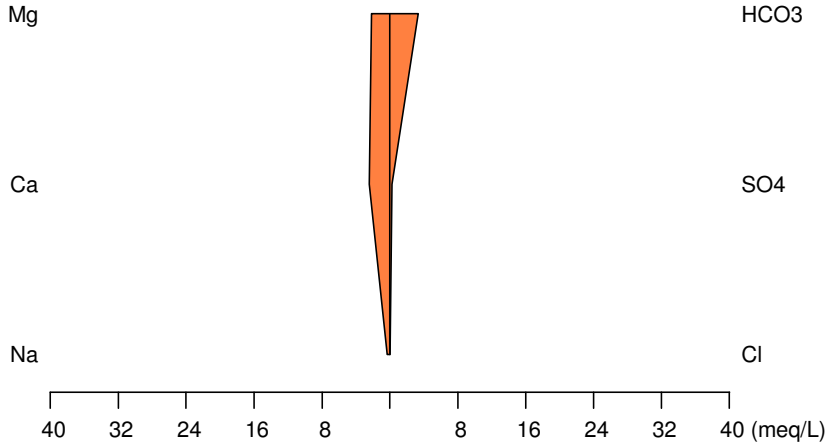
CFMW-019a,6/26/2017

Date: 6/26/2017
TDS (mg/l) = 218
El Cond. (uS/cm) =3460



CFMW-025a,6/22/2017

Date: 6/22/2017
TDS (mg/l) = 227
El Cond. (uS/cm) =3930

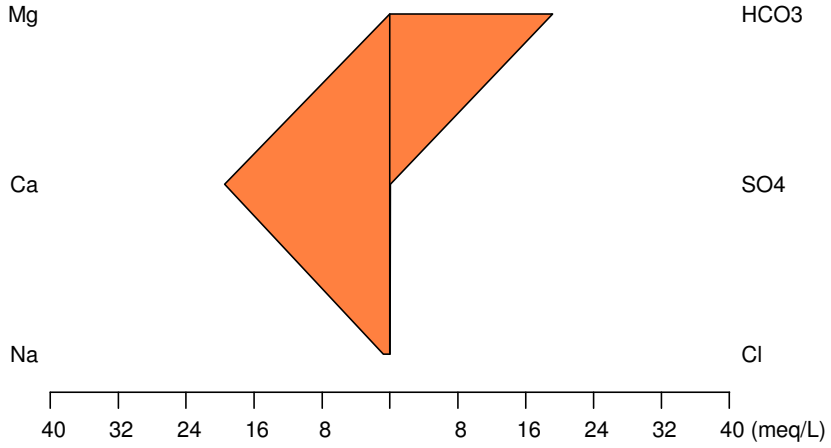


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

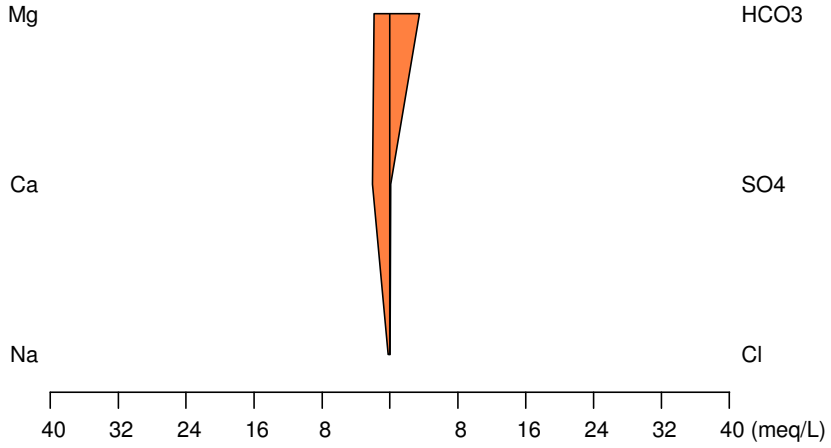
CFMW-032a,6/27/2017

Date: 6/27/2017
TDS (mg/l) = 1340
El Cond. (uS/cm) =51500



CFMW-044b,6/23/2017

Date: 6/23/2017
TDS (mg/l) = 218
El Cond. (uS/cm) =4060

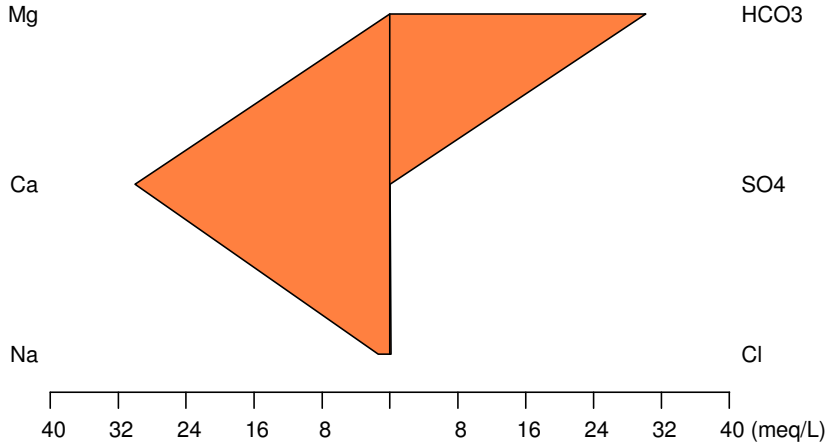


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

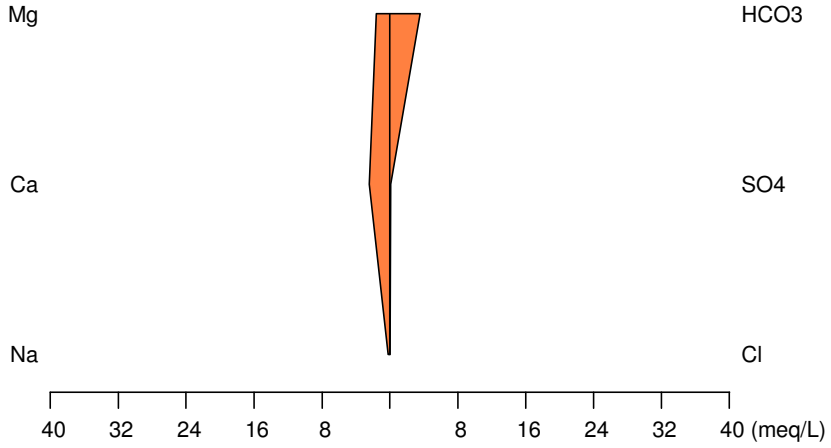
CFMW-053a,6/28/2017

Date: 6/28/2017
TDS (mg/l) = 1850
El Cond. (uS/cm) =71500



CFMW-056,6/22/2017

Date: 6/22/2017
TDS (mg/l) = 227
El Cond. (uS/cm) =3990

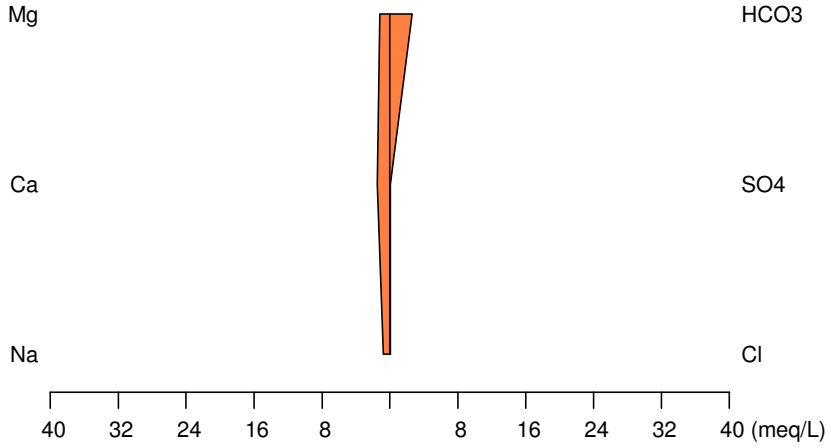


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

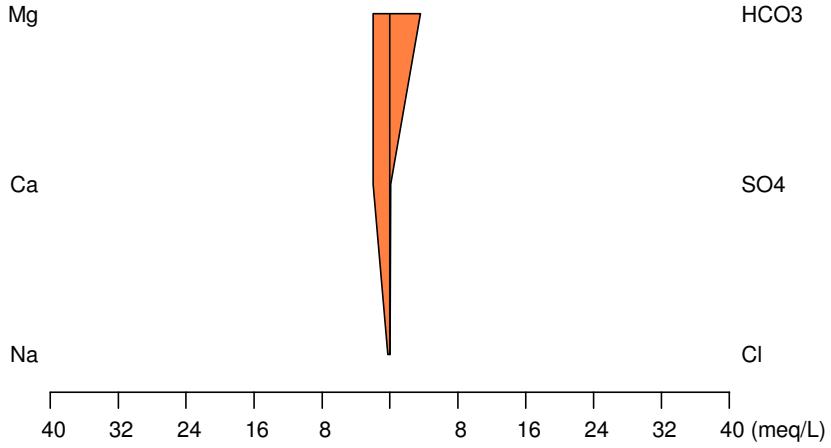
CFMW-056a,6/22/2017

Date: 6/22/2017
TDS (mg/l) = 239
El Cond. (uS/cm) =3150



CFMW-057,6/28/2017

Date: 6/28/2017
TDS (mg/l) = 211
El Cond. (uS/cm) =3940

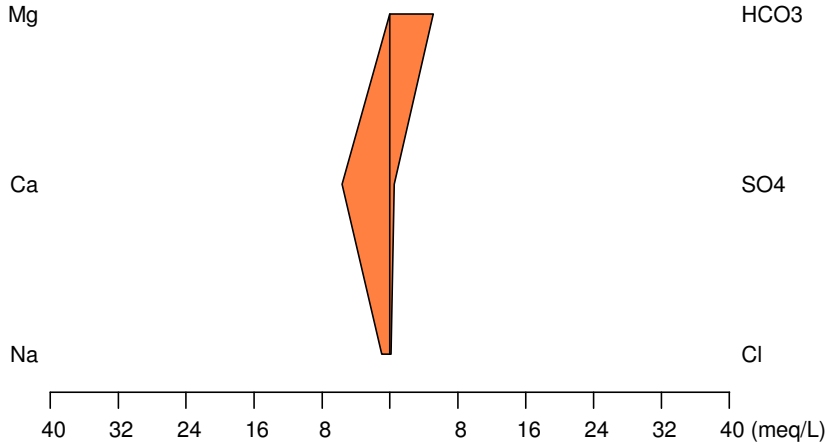


TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

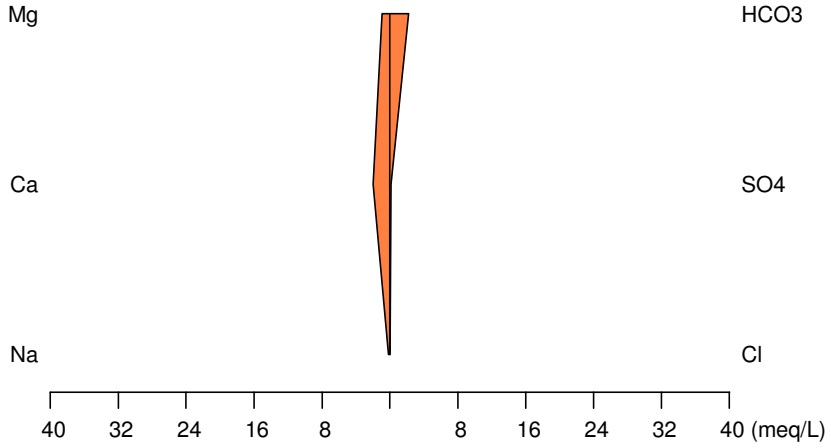
CFMW-057a,6/28/2017

Date: 6/28/2017
TDS (mg/l) = 396
El Cond. (uS/cm) =15200



CFMW-059a,6/28/2017

Date: 6/28/2017
TDS (mg/l) = 138
El Cond. (uS/cm) =2520



TITLE: Round 4 Stiff Diagrams of General Chemistry in Monitoring Wells Screened Below Upper Hydrogeologic Unit

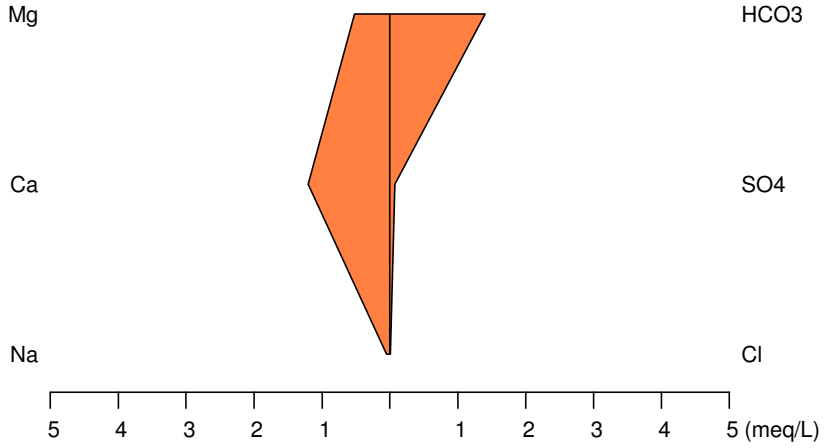
ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

APPENDIX O-3

Stiff Diagrams for Surface Water

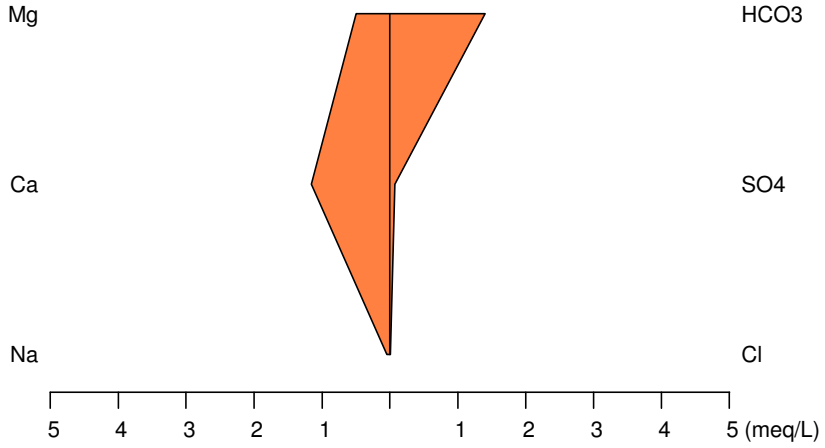
CFSWP-001,9/16/2016

Date: 9/16/2016
TDS (mg/l) = 101
El Cond. (uS/cm) =16800



CFSWP-002,9/16/2016

Date: 9/16/2016
TDS (mg/l) = 91
El Cond. (uS/cm) =16700

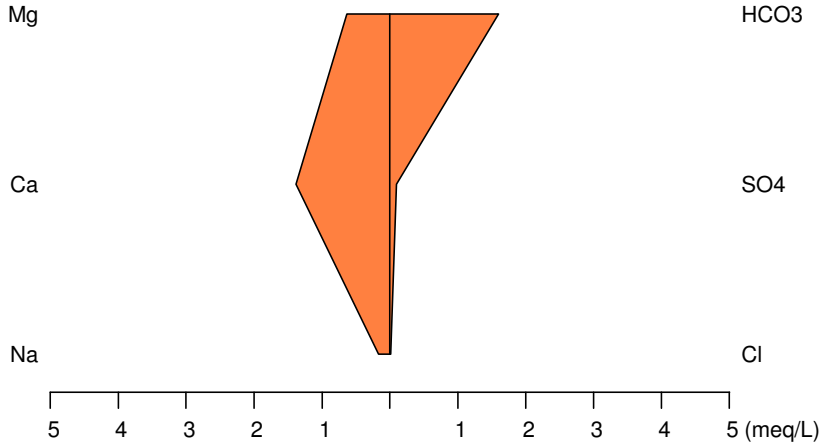


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

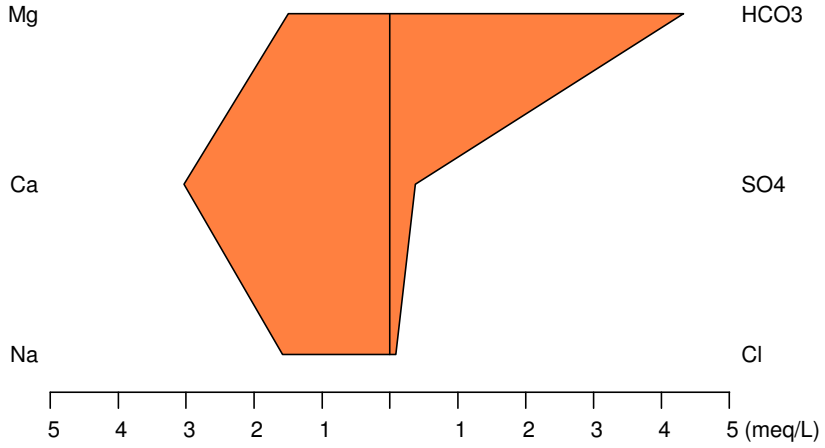
CFSWP-003,9/9/2016

Date: 9/9/2016
TDS (mg/l) = 116
El Cond. (uS/cm) =20800



CFSWP-004,9/9/2016

Date: 9/9/2016
TDS (mg/l) = 312
El Cond. (uS/cm) =52000

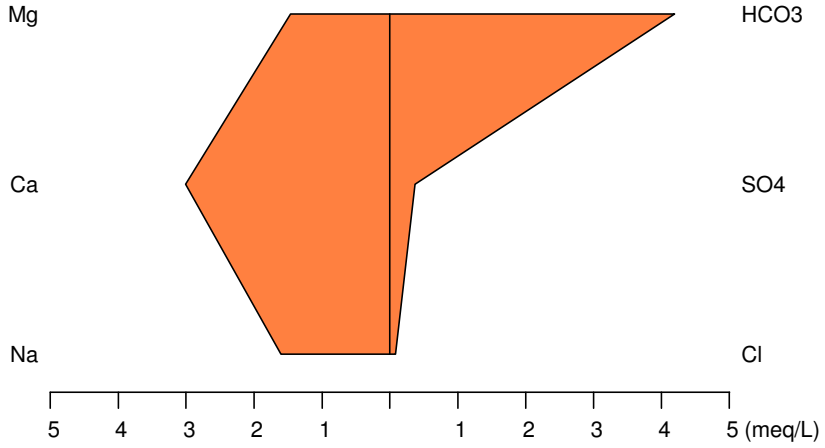


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

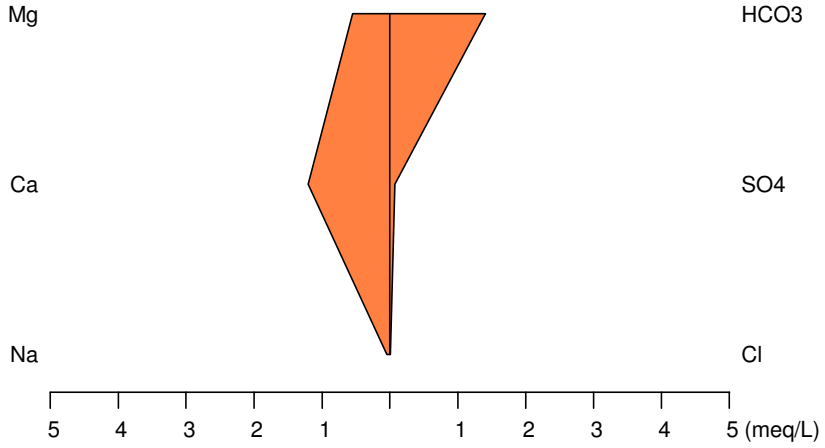
CFSWP-005,9/9/2016

Date: 9/9/2016
TDS (mg/l) = 315
El Cond. (uS/cm) =51700



CFSWP-006,9/9/2016

Date: 9/9/2016
TDS (mg/l) = 95
El Cond. (uS/cm) =16500

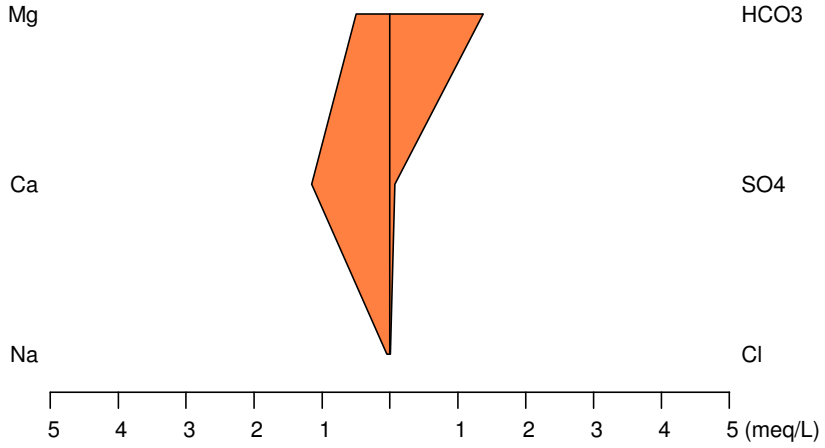


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

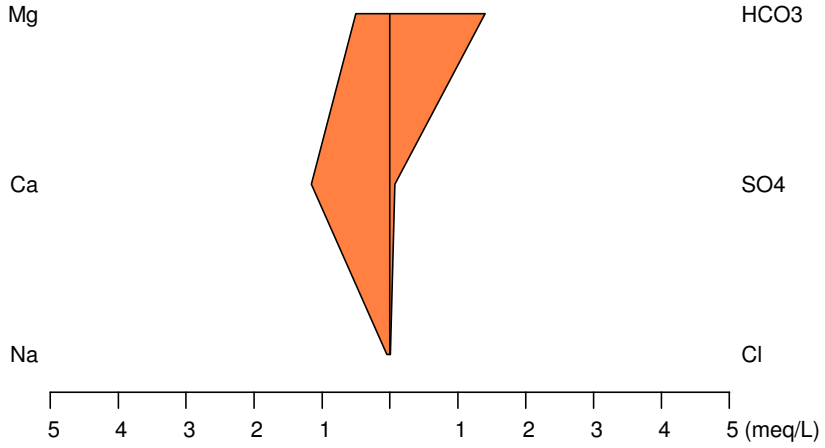
CFSWP-007,9/16/2016

Date: 9/16/2016
TDS (mg/l) = 100
El Cond. (uS/cm) =16600



CFSWP-008,9/16/2016

Date: 9/16/2016
TDS (mg/l) = 95
El Cond. (uS/cm) =16600

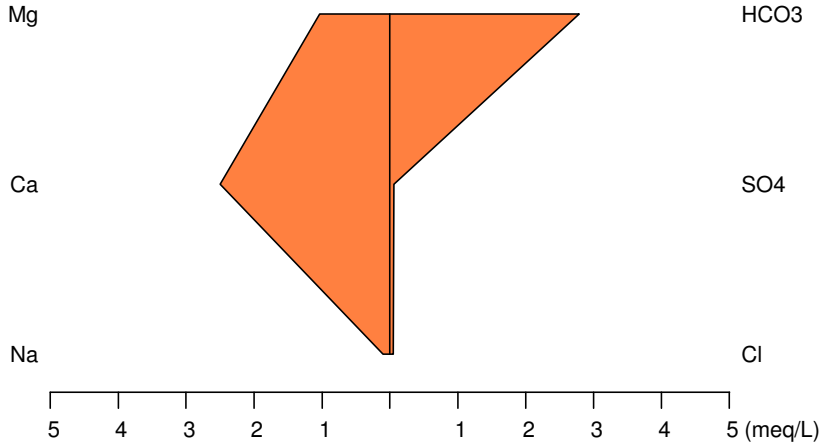


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

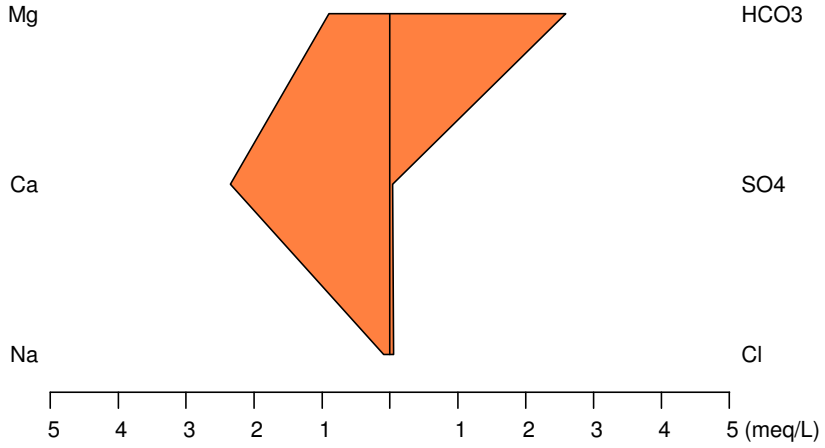
CFSWP-009,6/7/2016

Date: 6/7/2016
TDS (mg/l) = 179
El Cond. (uS/cm) =32600



CFSWP-010,6/7/2016

Date: 6/7/2016
TDS (mg/l) = 150
El Cond. (uS/cm) =29600

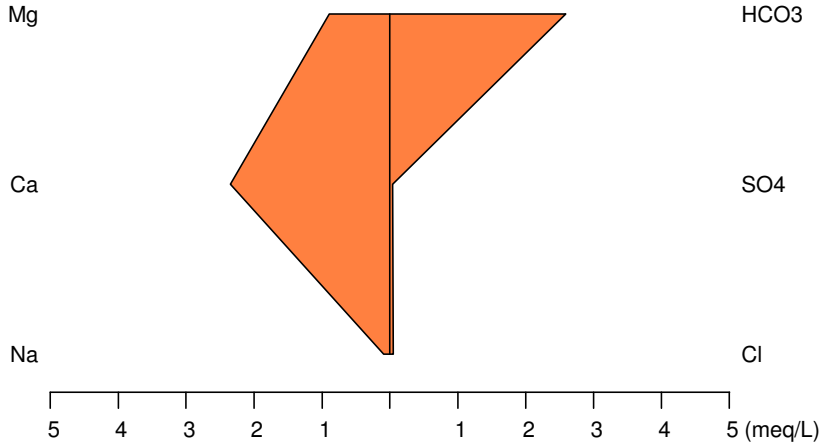


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

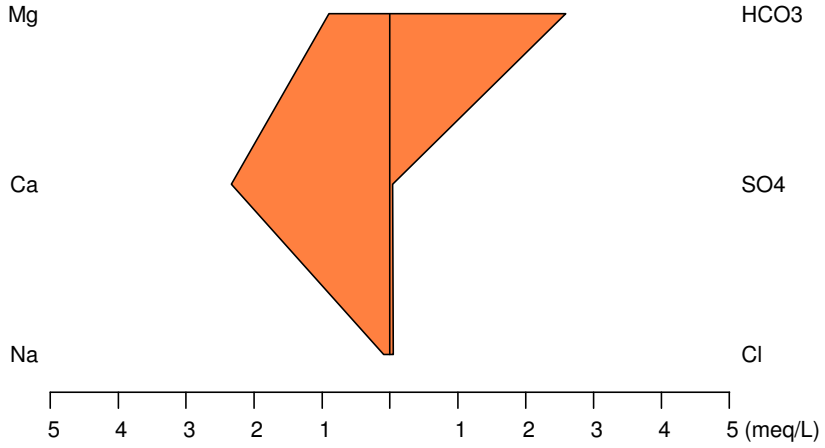
CFSWP-011,6/7/2016

Date: 6/7/2016
TDS (mg/l) = 170
El Cond. (uS/cm) =29800



CFSWP-012,6/7/2016

Date: 6/7/2016
TDS (mg/l) = 146
El Cond. (uS/cm) =29600

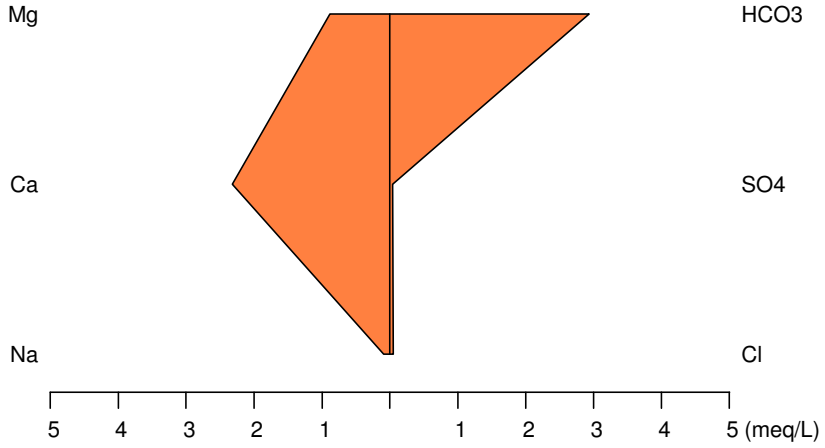


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

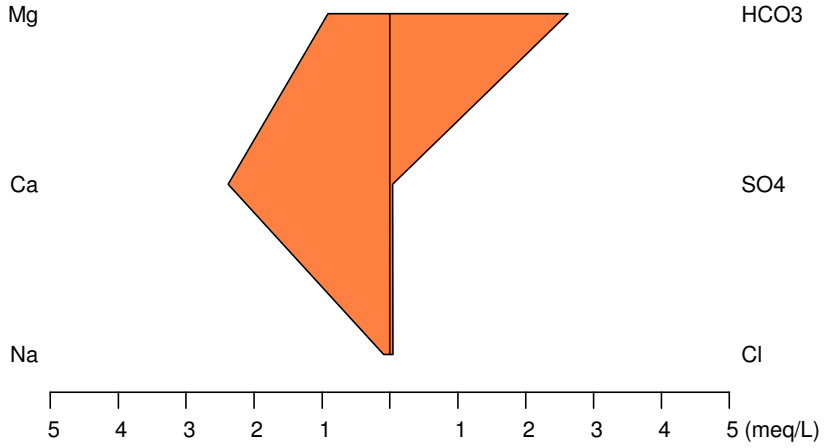
CFSWP-013,6/7/2016

Date: 6/7/2016
TDS (mg/l) = 173
El Cond. (uS/cm) =29500



CFSWP-013,6/7/2016

Date: 6/7/2016
TDS (mg/l) = 159
El Cond. (uS/cm) =29500

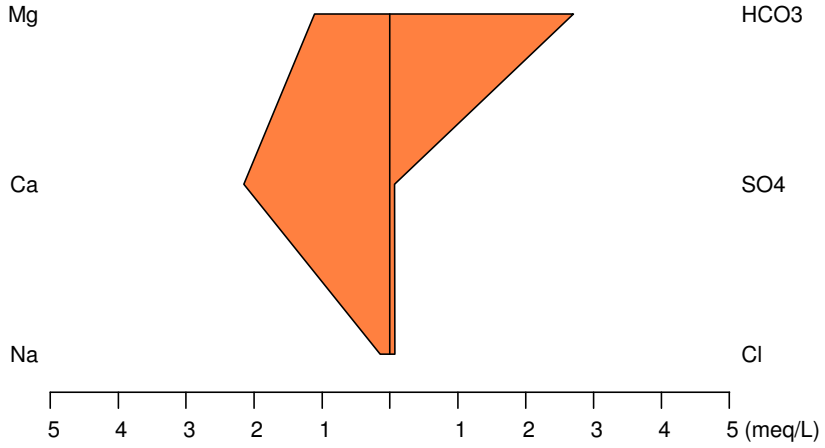


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

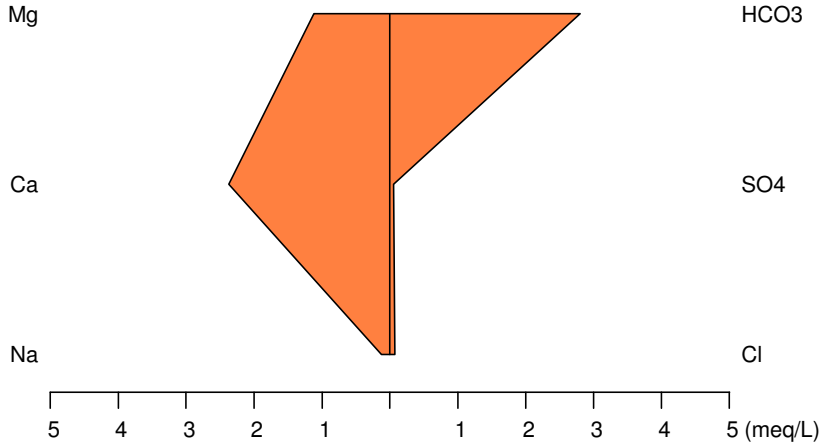
CFSWP-014,8/29/2016

Date: 8/29/2016
TDS (mg/l) = 167
El Cond. (uS/cm) =20800



CFSWP-015,8/29/2016

Date: 8/29/2016
TDS (mg/l) = 182
El Cond. (uS/cm) =31100

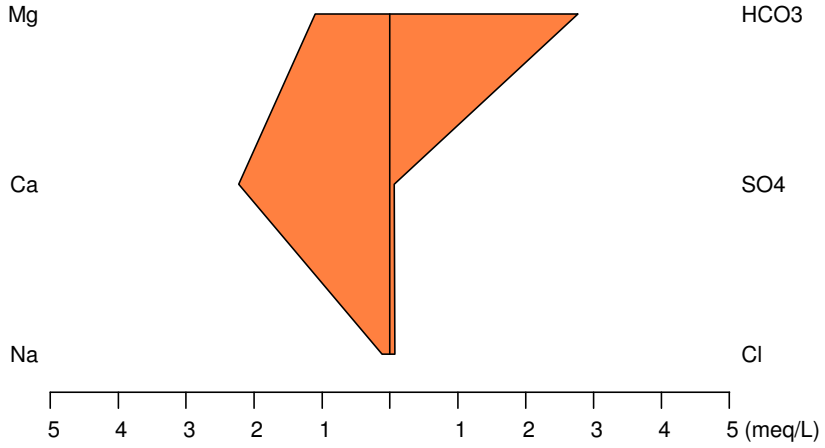


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

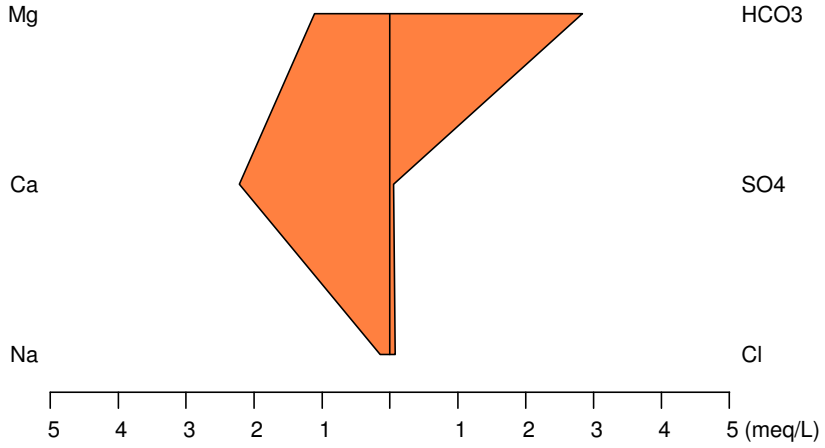
CFSWP-015,8/29/2016

Date: 8/29/2016
TDS (mg/l) = 176
El Cond. (uS/cm) =31100



CFSWP-016,8/29/2016

Date: 8/29/2016
TDS (mg/l) = 193
El Cond. (uS/cm) =31000

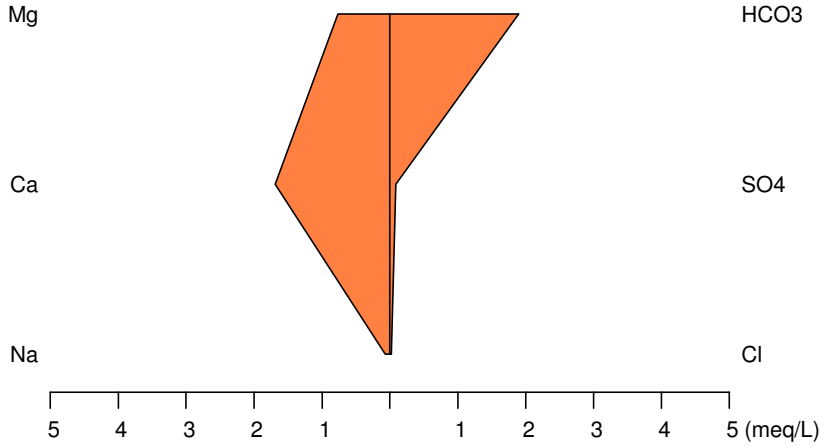


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

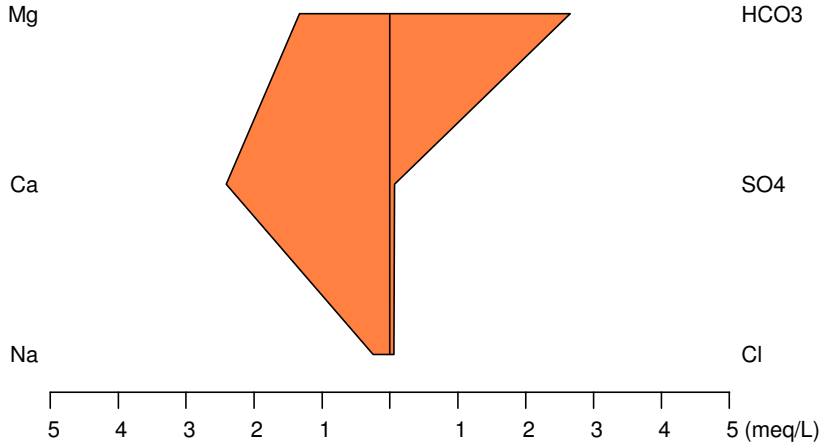
CFSWP-017,9/16/2016

Date: 9/16/2016
TDS (mg/l) = 120
El Cond. (uS/cm) =27400



CFSWP-018,6/6/2016

Date: 6/6/2016
TDS (mg/l) = 176
El Cond. (uS/cm) =35500

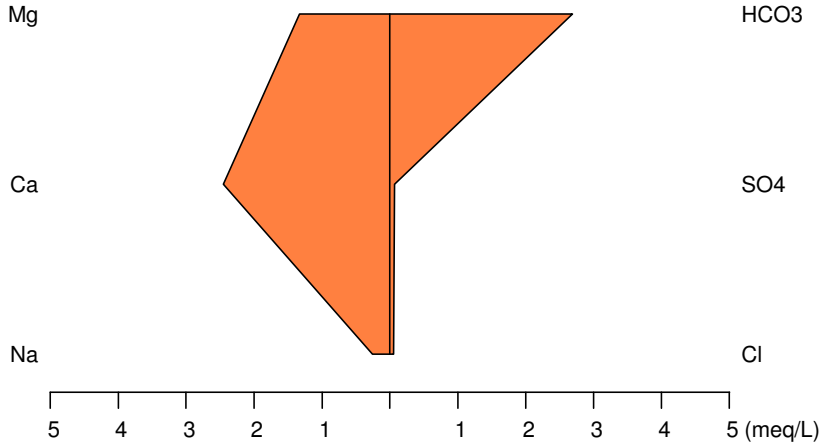


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

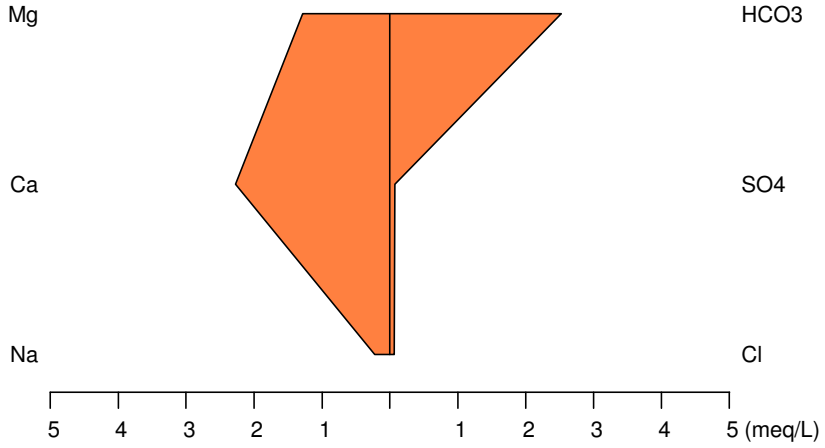
CFSWP-019,6/6/2016

Date: 6/6/2016
TDS (mg/l) = 183
El Cond. (uS/cm) =35700



CFSWP-020,6/6/2016

Date: 6/6/2016
TDS (mg/l) = 193
El Cond. (uS/cm) =34400

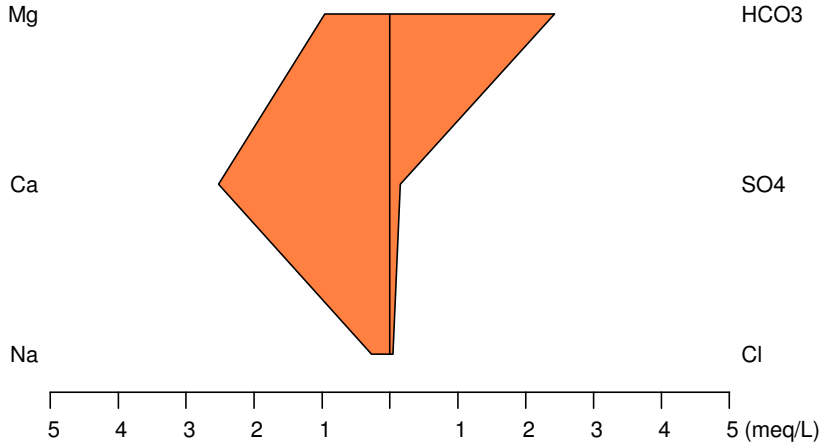


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

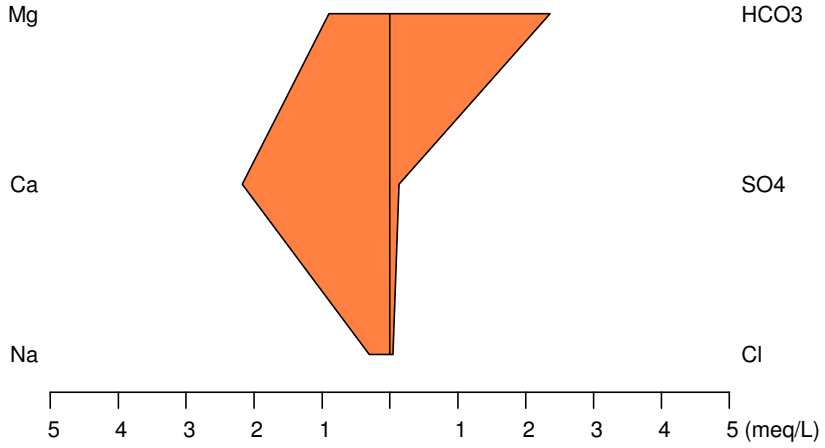
CFSWP-021,6/6/2016

Date: 6/6/2016
TDS (mg/l) = 176
El Cond. (uS/cm) =34400



CFSWP-022,6/6/2016

Date: 6/6/2016
TDS (mg/l) = 169
El Cond. (uS/cm) =34600

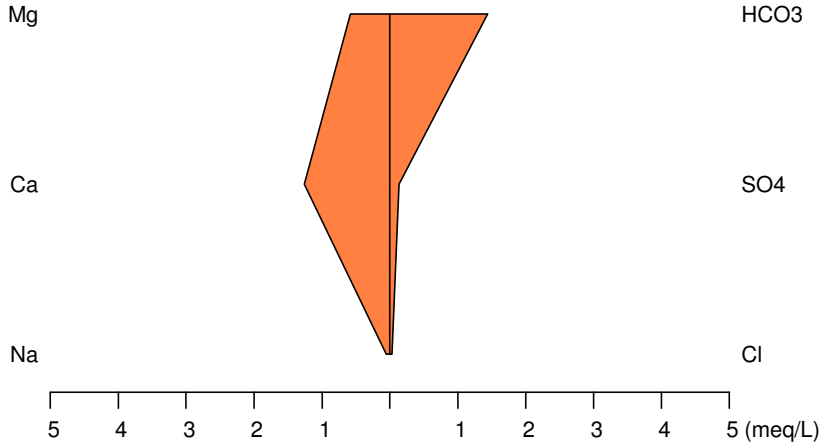


TITLE: Round 1Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Sept. 2016 (Round 1)

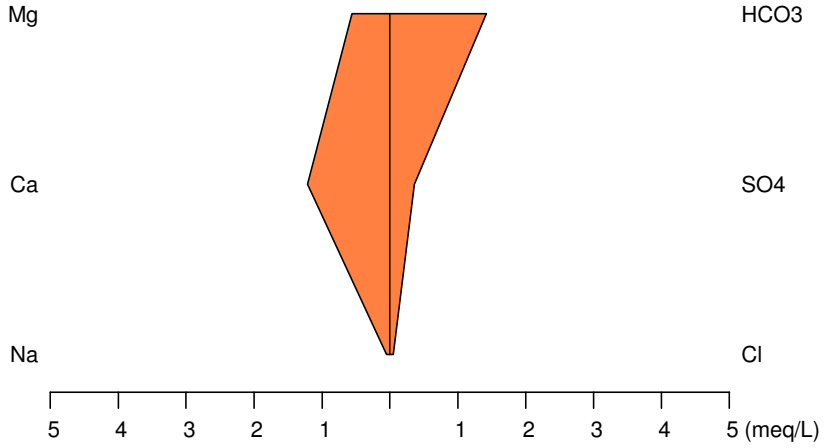
CFSWP-001,12/2/2016

Date: 12/2/2016
TDS (mg/l) = 81
El Cond. (uS/cm) =19400



CFSWP-002,12/2/2016

Date: 12/2/2016
TDS (mg/l) = 90
El Cond. (uS/cm) =18800

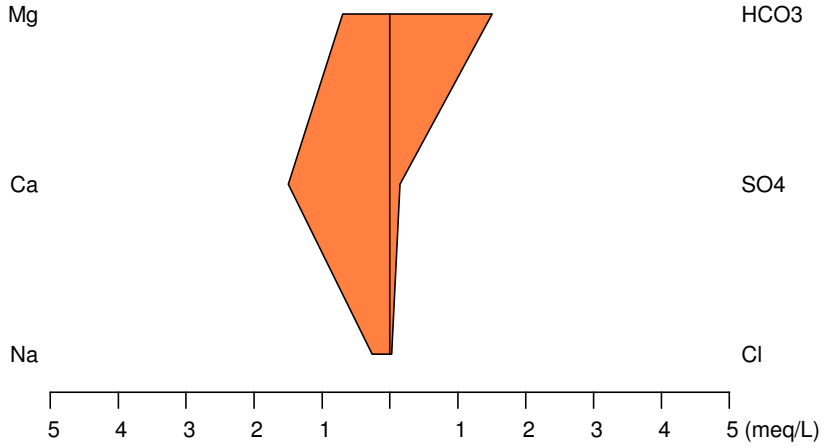


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

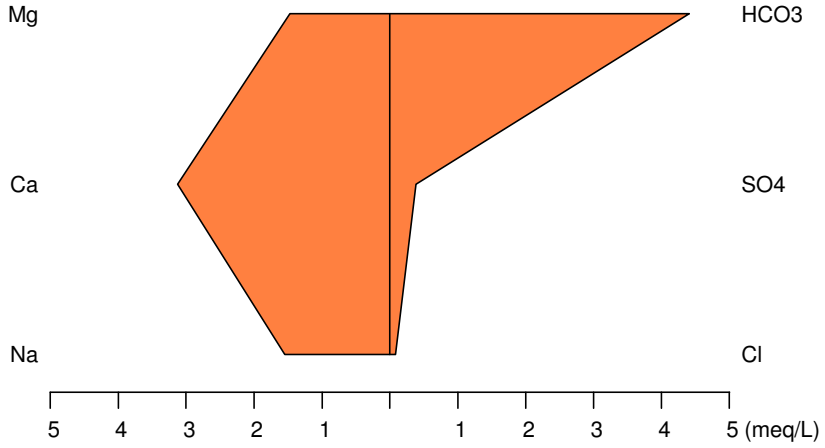
CFSWP-003,12/1/2016

Date: 12/1/2016
TDS (mg/l) = 118
El Cond. (uS/cm) =24200



CFSWP-005,12/1/2016

Date: 12/1/2016
TDS (mg/l) = 284
El Cond. (uS/cm) =57200

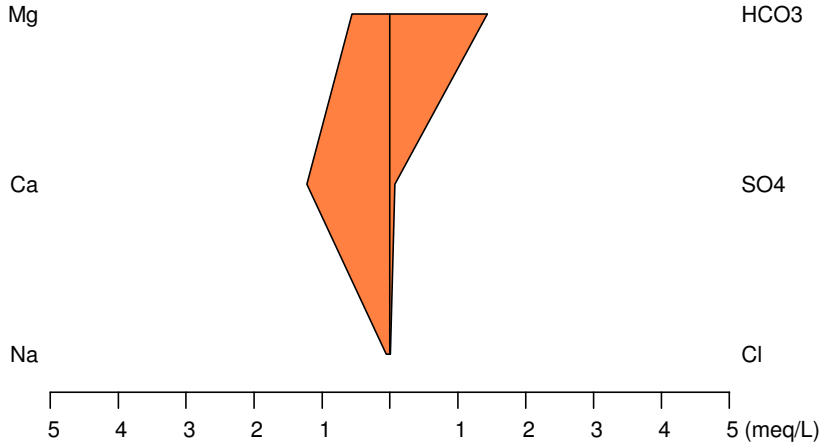


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

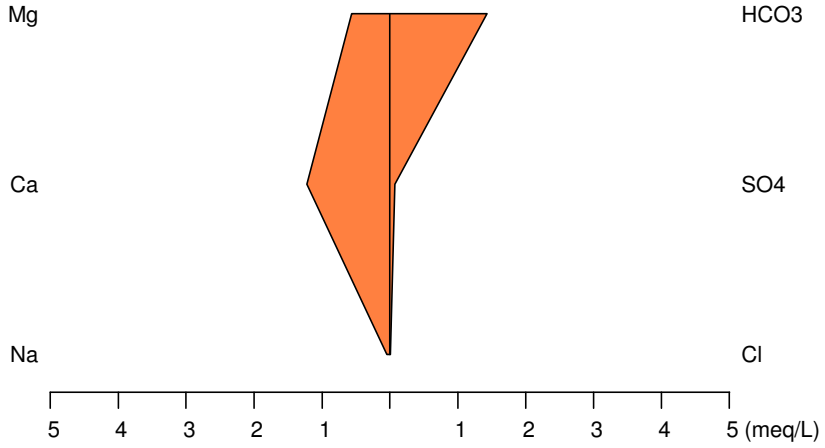
CFSWP-006,12/1/2016

Date: 12/1/2016
TDS (mg/l) = 90
El Cond. (uS/cm) =18300



CFSWP-007,12/2/2016

Date: 12/2/2016
TDS (mg/l) = 95
El Cond. (uS/cm) =18900

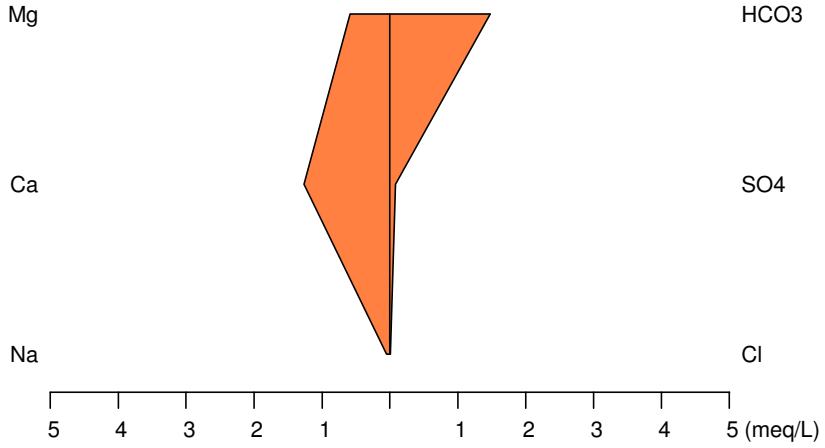


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

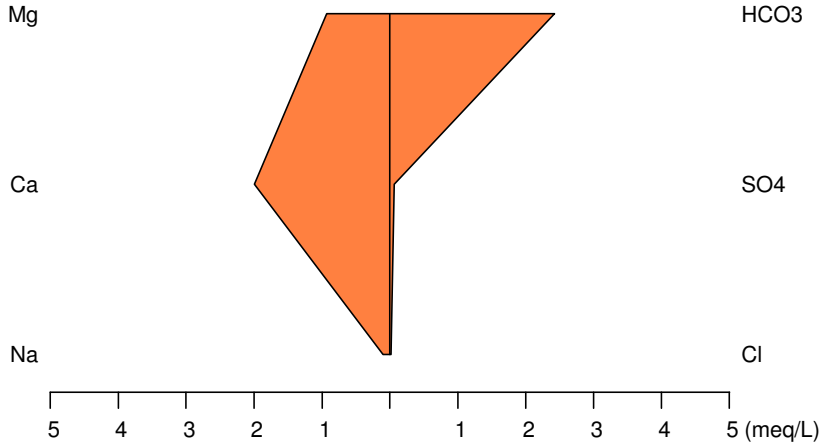
CFSWP-008,12/2/2016

Date: 12/2/2016
TDS (mg/l) = 69
El Cond. (uS/cm) =19600



CFSWP-013,11/30/2016

Date: 11/30/2016
TDS (mg/l) = 142
El Cond. (uS/cm) =32100

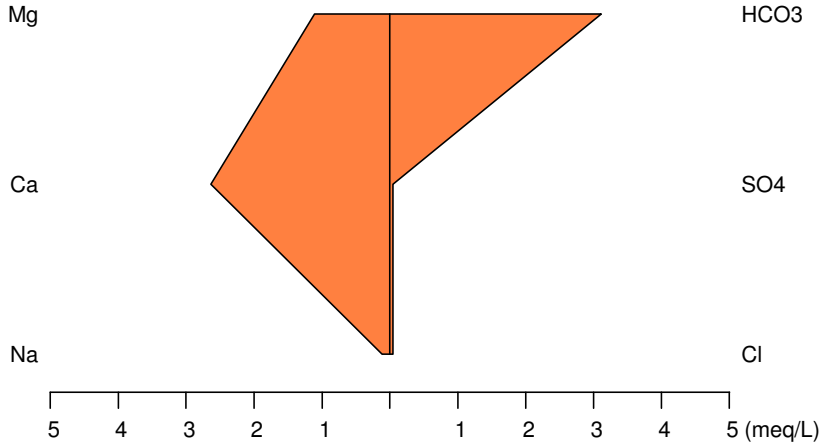


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

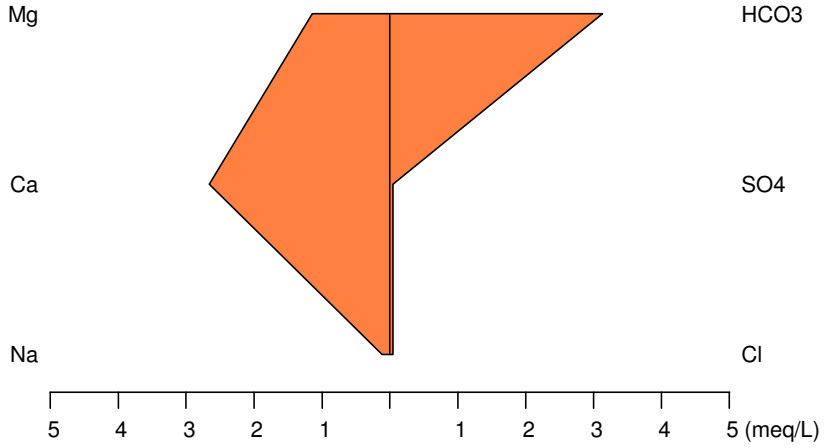
CFSWP-014,11/30/2016

Date: 11/30/2016
TDS (mg/l) = 172
El Cond. (uS/cm) =37900



CFSWP-014,11/30/2016

Date: 11/30/2016
TDS (mg/l) = 185
El Cond. (uS/cm) =37900

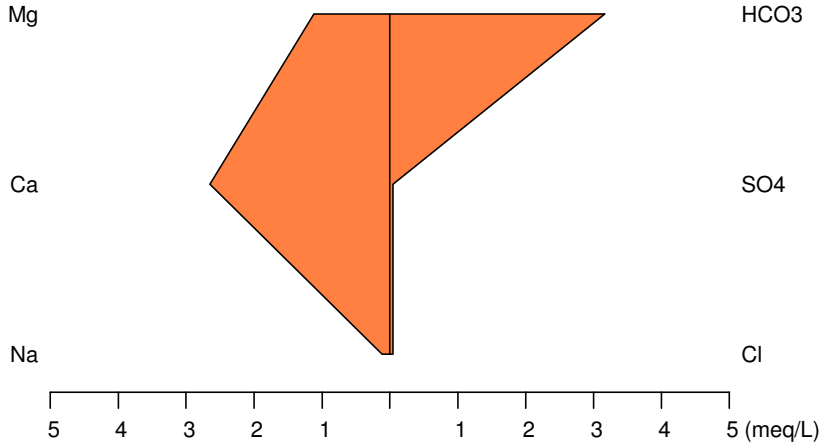


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

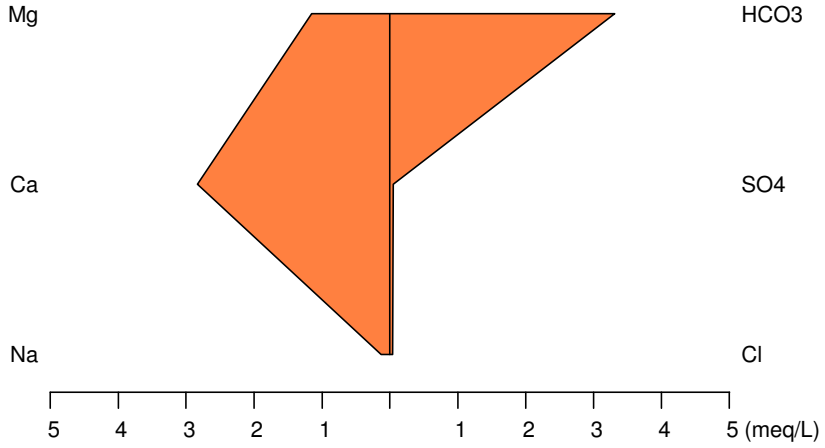
CFSWP-015,11/30/2016

Date: 11/30/2016
TDS (mg/l) = 174
El Cond. (uS/cm) =33300



CFSWP-015,12/20/2016

Date: 12/20/2016
TDS (mg/l) = 247
El Cond. (uS/cm) =33300

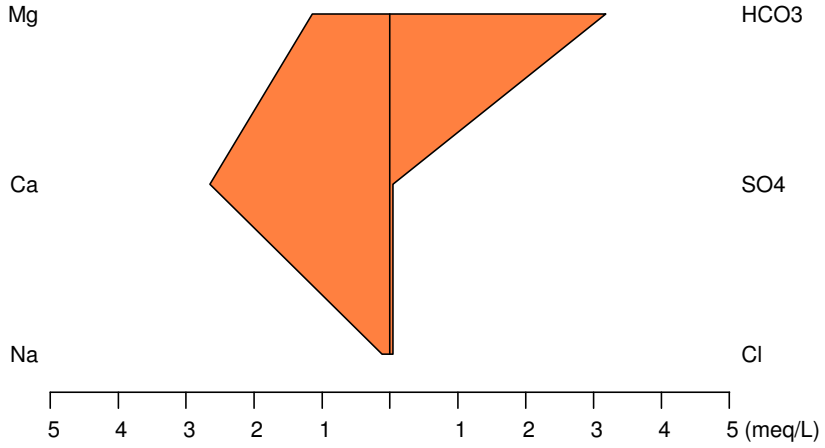


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

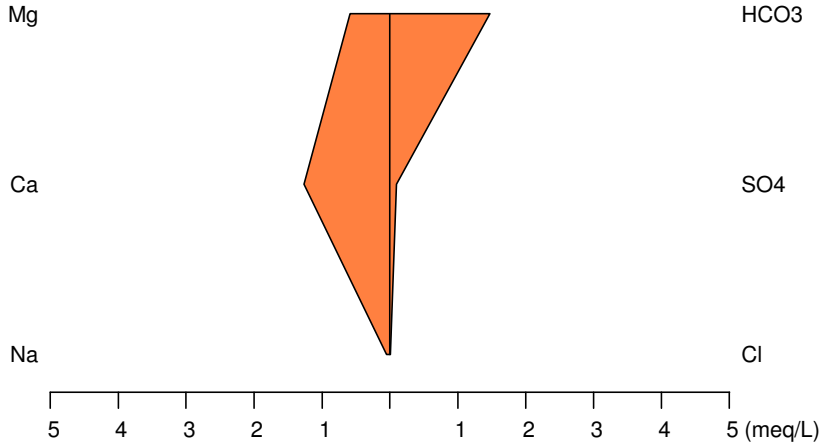
CFSWP-016,11/30/2016

Date: 11/30/2016
TDS (mg/l) = 196
El Cond. (uS/cm) =38500



CFSWP-017,12/2/2016

Date: 12/2/2016
TDS (mg/l) = 96
El Cond. (uS/cm) =19500

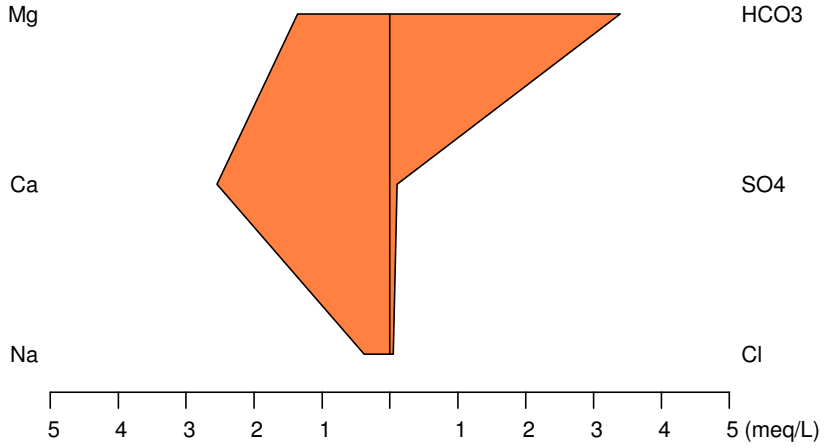


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

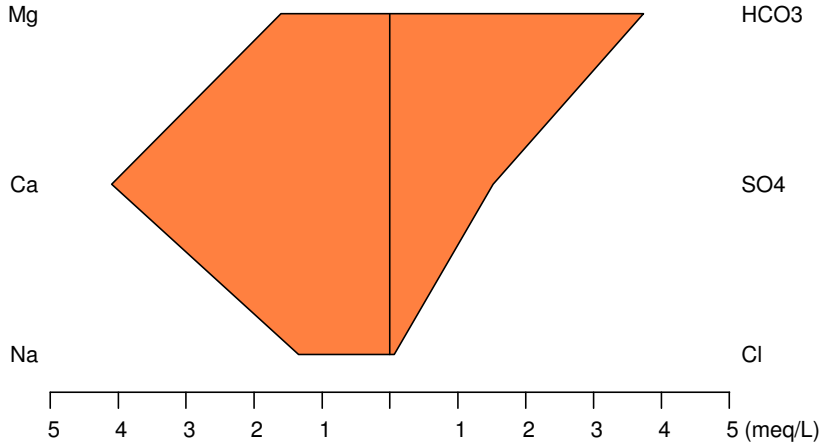
CFSWP-019,12/1/2016

Date: 12/1/2016
TDS (mg/l) = 201
El Cond. (uS/cm) =40000



CFSWP-021,11/30/2016

Date: 11/30/2016
TDS (mg/l) = 309
El Cond. (uS/cm) =59300

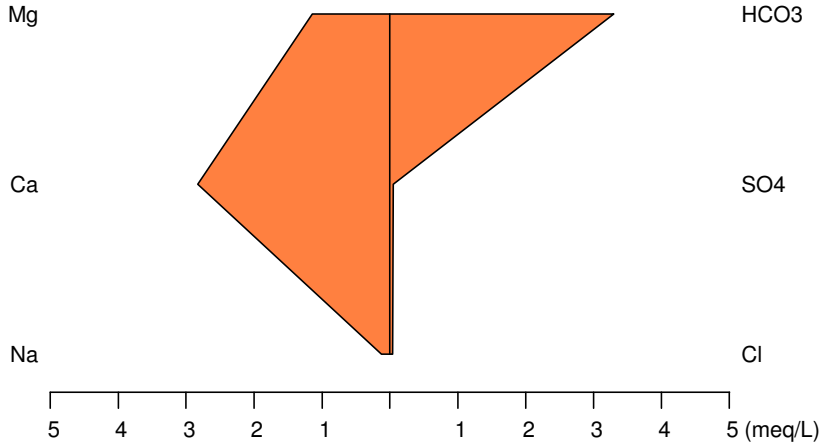


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

CFSWP-025,12/20/2016

Date: 12/20/2016
TDS (mg/l) = 243
El Cond. (uS/cm) =33400

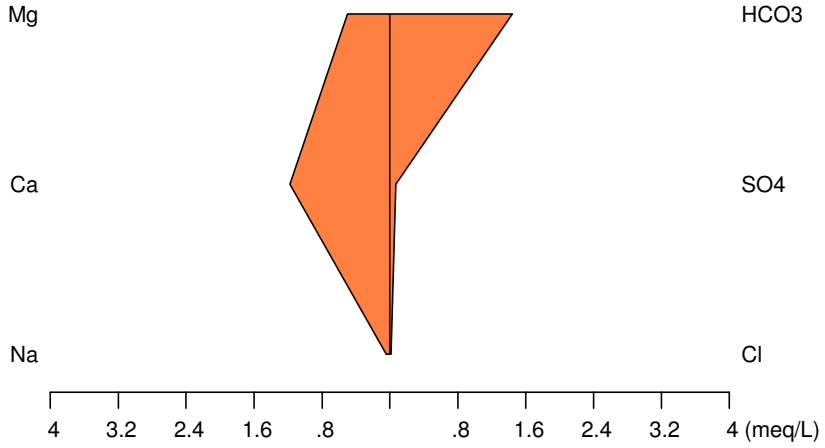


TITLE: Round 2 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: Dec. 2016 (Round 2)

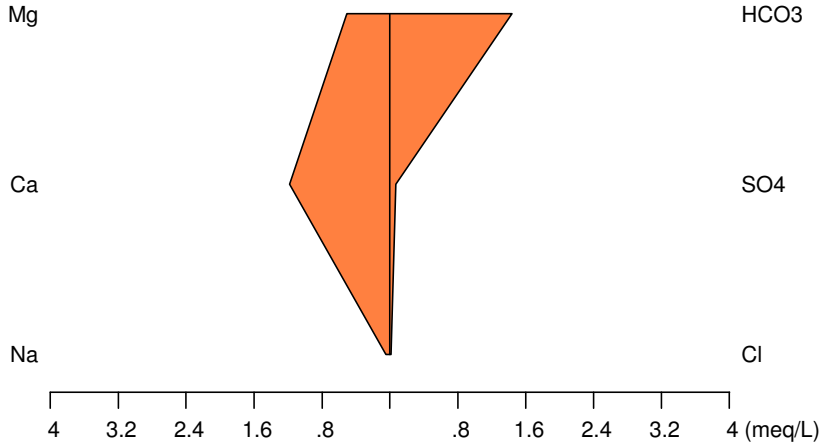
CFSWP-001,4/4/2017

Date: 4/4/2017
TDS (mg/l) = 82
El Cond. (uS/cm) =17900



CFSWP-002,4/4/2017

Date: 4/4/2017
TDS (mg/l) = 87
El Cond. (uS/cm) =16600

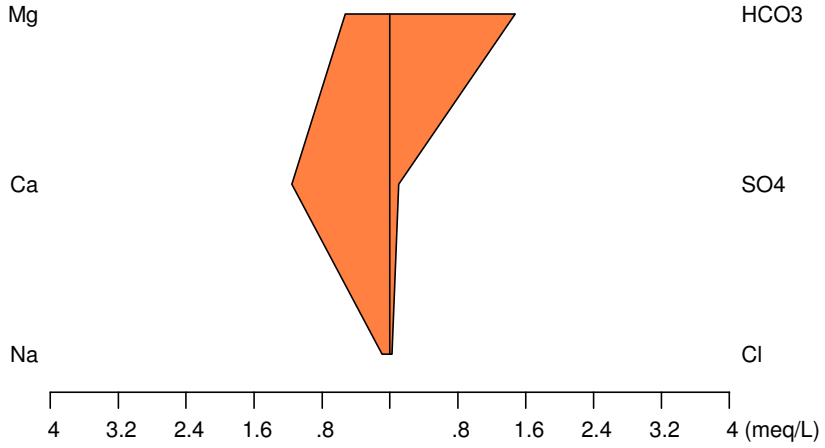


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

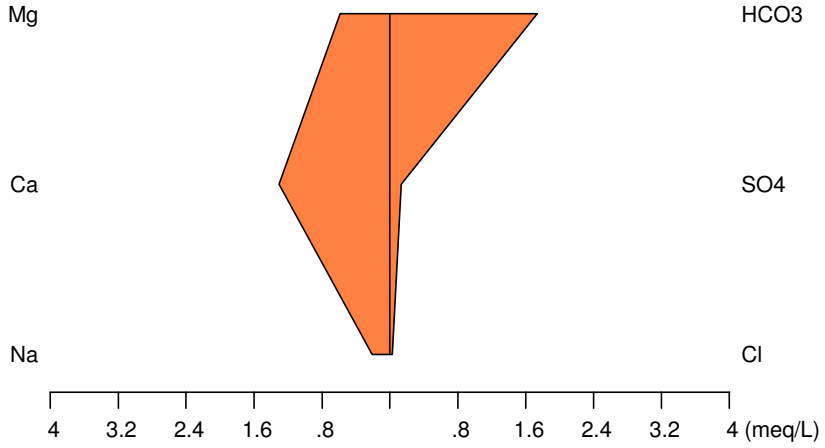
CFSWP-003,3/16/2017

Date: 3/16/2017
TDS (mg/l) = 96
El Cond. (uS/cm) =17000



CFSWP-004,3/16/2017

Date: 3/16/2017
TDS (mg/l) = 116
El Cond. (uS/cm) =20700

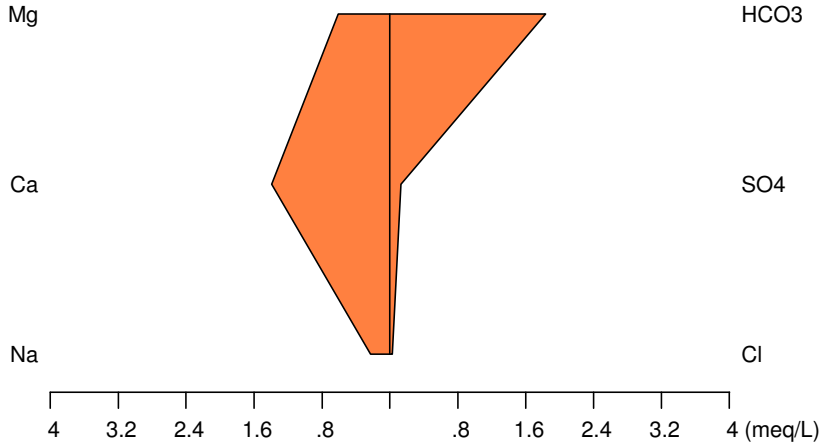


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

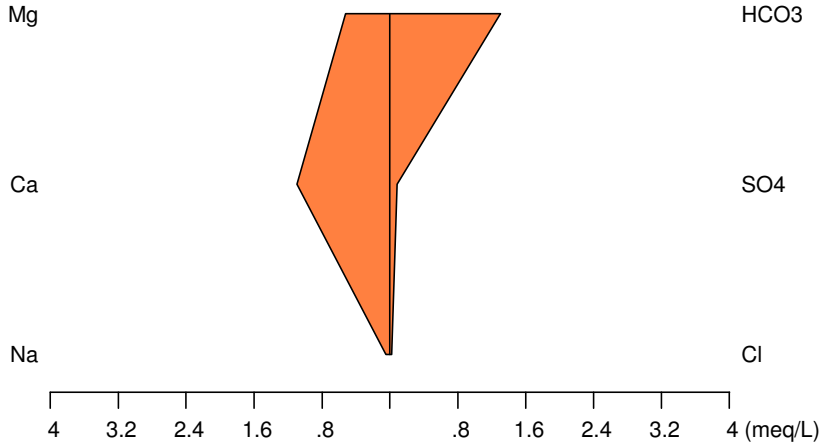
CFSWP-005,3/16/2017

Date: 3/16/2017
TDS (mg/l) = 127
El Cond. (uS/cm) =22200



CFSWP-006,3/16/2017

Date: 3/16/2017
TDS (mg/l) = 85
El Cond. (uS/cm) =16000

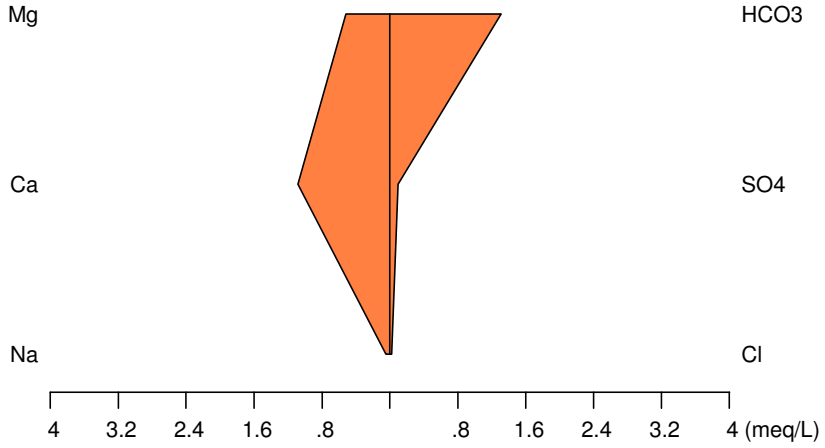


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

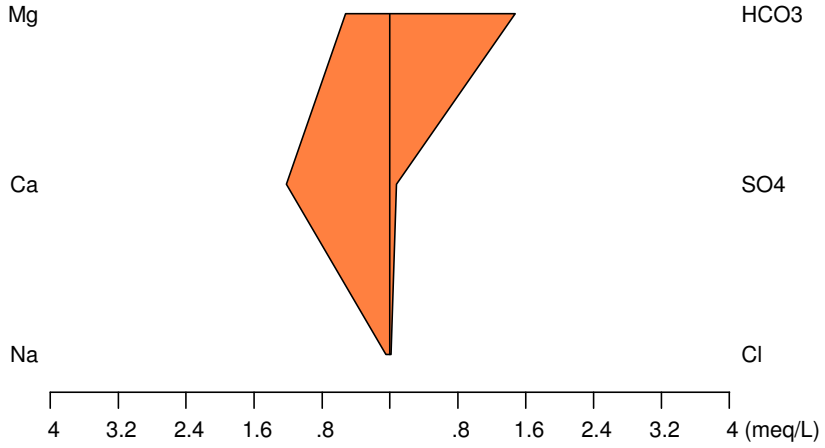
CFSWP-007,3/16/2017

Date: 3/16/2017
TDS (mg/l) = 89
El Cond. (uS/cm) =16000



CFSWP-008,4/4/2017

Date: 4/4/2017
TDS (mg/l) = 88
El Cond. (uS/cm) =17000

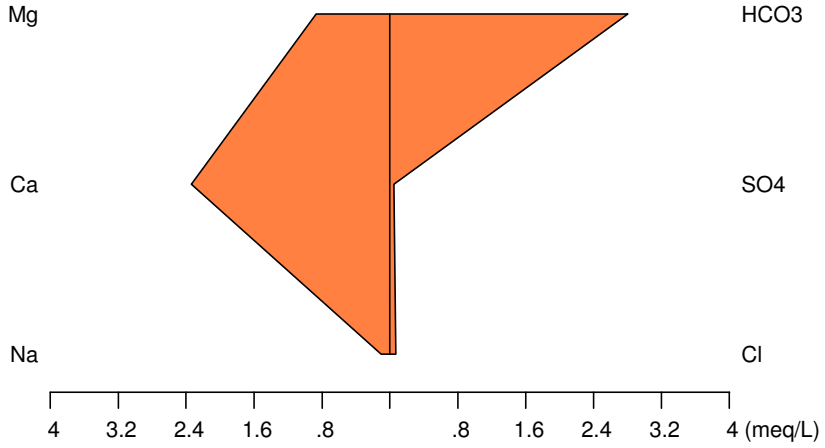


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

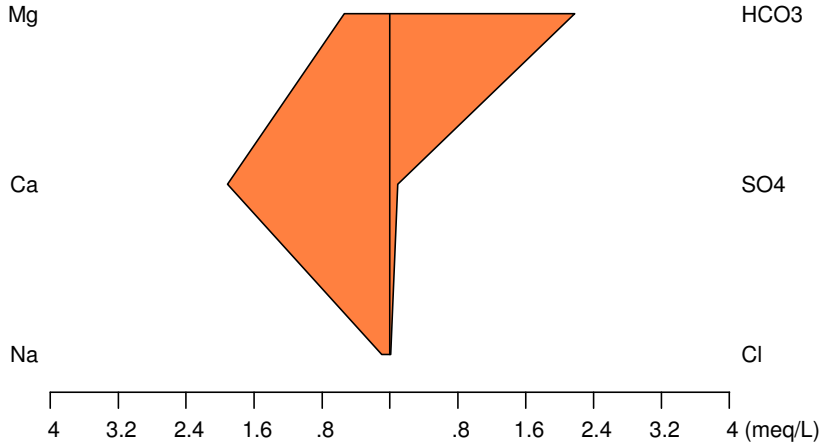
CFSWP-009,4/3/2017

Date: 4/3/2017
TDS (mg/l) = 163
El Cond. (uS/cm) =31700



CFSWP-010,3/15/2017

Date: 3/15/2017
TDS (mg/l) = 139
El Cond. (uS/cm) =17100

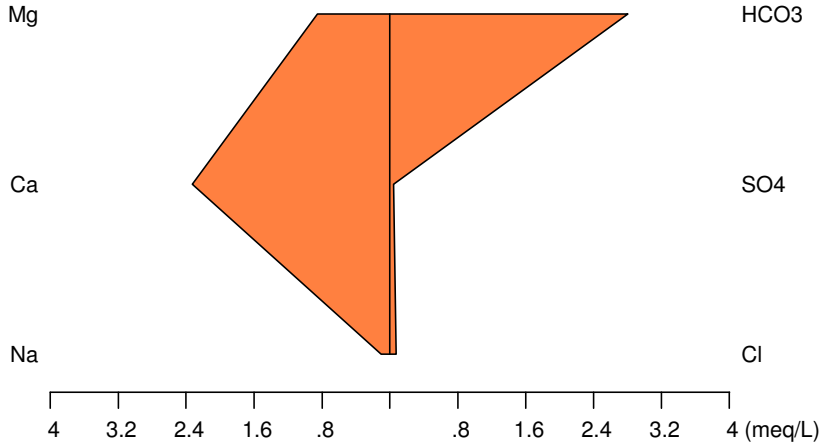


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

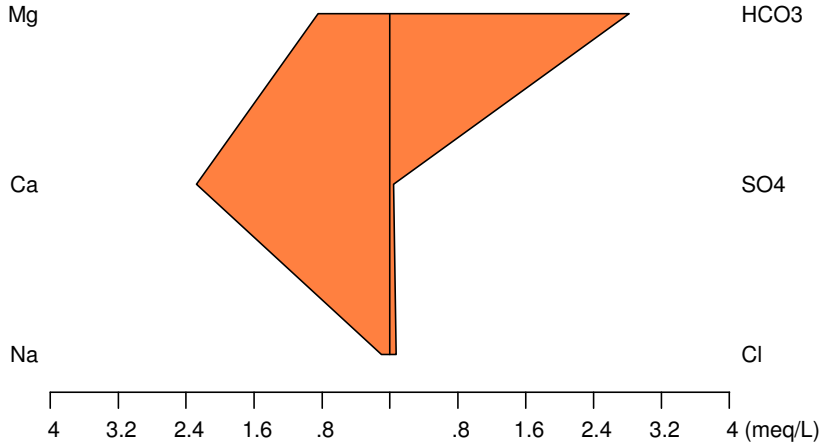
CFSWP-011,4/3/2017

Date: 4/3/2017
TDS (mg/l) = 170
El Cond. (uS/cm) =31000



CFSWP-012,4/3/2017

Date: 4/3/2017
TDS (mg/l) = 164
El Cond. (uS/cm) =31600

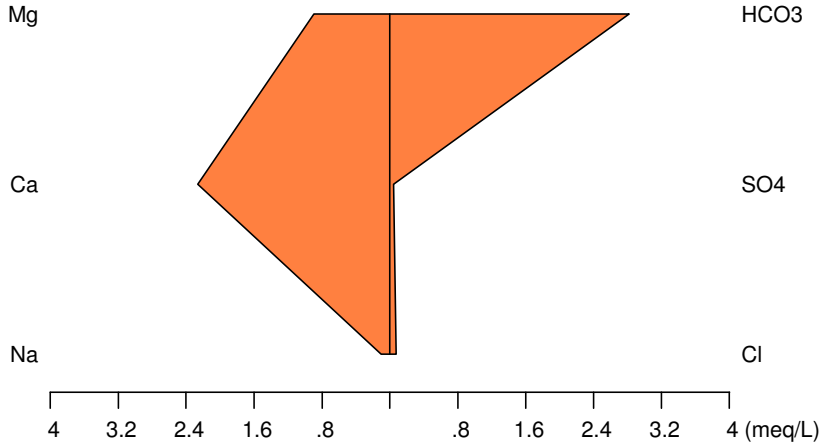


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

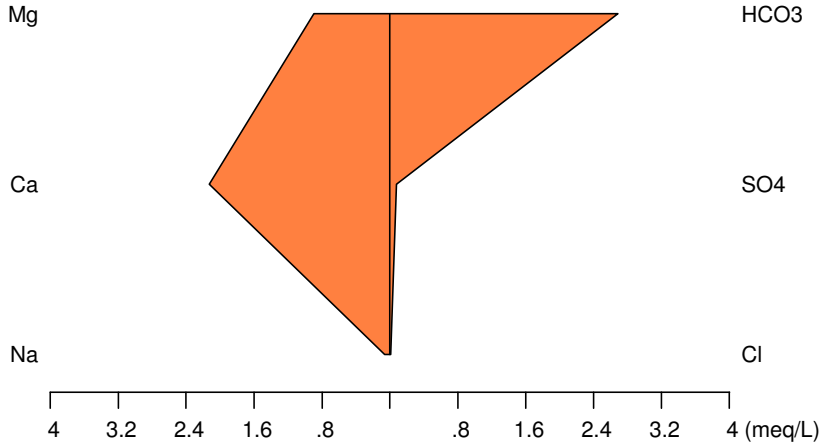
CFSWP-012,4/3/2017

Date: 4/3/2017
TDS (mg/l) = 163
El Cond. (uS/cm) =31600



CFSWP-013,3/15/2017

Date: 3/15/2017
TDS (mg/l) = 176
El Cond. (uS/cm) =29000

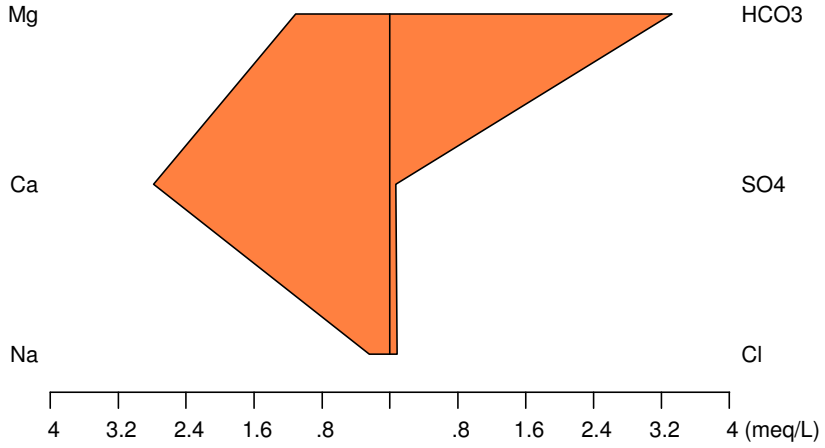


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

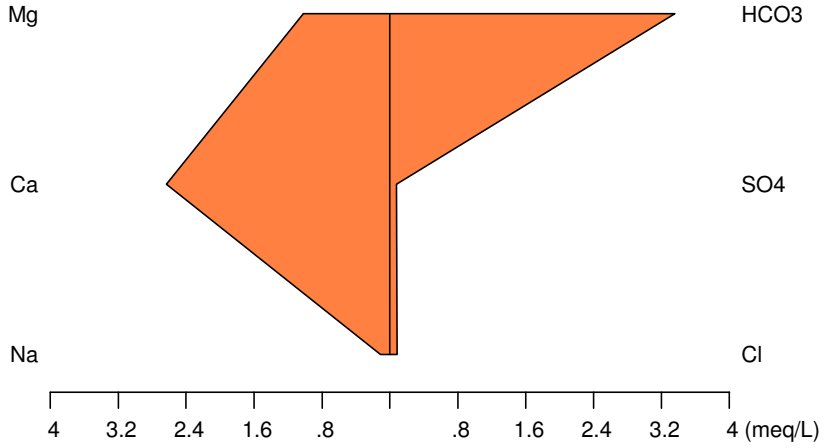
CFSWP-014,3/13/2017

Date: 3/13/2017
TDS (mg/l) = 223
El Cond. (uS/cm) =35100



CFSWP-014,3/13/2017

Date: 3/13/2017
TDS (mg/l) = 180
El Cond. (uS/cm) =35100

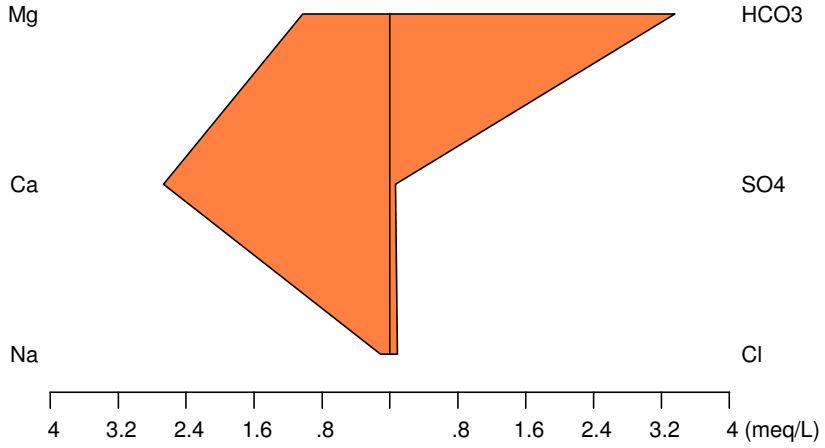


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

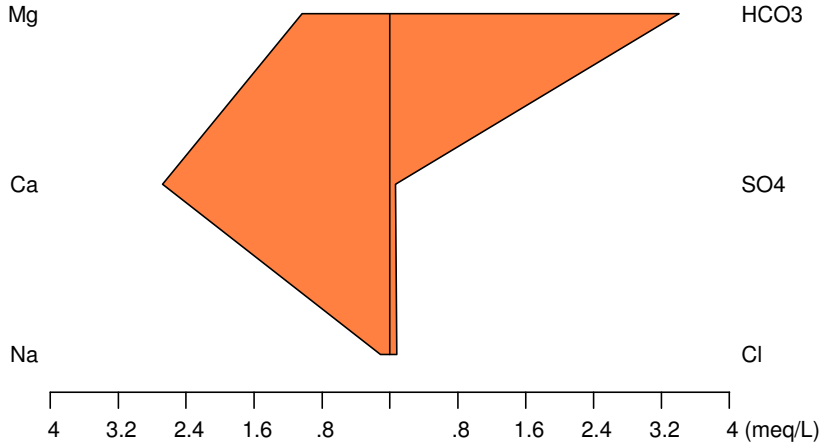
CFSWP-015,3/13/2017

Date: 3/13/2017
TDS (mg/l) = 194
El Cond. (uS/cm) =35600



CFSWP-016,3/13/2017

Date: 3/13/2017
TDS (mg/l) = 204
El Cond. (uS/cm) =35100

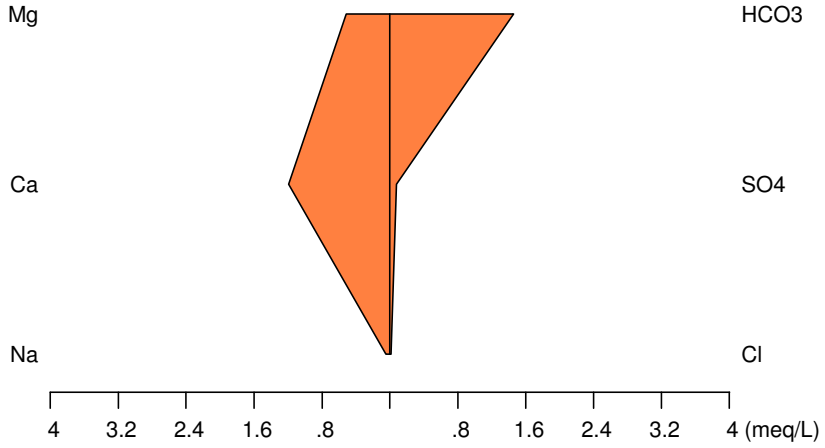


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

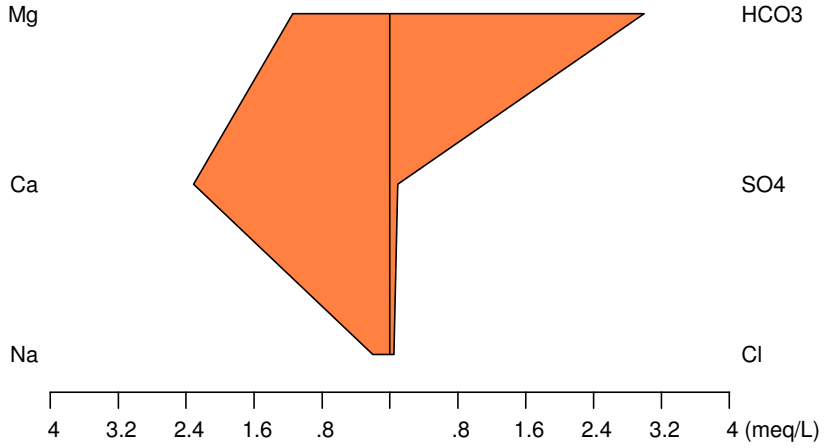
CFSWP-017,4/4/2017

Date: 4/4/2017
TDS (mg/l) = 87
El Cond. (uS/cm) =17100



CFSWP-018,4/3/2017

Date: 4/3/2017
TDS (mg/l) = 172
El Cond. (uS/cm) =34000

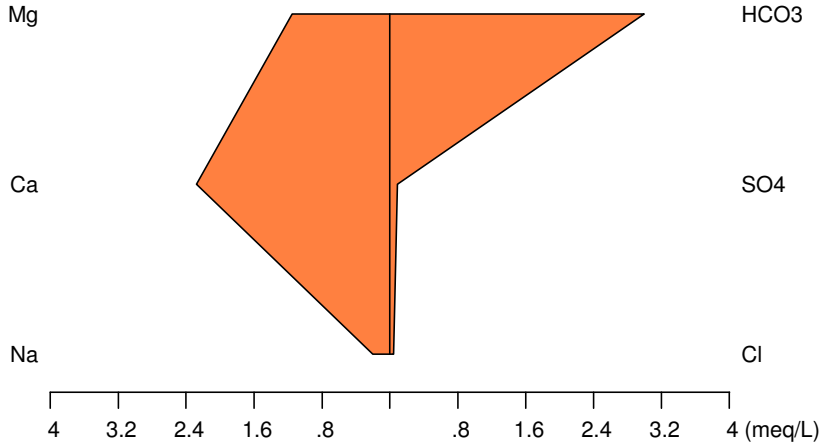


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

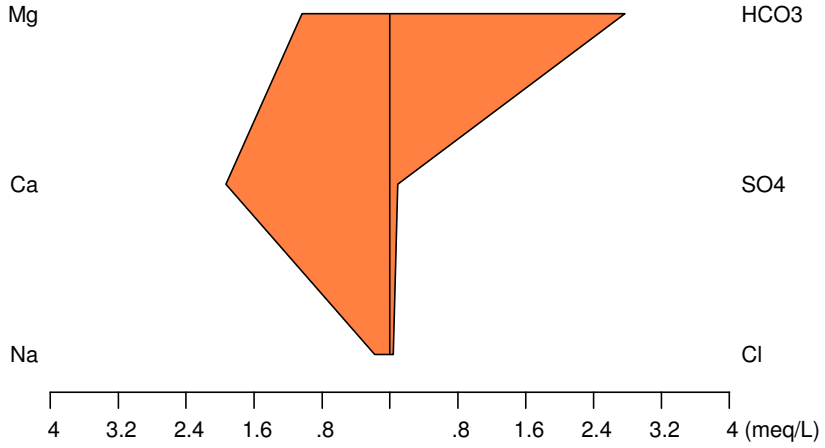
CFSWP-019,4/3/2017

Date: 4/3/2017
TDS (mg/l) = 172
El Cond. (uS/cm) =33800



CFSWP-020,3/16/2017

Date: 3/16/2017
TDS (mg/l) = 164
El Cond. (uS/cm) =31900

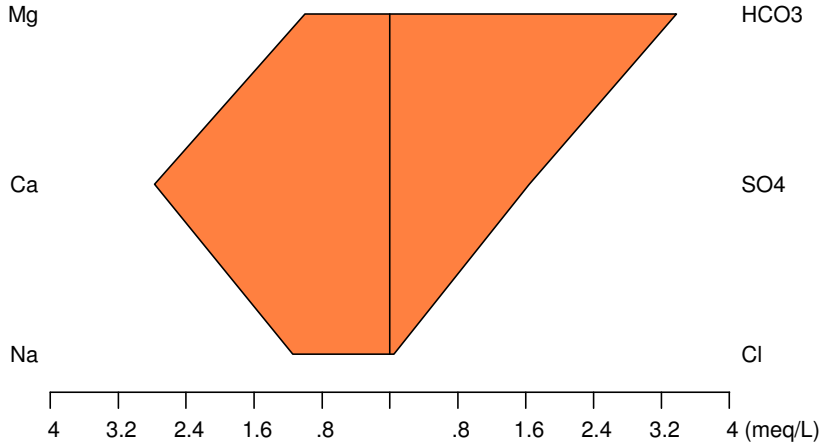


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

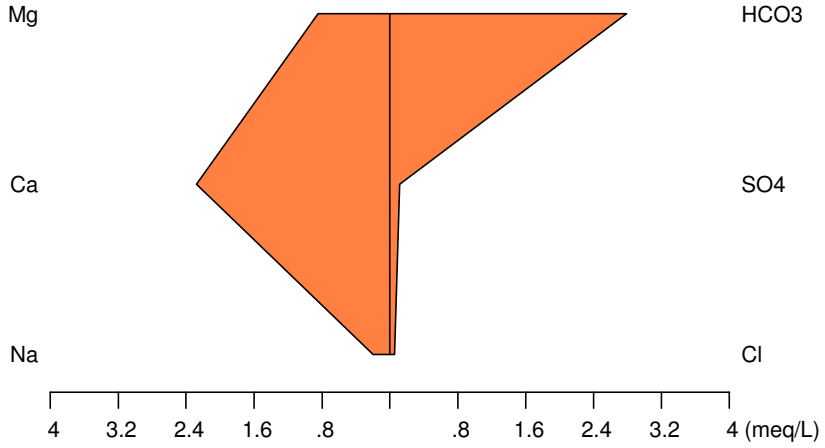
CFSWP-021,3/15/2017

Date: 3/15/2017
TDS (mg/l) = 296
El Cond. (uS/cm) =51500



CFSWP-022,4/3/2017

Date: 4/3/2017
TDS (mg/l) = 177
El Cond. (uS/cm) =32300

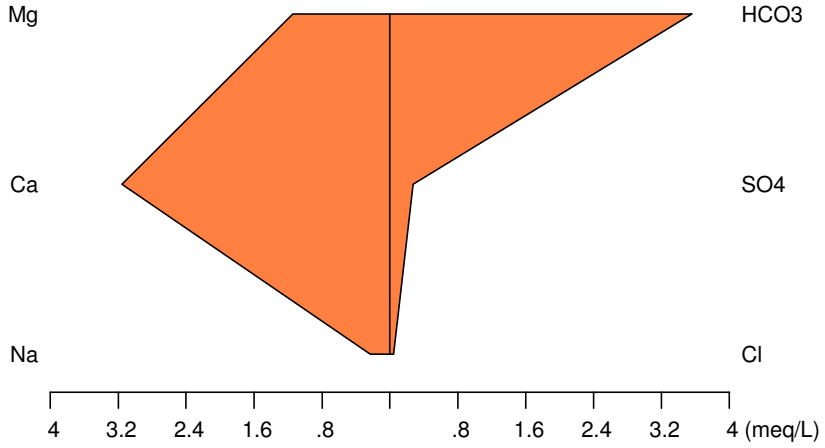


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

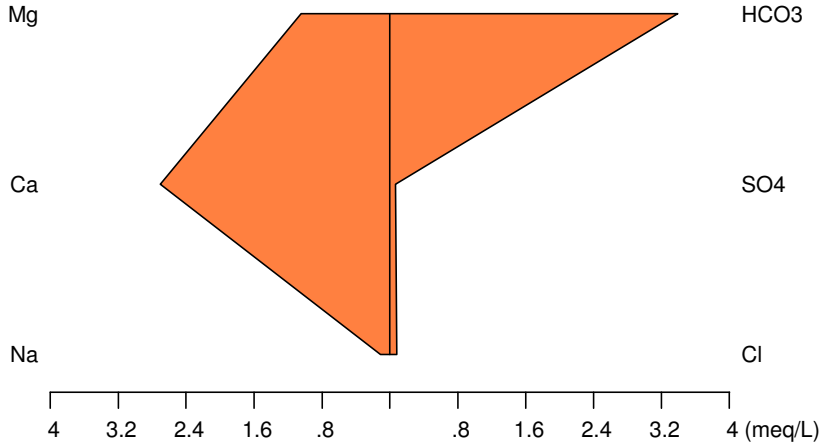
CFSWP-023,4/3/2017

Date: 4/3/2017
TDS (mg/l) = 232
El Cond. (uS/cm) =41300



CFSWP-025,3/13/2017

Date: 3/13/2017
TDS (mg/l) = 166
El Cond. (uS/cm) =38000

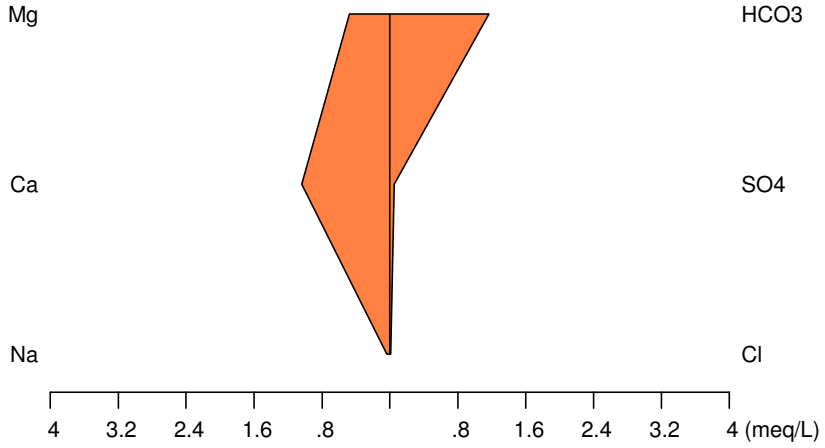


TITLE: Round 3 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: March 2017 (Round 3)

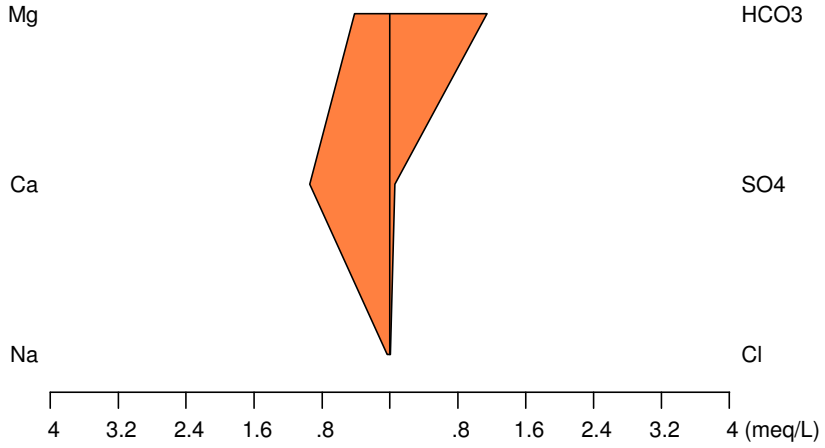
CFSWP-001,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 62
El Cond. (uS/cm) =13300



CFSWP-002,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 77
El Cond. (uS/cm) =12900

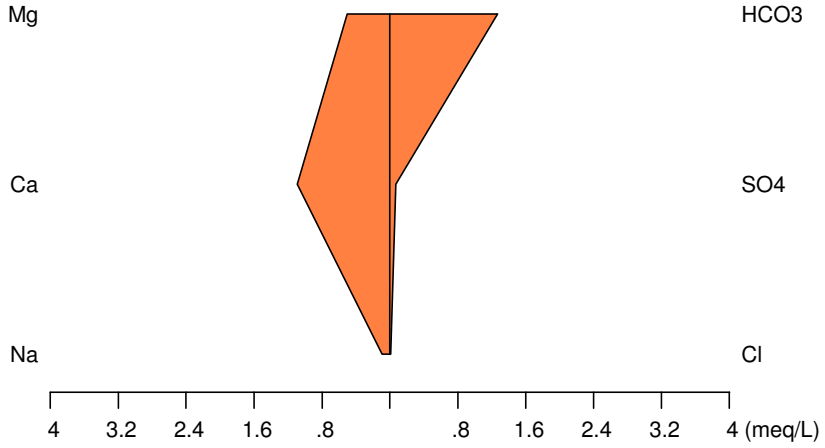


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

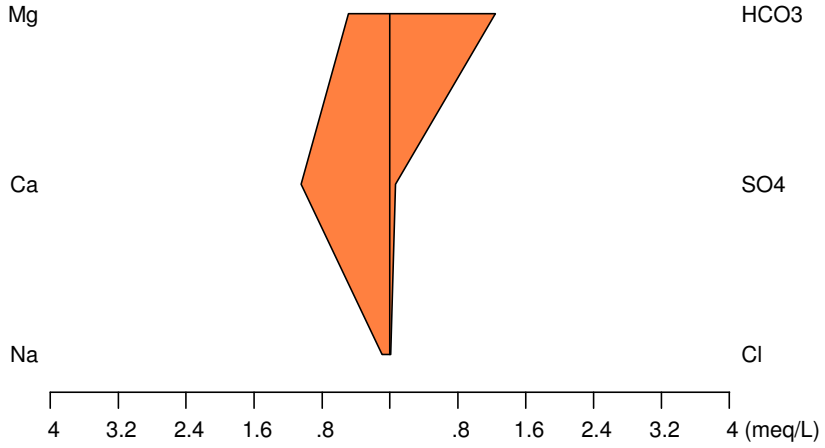
CFSWP-003,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 82
El Cond. (uS/cm) =14500



CFSWP-004,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 84
El Cond. (uS/cm) =14500

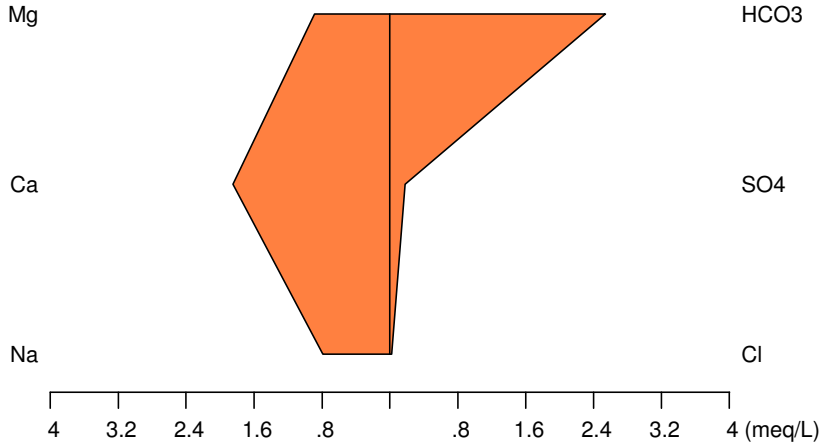


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

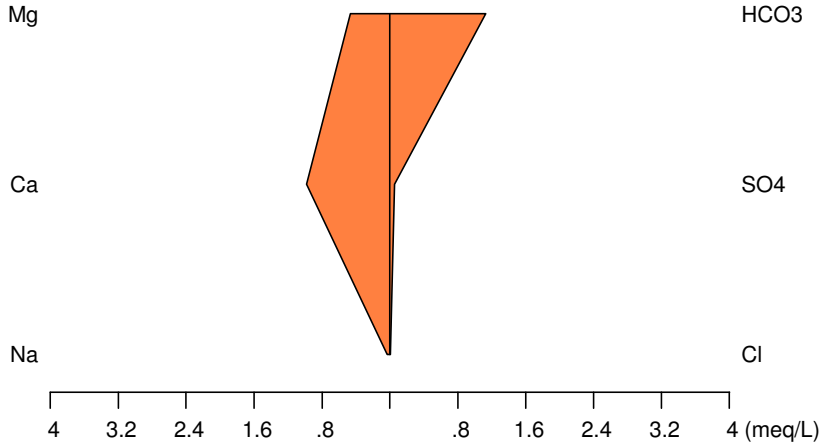
CFSWP-005,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 191
El Cond. (uS/cm) =30400



CFSWP-006,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 71
El Cond. (uS/cm) =12700

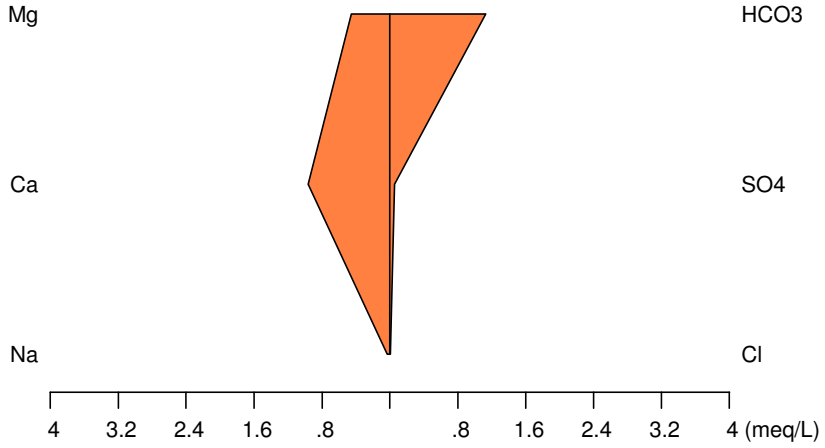


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

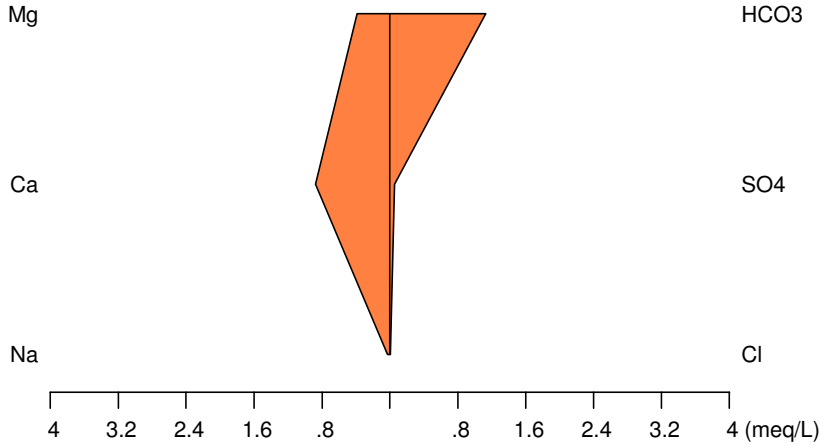
CFSWP-007,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 72
El Cond. (uS/cm) =12900



CFSWP-008,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 74
El Cond. (uS/cm) =12900

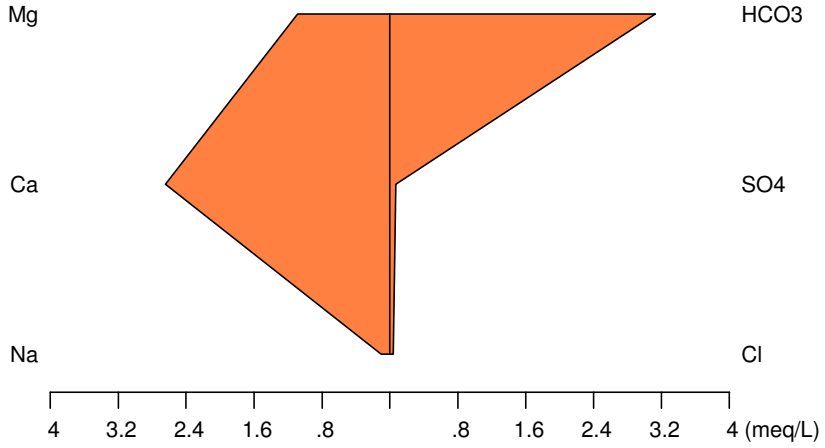


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

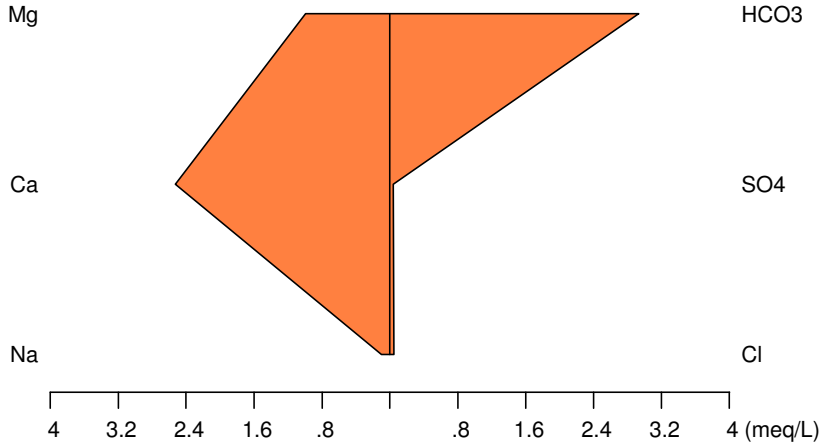
CFSWP-009,6/12/2017

Date: 6/12/2017
TDS (mg/l) = 225
El Cond. (uS/cm) =33300



CFSWP-010,6/12/2017

Date: 6/12/2017
TDS (mg/l) = 195
El Cond. (uS/cm) =32300

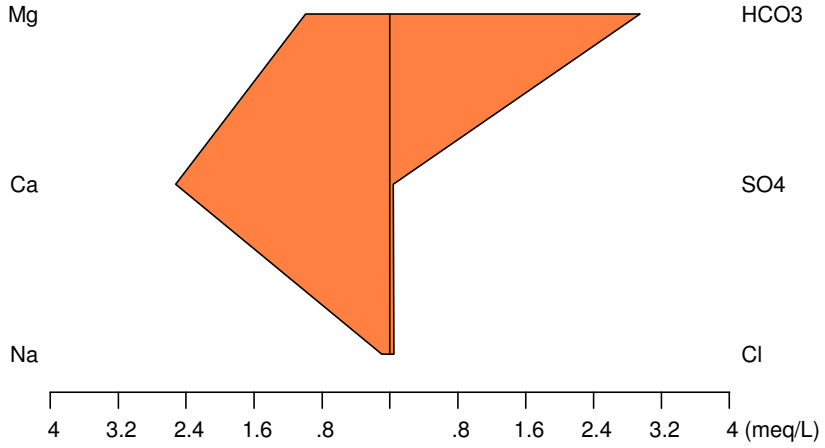


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

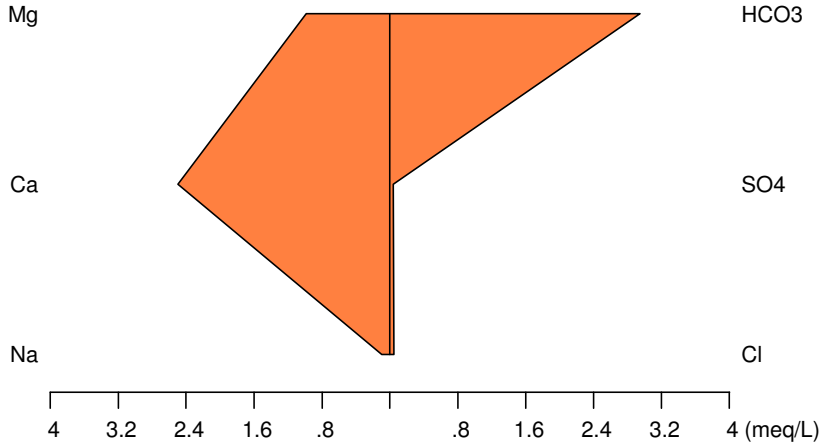
CFSWP-011,6/12/2017

Date: 6/12/2017
TDS (mg/l) = 199
El Cond. (uS/cm) =32700



CFSWP-012,6/12/2017

Date: 6/12/2017
TDS (mg/l) = 212
El Cond. (uS/cm) =28700

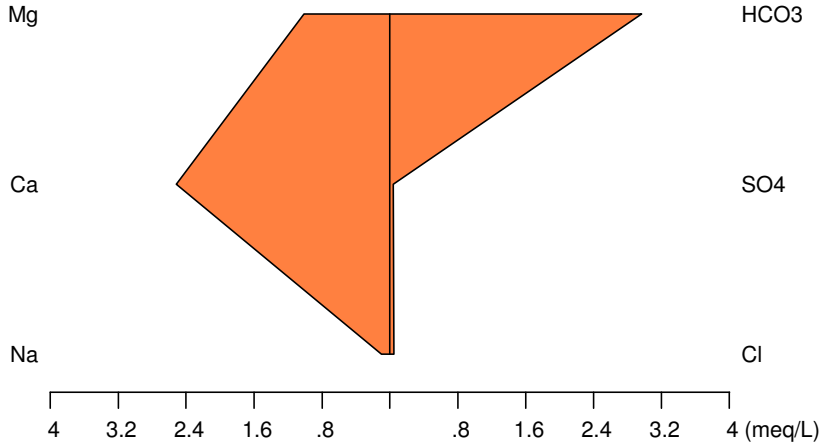


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

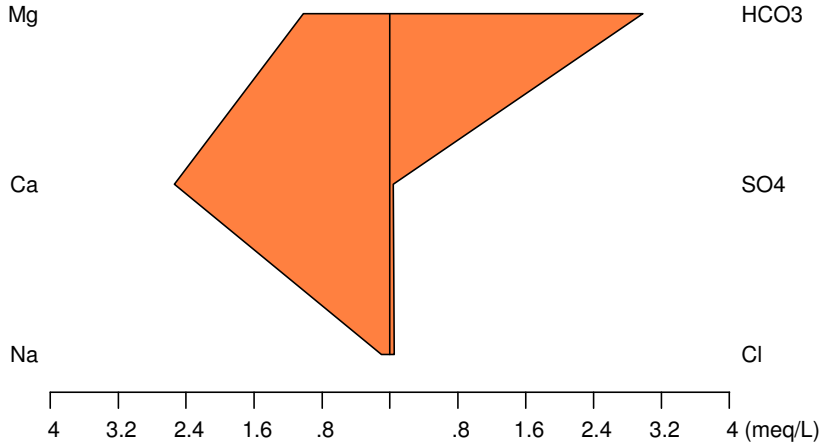
CFSWP-013,6/12/2017

Date: 6/12/2017
TDS (mg/l) = 207
El Cond. (uS/cm) =32000



CFSWP-014,6/13/2017

Date: 6/13/2017
TDS (mg/l) = 128
El Cond. (uS/cm) =32200

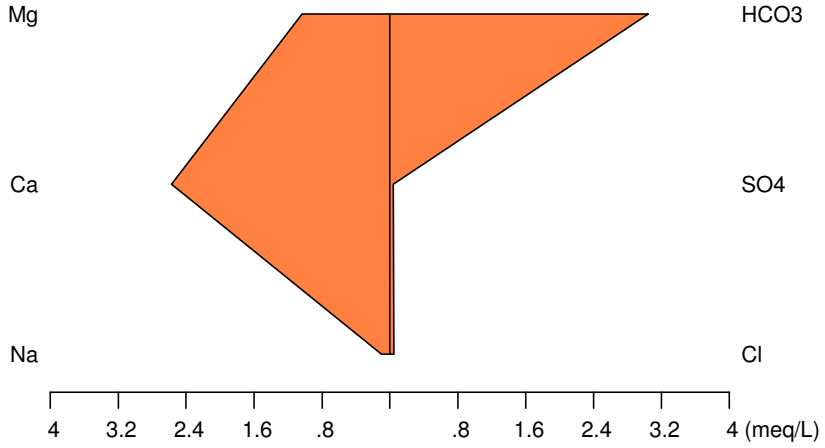


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

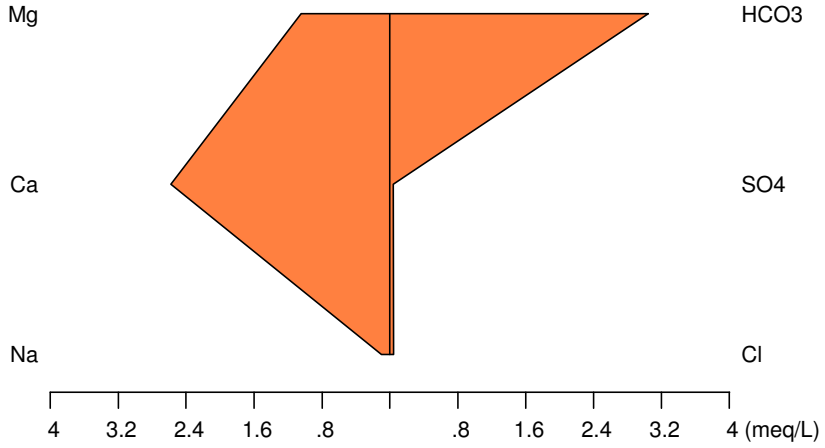
CFSWP-015,6/13/2017

Date: 6/13/2017
TDS (mg/l) = 179
El Cond. (uS/cm) =32800



CFSWP-015,6/13/2017

Date: 6/13/2017
TDS (mg/l) = 184
El Cond. (uS/cm) =32800

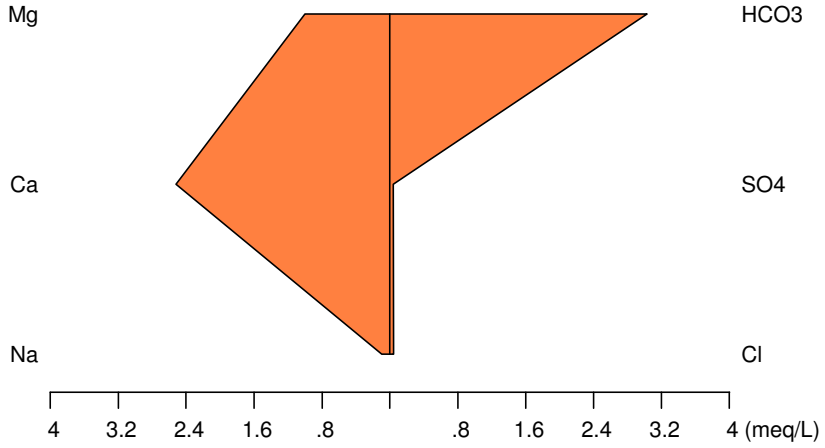


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

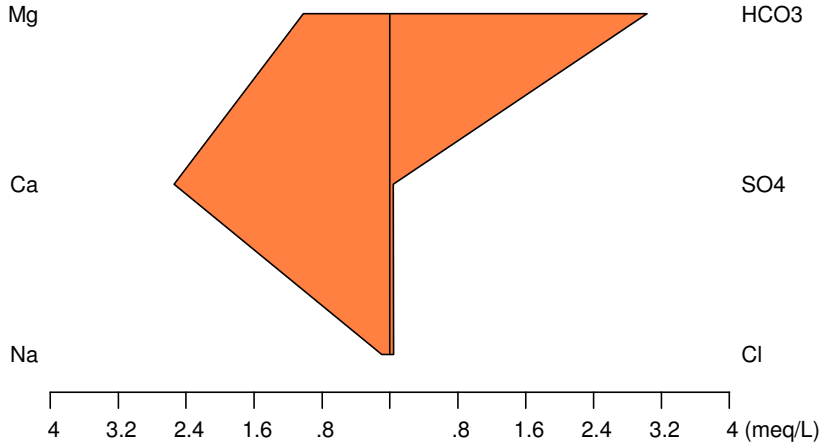
CFSWP-016,6/12/2017

Date: 6/12/2017
TDS (mg/l) = 210
El Cond. (uS/cm) =33700



CFSWP-016,6/12/2017

Date: 6/12/2017
TDS (mg/l) = 221
El Cond. (uS/cm) =33700

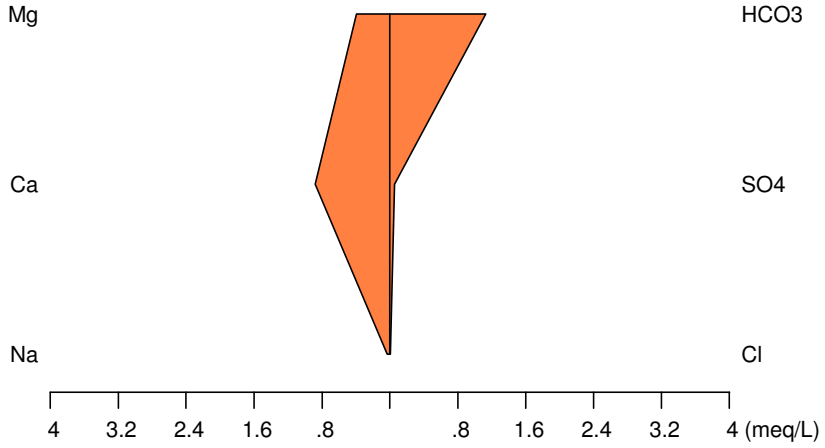


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

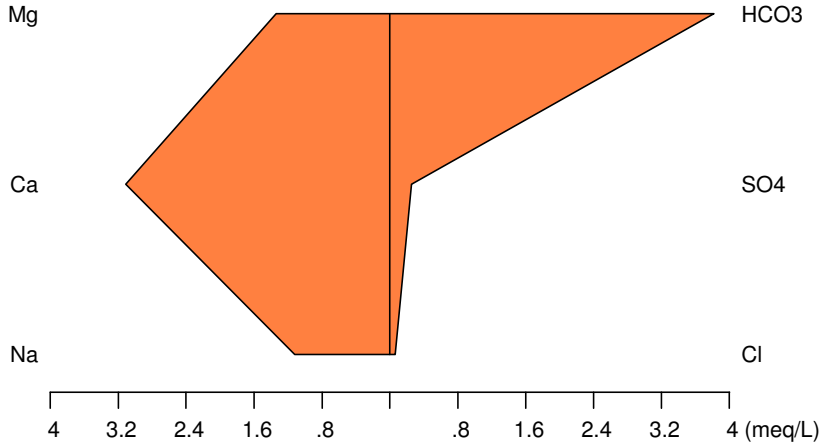
CFSWP-017,6/14/2017

Date: 6/14/2017
TDS (mg/l) = 74
El Cond. (uS/cm) =12900



CFSWP-018,6/15/2017

Date: 6/15/2017
TDS (mg/l) = 336
El Cond. (uS/cm) =45600

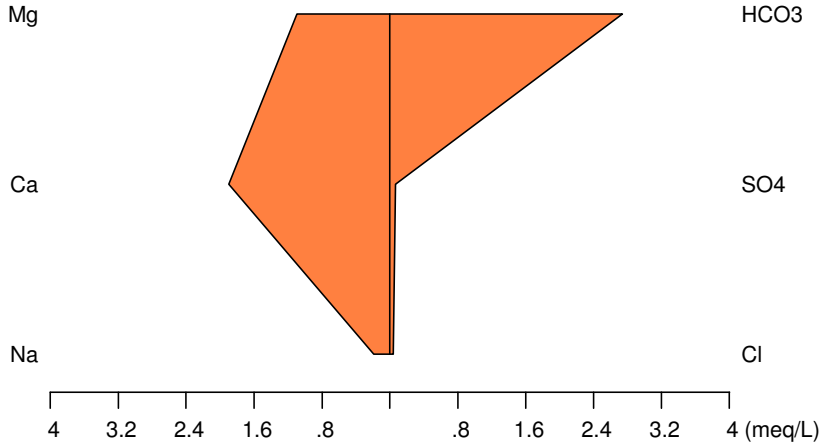


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

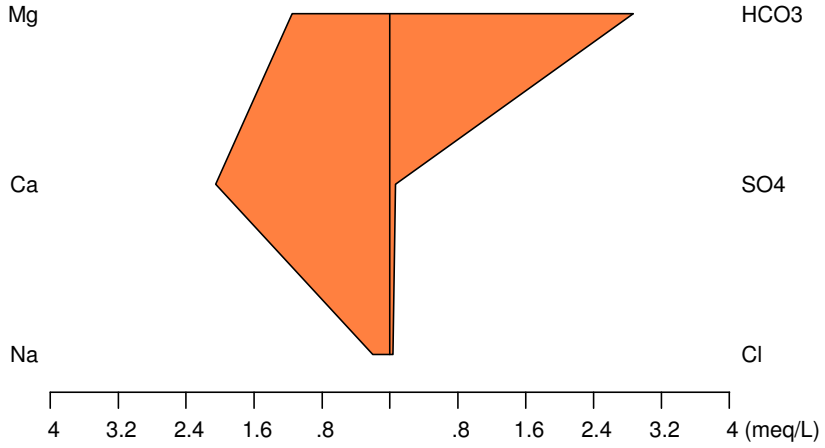
CFSWP-019,6/15/2017

Date: 6/15/2017
TDS (mg/l) = 203
El Cond. (uS/cm) =30300



CFSWP-020,6/15/2017

Date: 6/15/2017
TDS (mg/l) = 217
El Cond. (uS/cm) =31500

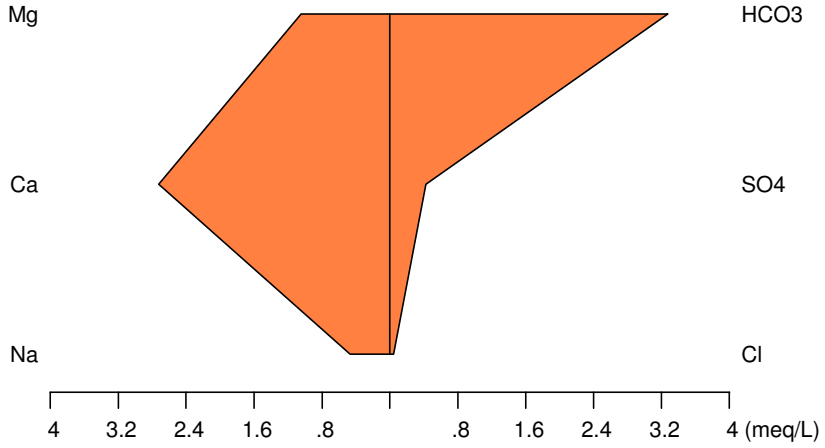


TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

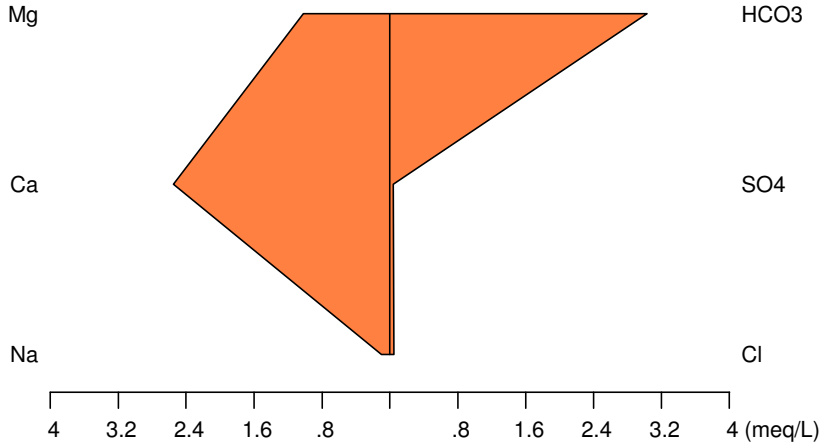
CFSWP-021,6/15/2017

Date: 6/15/2017
TDS (mg/l) = 252
El Cond. (uS/cm) =39800



CFSWP-025,6/13/2017

Date: 6/13/2017
TDS (mg/l) = 192
El Cond. (uS/cm) =32300



TITLE: Round 4 Stiff Diagrams of General Chemistry in Surface Water

ROUX	CLIENT: Columbia Falls Aluminum Company, LLC	PROJECT NO: 2476.0001Y004
	LOCATION: Columbia Falls, Montana	DATE: June 2017 (Round 4)

APPENDIX P

Sample Summary Report of General Chemistry in Groundwater and Surface Water

1. Sample Summary Report of General Chemistry for Monitoring Wells Screened in Upper Hydrogeologic Unit
2. Sample Summary Report of General Chemistry for Monitoring Wells Screened Below the Upper Hydrogeologic Unit
3. Sample Summary Report of General Chemistry in Surface Water

APPENDIX P-1

Sample Summary Report of General Chemistry for Monitoring Wells Screened in Upper Hydrogeologic Unit

Sample Summary Report

Sample ID	CFMW-001-GW	
Sample Date	9/20/2016	
Station	CFMW-001	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	34700	uS/cm
Sum of Anions	3.432502	meq/L
Sum of Cations	4.551954	meq/L
Balance	14.02039	%
Total dissolved solids	290.711	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.277767	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	8.36	0.36364	0.36364
K	0.74	1.892665E-02	1.892665E-02
Ca	60.3	1.504566	3.009132
Mg	14.1	0.5801275	1.160255
Cl	0.611	1.723423E-02	1.723423E-02
SO4	6.6	0.06875	0.1375
NO3			
HCO3	200	3.277767	3.277767

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.276596	2.593509	0.319	0.194
Ca/SO4	9.136364	21.8846	0.152	0.364
Na/Cl	13.68249	21.09987	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-001-GW	
Sample Date	12/12/2016	
Station	CFMW-001	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	43100	uS/cm
Sum of Anions	3.502388	meq/L
Sum of Cations	4.026995	meq/L
Balance	6.967466	%
Total dissolved solids	284.896	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.38	0.1905195	0.1905195
K	0.737	1.884992E-02	1.884992E-02
Ca	54.9	1.369829	2.739658
Mg	13.1	0.5389838	1.077968
Cl	0.799	2.253707E-02	2.253707E-02
SO4	4.98	0.051875	0.10375
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.19084	2.541503	0.319	0.194
Ca/SO4	11.0241	26.40634	0.152	0.364
Na/Cl	5.481852	8.453607	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-001-GW	
Sample Date	3/20/2017	
Station	CFMW-001	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	174000	uS/cm
Sum of Anions	3.631352	meq/L
Sum of Cations	3.95597	meq/L
Balance	4.278425	%
Total dissolved solids	290.969	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.474433	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.2	0.1826899	0.1826899
K	0.676	1.728975E-02	1.728975E-02
Ca	53.5	1.334897	2.669794
Mg	13.2	0.5430981	1.086196
Cl	0.393	1.108519E-02	1.108519E-02
SO4	7	7.291667E-02	0.1458333
NO3			
HCO3	212	3.474433	3.474433

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.05303	2.45793	0.319	0.194
Ca/SO4	7.642857	18.30716	0.152	0.364
Na/Cl	10.68702	16.48054	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-001-GW	
Sample Date	6/19/2017	
Station	CFMW-001	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4110	uS/cm
Sum of Anions	3.634662	meq/L
Sum of Cations	4.560544	meq/L
Balance	11.29785	%
Total dissolved solids	301.634	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.507211	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.81	0.2092235	0.2092235
K	0.826	2.112624E-02	2.112624E-02
Ca	59.4	1.48211	2.96422
Mg	16.6	0.682987	1.365974
Cl	0.338	9.533829E-03	9.533829E-03
SO4	5.66	5.895833E-02	0.1179167
NO3			
HCO3	214	3.507211	3.507211

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.578313	2.170041	0.319	0.194
Ca/SO4	10.4947	25.13826	0.152	0.364
Na/Cl	14.23077	21.94538	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-002-GW	
Sample Date	9/12/2016	
Station	CFMW-002	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	90900	uS/cm
Sum of Anions	7.23425	meq/L
Sum of Cations	10.03501	meq/L
Balance	16.2182	%
Total dissolved solids	651.25	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.817756	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	173	7.525086	7.525086
K	1.02	2.608809E-02	2.608809E-02
Ca	31.8	0.7934528	1.586906
Mg	10.9	0.4484674	0.8969347
Cl	4.13	0.1164932	0.1164932
SO4	14.4	0.15	0.3
NO3			
HCO3	416	6.817756	6.817756

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.917431	1.769254	0.319	0.194
Ca/SO4	2.208333	5.289685	0.152	0.364
Na/Cl	41.88862	64.59676	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-002-GW	
Sample Date	3/24/2017	
Station	CFMW-002	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	704000	uS/cm
Sum of Anions	8.408525	meq/L
Sum of Cations	11.3271	meq/L
Balance	14.78837	%
Total dissolved solids	748.86	mg/L
Total hardness		mg/l CaCO3
Alkalinity	7.89942	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	191	8.308043	8.308043
K	1.06	2.711115E-02	2.711115E-02
Ca	37.2	0.9281901	1.85638
Mg	13.8	0.5677844	1.135569
Cl	1.8	5.077187E-02	5.077187E-02
SO4	22	0.2291667	0.4583333
NO3			
HCO3	482	7.89942	7.89942

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.695652	1.634758	0.319	0.194
Ca/SO4	1.690909	4.050284	0.152	0.364
Na/Cl	106.1111	163.6348	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-002-GW	
Sample Date	6/27/2017	
Station	CFMW-002	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	3770	uS/cm
Sum of Anions	4.827611	meq/L
Sum of Cations	6.520372	meq/L
Balance	14.91684	%
Total dissolved solids	428.073	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.638041	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	97.3	4.232317	4.232317
K	0.793	2.028221E-02	2.028221E-02
Ca	27.8	0.6936474	1.387295
Mg	10.7	0.4402386	0.8804772
Cl	1.75	4.936154E-02	4.936154E-02
SO4	6.73	7.010417E-02	0.1402083
NO3			
HCO3	283	4.638041	4.638041

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.598131	1.575617	0.319	0.194
Ca/SO4	4.130758	9.894525	0.152	0.364
Na/Cl	55.6	85.7412	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-003-GW	
Sample Date	9/14/2016	
Station	CFMW-003	
Location		
Geology		
Watertype	Na-Ca-SO4-HCO3	
Temperature (℃)		
pH		
Conductivity	262000	uS/cm
Sum of Anions	26.4434	meq/L
Sum of Cations	26.71139	meq/L
Balance	0.5041729	%
Total dissolved solids	1945	mg/L
Total hardness		mg/l CaCO3
Alkalinity	10.88219	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	322	14.00623	14.00623
K	2.1	5.371077E-02	5.371077E-02
Ca	178	4.441339	8.882679
Mg	45.8	1.884386	3.768772
Cl	39.1	1.102878	1.102878
SO4	694	7.229167	14.45833
NO3			
HCO3	664	10.88219	10.88219

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.886463	2.356916	0.319	0.194
Ca/SO4	0.2564842	0.6143639	0.152	0.364
Na/Cl	8.235294	12.69971	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-003-GW	
Sample Date	12/9/2016	
Station	CFMW-003	
Location		
Geology		
Watertype	Na-Ca-SO4-HCO3	
Temperature (℃)		
pH		
Conductivity	256000	uS/cm
Sum of Anions	24.84679	meq/L
Sum of Cations	28.99133	meq/L
Balance	7.698156	%
Total dissolved solids	1920.24	mg/L
Total hardness		mg/l CaCO3
Alkalinity	11.02969	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	360	15.65914	15.65914
K	2.04	5.217618E-02	5.217618E-02
Ca	184	4.591048	9.182096
Mg	49.8	2.048961	4.097922
Cl	33.4	0.9421003	0.9421003
SO4	618	6.4375	12.875
NO3			
HCO3	673	11.02969	11.02969

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.694779	2.240671	0.319	0.194
Ca/SO4	0.2977346	0.7131725	0.152	0.364
Na/Cl	10.77844	16.62152	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-003-GW	
Sample Date	3/22/2017	
Station	CFMW-003	
Location		
Geology		
Watertype	Na-Ca-SO4-HCO3	
Temperature (℃)		
pH		
Conductivity	1950000	uS/cm
Sum of Anions	32.7255	meq/L
Sum of Cations	26.17678	meq/L
Balance	-11.11795	%
Total dissolved solids	2237.82	mg/L
Total hardness		mg/l CaCO3
Alkalinity	11.39024	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	320	13.91923	13.91923
K	1.92	4.910699E-02	4.910699E-02
Ca	165	4.116972	8.233944
Mg	48.3	1.987245	3.974491
Cl	46.6	1.314427	1.314427
SO4	961	10.01042	20.02083
NO3			
HCO3	695	11.39024	11.39024

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.416149	2.071698	0.319	0.194
Ca/SO4	0.1716962	0.4112688	0.152	0.364
Na/Cl	6.866953	10.58958	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-003-GW	
Sample Date	6/27/2017	
Station	CFMW-003	
Location		
Geology		
Watertype	Na-Ca-SO4-HCO3	
Temperature (℃)		
pH		
Conductivity	25400	uS/cm
Sum of Anions	30.92979	meq/L
Sum of Cations	30.91733	meq/L
Balance	-0.0201476	%
Total dissolved solids	2247.21	mg/L
Total hardness		mg/l CaCO3
Alkalinity	11.04608	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	372	16.18111	16.18111
K	2.21	0.0565242	0.0565242
Ca	201	5.015221	10.03044
Mg	56.5	2.324625	4.649249
Cl	36.5	1.029541	1.029541
SO4	905	9.427084	18.85417
NO3			
HCO3	674	11.04608	11.04608

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.557522	2.157433	0.319	0.194
Ca/SO4	0.2220995	0.5320013	0.152	0.364
Na/Cl	10.19178	15.71683	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-007-GW	
Sample Date	9/21/2016	
Station	CFMW-007	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	36200	uS/cm
Sum of Anions	6.297098	meq/L
Sum of Cations	3.705873	meq/L
Balance	-25.90455	%
Total dissolved solids	448.019	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.129425	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.05	0.1326677	0.1326677
K	0.579	1.480883E-02	1.480883E-02
Ca	50.2	1.252558	2.505115
Mg	12.8	0.5266406	1.053281
Cl	1.86	5.246427E-02	5.246427E-02
SO4	5.53	5.760417E-02	0.1152083
NO3			
HCO3	374	6.129425	6.129425

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.921875	2.378392	0.319	0.194
Ca/SO4	9.077758	21.74422	0.152	0.364
Na/Cl	1.639785	2.528725	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-007-GW	
Sample Date	12/12/2016	
Station	CFMW-007	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	43500	uS/cm
Sum of Anions	3.704096	meq/L
Sum of Cations	4.261513	meq/L
Balance	6.997794	%
Total dissolved solids	297.918	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.326934	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.97	0.2596807	0.2596807
K	0.668	1.708514E-02	1.708514E-02
Ca	56.6	1.412246	2.824492
Mg	14.1	0.5801275	1.160255
Cl	1.48	4.174576E-02	4.174576E-02
SO4	16.1	0.1677083	0.3354167
NO3			
HCO3	203	3.326934	3.326934

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.014184	2.434372	0.319	0.194
Ca/SO4	3.515528	8.420846	0.152	0.364
Na/Cl	4.033783	6.220529	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-007-GW	
Sample Date	3/28/2017	
Station	CFMW-007	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	242000	uS/cm
Sum of Anions	3.72578	meq/L
Sum of Cations	4.093793	meq/L
Balance	4.706301	%
Total dissolved solids	295.453	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.343323	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.89	0.1692057	0.1692057
K	0.643	1.644573E-02	1.644573E-02
Ca	54.9	1.369829	2.739658
Mg	14.2	0.5842419	1.168484
Cl	1.52	4.287402E-02	4.287402E-02
SO4	16.3	0.1697917	0.3395833
NO3			
HCO3	204	3.343323	3.343323

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.866197	2.344626	0.319	0.194
Ca/SO4	3.368098	8.067704	0.152	0.364
Na/Cl	2.559211	3.946579	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-007-GW	
Sample Date	6/19/2017	
Station	CFMW-007	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3940	uS/cm
Sum of Anions	3.47027	meq/L
Sum of Cations	4.127062	meq/L
Balance	8.645038	%
Total dissolved solids	280.921	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.179435	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.56	0.1983491	0.1983491
K	0.661	1.690611E-02	1.690611E-02
Ca	52.5	1.309946	2.619891
Mg	15.7	0.6459576	1.291915
Cl	1.3	3.666857E-02	3.666857E-02
SO4	12.2	0.1270833	0.2541667
NO3			
HCO3	194	3.179435	3.179435

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.343949	2.027913	0.319	0.194
Ca/SO4	4.303279	10.30777	0.152	0.364
Na/Cl	3.507692	5.409239	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-008-GW	
Sample Date	9/21/2016	
Station	CFMW-008	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	63000	uS/cm
Sum of Anions	5.890362	meq/L
Sum of Cations	6.706469	meq/L
Balance	6.478668	%
Total dissolved solids	505.93	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.686926	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	138	6.00267	6.00267
K	1.19	3.043611E-02	3.043611E-02
Ca	6.37	0.1589401	0.3178802
Mg	4.32	0.1777412	0.3554824
Cl	2.02	5.697732E-02	5.697732E-02
SO4	7.03	7.322917E-02	0.1464583
NO3			
HCO3	347	5.686926	5.686926

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.474537	0.8942218	0.319	0.194
Ca/SO4	0.9061166	2.170448	0.152	0.364
Na/Cl	68.31683	105.3519	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-008-GW	
Sample Date	12/16/2016	
Station	CFMW-008	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	83200	uS/cm
Sum of Anions	5.993908	meq/L
Sum of Cations	7.040154	meq/L
Balance	8.027014	%
Total dissolved solids	501.57	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.572205	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	86	3.740794	3.740794
K	2.22	5.677996E-02	5.677996E-02
Ca	38.1	0.9506463	1.901293
Mg	16.3	0.6706439	1.341288
Cl	3.65	0.1029541	0.1029541
SO4	15.3	0.159375	0.31875
NO3			
HCO3	340	5.572205	5.572205

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.337423	1.417513	0.319	0.194
Ca/SO4	2.490196	5.964839	0.152	0.364
Na/Cl	23.56164	36.33459	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-008-GW	
Sample Date	3/28/2017	
Station	CFMW-008	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	396000	uS/cm
Sum of Anions	6.28894	meq/L
Sum of Cations	6.732866	meq/L
Balance	3.409096	%
Total dissolved solids	516.8701	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.031092	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	89.8	3.906085	3.906085
K	2.21	0.0565242	0.0565242
Ca	28.8	0.7185987	1.437197
Mg	16.2	0.6665295	1.333059
Cl	1.46	4.118163E-02	4.118163E-02
SO4	10.4	0.1083333	0.2166667
NO3			
HCO3	368	6.031092	6.031092

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.777778	1.07812	0.319	0.194
Ca/SO4	2.769231	6.633219	0.152	0.364
Na/Cl	61.50685	94.85019	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-008-GW	
Sample Date	6/20/2017	
Station	CFMW-008	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	7270	uS/cm
Sum of Anions	6.360855	meq/L
Sum of Cations	8.005893	meq/L
Balance	11.45031	%
Total dissolved solids	551.14	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.260536	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	113	4.91523	4.91523
K	2.56	6.547599E-02	6.547599E-02
Ca	31.6	0.7884626	1.576925
Mg	17.6	0.7241309	1.448262
Cl	1.23	3.469411E-02	3.469411E-02
SO4	3.15	0.0328125	0.065625
NO3			
HCO3	382	6.260536	6.260536

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.795455	1.08884	0.319	0.194
Ca/SO4	10.03175	24.02934	0.152	0.364
Na/Cl	91.86992	141.6733	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-010-GW	
Sample Date	9/12/2016	
Station	CFMW-010	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	201000	uS/cm
Sum of Anions	15.47083	meq/L
Sum of Cations	22.52307	meq/L
Balance	18.56151	%
Total dissolved solids	1426.09	mg/L
Total hardness		mg/l CaCO3
Alkalinity	14.34023	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	445	19.35644	19.35644
K	1.46	3.734178E-02	3.734178E-02
Ca	35.5	0.8857728	1.771546
Mg	16.5	0.6788726	1.357745
Cl	4.63	0.1305965	0.1305965
SO4	48	0.5	1
NO3			
HCO3	875	14.34023	14.34023

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.151515	1.30477	0.319	0.194
Ca/SO4	0.7395833	1.771546	0.152	0.364
Na/Cl	96.11231	148.2155	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-010-GW	
Sample Date	12/15/2016	
Station	CFMW-010	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	106000	uS/cm
Sum of Anions	8.809246	meq/L
Sum of Cations	11.61651	meq/L
Balance	13.74375	%
Total dissolved solids	788.842	mg/L
Total hardness		mg/l CaCO3
Alkalinity	8.423862	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	231	10.04795	10.04795
K	0.89	2.276314E-02	2.276314E-02
Ca	14.8	0.3692799	0.7385598
Mg	9.81	0.4036207	0.8072413
Cl	0.442	1.246731E-02	1.246731E-02
SO4	17.9	0.1864583	0.3729167
NO3			
HCO3	514	8.423862	8.423862

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.508665	0.9149183	0.319	0.194
Ca/SO4	0.8268157	1.980496	0.152	0.364
Na/Cl	522.6245	805.9432	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-010-GW	
Sample Date	3/24/2017	
Station	CFMW-010	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (°C)		
pH		
Conductivity	632000	uS/cm
Sum of Anions	7.884398	meq/L
Sum of Cations	10.53234	meq/L
Balance	14.37793	%
Total dissolved solids	706.47	mg/L
Total hardness		mg/l CaCO3
Alkalinity	7.506087	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	198	8.612526	8.612526
K	0.81	2.071701E-02	2.071701E-02
Ca	23.1	0.5763761	1.152752
Mg	9.07	0.3731742	0.7463484
Cl	1.89	5.331046E-02	5.331046E-02
SO4	15.6	0.1625	0.325
NO3			
HCO3	458	7.506087	7.506087

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.546858	1.544523	0.319	0.194
Ca/SO4	1.480769	3.54693	0.152	0.364
Na/Cl	104.7619	161.5541	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-010-GW	
Sample Date	6/27/2017	
Station	CFMW-010	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	6580	uS/cm
Sum of Anions	5.490369	meq/L
Sum of Cations	7.779803	meq/L
Balance	17.25248	%
Total dissolved solids	495.869	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.293594	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	122	5.306708	5.306708
K	0.929	2.376062E-02	2.376062E-02
Ca	28.8	0.7185987	1.437197
Mg	12.3	0.5060687	1.012137
Cl	1.71	4.823328E-02	4.823328E-02
SO4	7.13	7.427084E-02	0.1485417
NO3			
HCO3	323	5.293594	5.293594

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.341463	1.419963	0.319	0.194
Ca/SO4	4.03927	9.675382	0.152	0.364
Na/Cl	71.34502	110.0217	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-011-GW	
Sample Date	9/13/2016	
Station	CFMW-011	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	38500	uS/cm
Sum of Anions	3.353519	meq/L
Sum of Cations	3.985228	meq/L
Balance	8.607861	%
Total dissolved solids	274.527	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.212212	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.95	0.4328012	0.4328012
K	0.657	0.0168038	0.0168038
Ca	47.6	1.187684	2.375368
Mg	14.1	0.5801275	1.160255
Cl	1.59	4.484849E-02	4.484849E-02
SO4	4.63	4.822917E-02	9.645834E-02
NO3			
HCO3	196	3.212212	3.212212

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.375886	2.047281	0.319	0.194
Ca/SO4	10.28078	24.62584	0.152	0.364
Na/Cl	6.257862	9.650296	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-011-GW	
Sample Date	12/8/2016	
Station	CFMW-011	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	45100	uS/cm
Sum of Anions	3.7451	meq/L
Sum of Cations	4.43681	meq/L
Balance	8.45413	%
Total dissolved solids	306.34	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.572767	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	11.2	0.4871732	0.4871732
K	0.709	1.813378E-02	1.813378E-02
Ca	52.4	1.307451	2.614901
Mg	16	0.6583008	1.316602
Cl	0.681	1.920869E-02	1.920869E-02
SO4	7.35	0.0765625	0.153125
NO3			
HCO3	218	3.572767	3.572767

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.275	1.986099	0.319	0.194
Ca/SO4	7.129252	17.0769	0.152	0.364
Na/Cl	16.4464	25.36213	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-011-GW	
Sample Date	3/27/2017	
Station	CFMW-011	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	270000	uS/cm
Sum of Anions	4.616319	meq/L
Sum of Cations	5.189043	meq/L
Balance	5.84093	%
Total dissolved solids	370.808	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.261098	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	13.3	0.5785182	0.5785182
K	0.798	2.041009E-02	2.041009E-02
Ca	62.3	1.554469	3.108938
Mg	18	0.7405884	1.481177
Cl	1.81	5.105393E-02	5.105393E-02
SO4	14.6	0.1520833	0.3041667
NO3			
HCO3	260	4.261098	4.261098

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.461111	2.098965	0.319	0.194
Ca/SO4	4.267123	10.22116	0.152	0.364
Na/Cl	7.348067	11.33151	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-011-GW	
Sample Date	6/28/2017	
Station	CFMW-011	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3870	uS/cm
Sum of Anions	3.635809	meq/L
Sum of Cations	4.286785	meq/L
Balance	8.216702	%
Total dissolved solids	298.773	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.490822	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	18.1	0.7873067	0.7873067
K	0.733	1.874762E-02	1.874762E-02
Ca	46.5	1.160238	2.320475
Mg	14.1	0.5801275	1.160255
Cl	1.75	4.936154E-02	4.936154E-02
SO4	4.59	0.0478125	9.562501E-02
NO3			
HCO3	213	3.490822	3.490822

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.297872	1.99997	0.319	0.194
Ca/SO4	10.13072	24.26641	0.152	0.364
Na/Cl	10.34286	15.9498	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP15-GW	
Sample Date	6/28/2017	
Station	CFMW-011	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (°C)		
pH		
Conductivity	3870	uS/cm
Sum of Anions	3.550961	meq/L
Sum of Cations	4.281256	meq/L
Balance	9.324245	%
Total dissolved solids	293.527	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.408878	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	18.2	0.7916565	0.7916565
K	0.737	1.884992E-02	1.884992E-02
Ca	46.3	1.155247	2.310495
Mg	14.1	0.5801275	1.160255
Cl	1.78	5.020774E-02	5.020774E-02
SO4	4.41	0.0459375	0.091875
NO3			
HCO3	208	3.408878	3.408878

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.283688	1.991368	0.319	0.194
Ca/SO4	10.49887	25.14824	0.152	0.364
Na/Cl	10.22472	15.76762	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-012-GW	
Sample Date	9/12/2016	
Station	CFMW-012	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	105000	uS/cm
Sum of Anions	8.314667	meq/L
Sum of Cations	10.62336	meq/L
Balance	12.19078	%
Total dissolved solids	738.597	mg/L
Total hardness		mg/l CaCO3
Alkalinity	7.768309	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	226	9.83046	9.83046
K	0.817	2.089605E-02	2.089605E-02
Ca	8.66	0.2160787	0.4321573
Mg	4.13	0.1699239	0.3398478
Cl	3.49	9.844101E-02	9.844101E-02
SO4	21.5	0.2239583	0.4479167
NO3			
HCO3	474	7.768309	7.768309

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.096852	1.27162	0.319	0.194
Ca/SO4	0.4027907	0.9648163	0.152	0.364
Na/Cl	64.75645	99.86142	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-012-GW	
Sample Date	12/14/2016	
Station	CFMW-012	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (°C)		
pH		
Conductivity	114000	uS/cm
Sum of Anions	9.562933	meq/L
Sum of Cations	11.28575	meq/L
Balance	8.263444	%
Total dissolved solids	832.301	mg/L
Total hardness		mg/l CaCO3
Alkalinity	9.276082	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	234	10.17844	10.17844
K	0.937	2.396524E-02	2.396524E-02
Ca	11.7	0.2919307	0.5838615
Mg	6.07	0.2497429	0.4994857
Cl	0.494	1.393406E-02	1.393406E-02
SO4	13.1	0.1364583	0.2729167
NO3			
HCO3	566	9.276082	9.276082

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.927512	1.168925	0.319	0.194
Ca/SO4	0.8931297	2.13934	0.152	0.364
Na/Cl	473.6842	730.4721	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-012-GW	
Sample Date	3/22/2017	
Station	CFMW-012	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	836000	uS/cm
Sum of Anions	9.500994	meq/L
Sum of Cations	13.08647	meq/L
Balance	15.87374	%
Total dissolved solids	848.61	mg/L
Total hardness		mg/l CaCO3
Alkalinity	8.554973	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	232	10.09144	10.09144
K	1.6	0.0409225	0.0409225
Ca	31	0.7734917	1.546983
Mg	17.1	0.7035589	1.407118
Cl	1.41	0.0397713	0.0397713
SO4	43.5	0.453125	0.90625
NO3			
HCO3	522	8.554973	8.554973

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.812865	1.099399	0.319	0.194
Ca/SO4	0.7126437	1.707016	0.152	0.364
Na/Cl	164.539	253.7369	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-012-GW	
Sample Date	6/23/2017	
Station	CFMW-012	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	38600	uS/cm
Sum of Anions	25.91134	meq/L
Sum of Cations	37.37193	meq/L
Balance	18.10999	%
Total dissolved solids	2411.877	mg/L
Total hardness		mg/l CaCO3
Alkalinity	24.25548	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	834	36.277	36.277
K	3.41	8.721607E-02	8.721607E-02
Ca	7.48	0.1866361	0.3732722
Mg	7.71	0.3172187	0.6344374
Cl	0.577	0.0162752	0.0162752
SO4	78.7	0.8197917	1.639583
NO3			
HCO3	1480	24.25548	24.25548

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.9701686	0.5883514	0.319	0.194
Ca/SO4	9.504448E-02	0.2276628	0.152	0.364
Na/Cl	1445.407	2228.974	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-014-GW	
Sample Date	9/12/2016	
Station	CFMW-014	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	104000	uS/cm
Sum of Anions	8.59936	meq/L
Sum of Cations	10.95931	meq/L
Balance	12.06599	%
Total dissolved solids	744.27	mg/L
Total hardness		mg/l CaCO3
Alkalinity	7.801086	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	168	7.307598	7.307598
K	1.12	2.864575E-02	2.864575E-02
Ca	44.9	1.120315	2.240631
Mg	16.8	0.6912158	1.382432
Cl	2.45	6.910615E-02	6.910615E-02
SO4	35	0.3645833	0.7291667
NO3			
HCO3	476	7.801086	7.801086

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.672619	1.62079	0.319	0.194
Ca/SO4	1.282857	3.072865	0.152	0.364
Na/Cl	68.57143	105.7445	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-014-GW	
Sample Date	12/15/2016	
Station	CFMW-014	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (°C)		
pH		
Conductivity	138000	uS/cm
Sum of Anions	9.963996	meq/L
Sum of Cations	13.84634	meq/L
Balance	16.30529	%
Total dissolved solids	892.87	mg/L
Total hardness		mg/l CaCO3
Alkalinity	8.981083	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	239	10.39593	10.39593
K	1.16	2.966881E-02	2.966881E-02
Ca	42	1.047957	2.095913
Mg	16.1	0.6624151	1.32483
Cl	1.61	4.541262E-02	4.541262E-02
SO4	45	0.46875	0.9375
NO3			
HCO3	548	8.981083	8.981083

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.608696	1.582024	0.319	0.194
Ca/SO4	0.9333333	2.235641	0.152	0.364
Na/Cl	148.4472	228.9216	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-014-GW	
Sample Date	3/29/2017	
Station	CFMW-014	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	772000	uS/cm
Sum of Anions	9.500391	meq/L
Sum of Cations	13.1599	meq/L
Balance	16.14943	%
Total dissolved solids	839.3099	mg/L
Total hardness		mg/l CaCO3
Alkalinity	8.423862	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	191	8.308043	8.308043
K	1.14	2.915728E-02	2.915728E-02
Ca	60.2	1.502071	3.004142
Mg	22.1	0.9092779	1.818556
Cl	2.27	6.402897E-02	6.402897E-02
SO4	48.6	0.50625	1.0125
NO3			
HCO3	514	8.423862	8.423862

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.723982	1.651938	0.319	0.194
Ca/SO4	1.238683	2.967054	0.152	0.364
Na/Cl	84.14097	129.7544	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-014-GW	
Sample Date	6/27/2017	
Station	CFMW-014	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	4560	uS/cm
Sum of Anions	4.349892	meq/L
Sum of Cations	5.623005	meq/L
Balance	12.76573	%
Total dissolved solids	379.035	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.162765	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	79.1	3.440661	3.440661
K	0.805	2.058913E-02	2.058913E-02
Ca	26.5	0.6612107	1.322421
Mg	10.2	0.4196667	0.8393335
Cl	1.56	4.400229E-02	4.400229E-02
SO4	6.87	0.0715625	0.143125
NO3			
HCO3	254	4.162765	4.162765

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.598039	1.575561	0.319	0.194
Ca/SO4	3.857351	9.239625	0.152	0.364
Na/Cl	50.70513	78.19277	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-015-GW	
Sample Date	9/12/2016	
Station	CFMW-015	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	256000	uS/cm
Sum of Anions	21.4863	meq/L
Sum of Cations	27.49511	meq/L
Balance	12.26753	%
Total dissolved solids	1912.29	mg/L
Total hardness		mg/l CaCO3
Alkalinity	19.50272	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	620	26.96852	26.96852
K	2.4	6.138375E-02	6.138375E-02
Ca	2.71	6.761815E-02	0.1352363
Mg	4.01	0.1649866	0.3299733
Cl	5.77	0.162752	0.162752
SO4	87.4	0.9104167	1.820833
NO3			
HCO3	1190	19.50272	19.50272

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.6758105	0.4098401	0.319	0.194
Ca/SO4	3.100687E-02	7.427164E-02	0.152	0.364
Na/Cl	107.4523	165.7031	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-015-GW	
Sample Date	12/15/2016	
Station	CFMW-015	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	176000	uS/cm
Sum of Anions	13.46591	meq/L
Sum of Cations	16.12082	meq/L
Balance	8.973298	%
Total dissolved solids	1177.94	mg/L
Total hardness		mg/l CaCO3
Alkalinity	12.48829	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	365	15.87663	15.87663
K	1.52	3.887637E-02	3.887637E-02
Ca	1.41	0.0351814	7.036279E-02
Mg	1.64	6.747583E-02	0.1349517
Cl	1.57	4.428435E-02	4.428435E-02
SO4	44.8	0.4666667	0.9333333
NO3			
HCO3	762	12.48829	12.48829

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.8597561	0.5213926	0.319	0.194
Ca/SO4	3.147322E-02	7.538871E-02	0.152	0.364
Na/Cl	232.4841	358.5155	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-015-GW	
Sample Date	3/29/2017	
Station	CFMW-015	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	1650000	uS/cm
Sum of Anions	18.73285	meq/L
Sum of Cations	26.8735	meq/L
Balance	17.84982	%
Total dissolved solids	1748.38	mg/L
Total hardness		mg/l CaCO3
Alkalinity	18.19161	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	601	26.14206	26.14206
K	2.56	6.547599E-02	6.547599E-02
Ca	4.21	0.1050452	0.2100903
Mg	5.54	0.2279366	0.4558733
Cl	2.57	7.249095E-02	7.249095E-02
SO4	22.5	0.234375	0.46875
NO3			
HCO3	1110	18.19161	18.19161

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.7599278	0.4608525	0.319	0.194
Ca/SO4	0.1871111	0.4481927	0.152	0.364
Na/Cl	233.8521	360.6252	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-015-GW	
Sample Date	6/27/2017	
Station	CFMW-015	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (℃)		
pH		
Conductivity	32500	uS/cm
Sum of Anions	27.92736	meq/L
Sum of Cations	31.36219	meq/L
Balance	5.793304	%
Total dissolved solids	2390.7	mg/L
Total hardness		mg/l CaCO3
Alkalinity	25.73047	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	703	30.57882	30.57882
K	2.76	7.059131E-02	7.059131E-02
Ca	3.73	9.306853E-02	0.1861371
Mg	6.4	0.2633203	0.5266406
Cl	1.81	5.105393E-02	5.105393E-02
SO4	103	1.072917	2.145833
NO3			
HCO3	1570	25.73047	25.73047

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.5828125	0.3534423	0.319	0.194
Ca/SO4	3.621359E-02	8.674347E-02	0.152	0.364
Na/Cl	388.3978	598.9512	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-016-GW	
Sample Date	3/28/2017	
Station	CFMW-016	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	235000	uS/cm
Sum of Anions	3.640308	meq/L
Sum of Cations	3.885074	meq/L
Balance	3.252533	%
Total dissolved solids	290.948	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.425267	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	13.3	0.5785182	0.5785182
K	0.648	1.657361E-02	1.657361E-02
Ca	46.8	1.167723	2.335446
Mg	11.6	0.4772681	0.9545361
Cl	2.04	5.754145E-02	5.754145E-02
SO4	7.56	0.07875	0.1575
NO3			
HCO3	209	3.425267	3.425267

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.034482	2.446681	0.319	0.194
Ca/SO4	6.190476	14.82823	0.152	0.364
Na/Cl	6.519608	10.05394	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-016-GW	
Sample Date	6/29/2017	
Station	CFMW-016	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3440	uS/cm
Sum of Anions	3.097227	meq/L
Sum of Cations	3.598086	meq/L
Balance	7.480745	%
Total dissolved solids	252.044	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.999157	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.58	0.1557214	0.1557214
K	0.584	1.493671E-02	1.493671E-02
Ca	48.4	1.207645	2.41529
Mg	12.3	0.5060687	1.012137
Cl	1.49	4.202783E-02	4.202783E-02
SO4	2.69	2.802083E-02	5.604167E-02
NO3			
HCO3	183	2.999157	2.999157

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.934959	2.386327	0.319	0.194
Ca/SO4	17.99257	43.09812	0.152	0.364
Na/Cl	2.402684	3.705198	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP10-GW	
Sample Date	3/28/2017	
Station	CFMW-016	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	234000	uS/cm
Sum of Anions	3.689475	meq/L
Sum of Cations	3.885074	meq/L
Balance	2.58232	%
Total dissolved solids	293.948	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.474433	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	13.3	0.5785182	0.5785182
K	0.648	1.657361E-02	1.657361E-02
Ca	46.8	1.167723	2.335446
Mg	11.6	0.4772681	0.9545361
Cl	2.04	5.754145E-02	5.754145E-02
SO4	7.56	0.07875	0.1575
NO3			
HCO3	212	3.474433	3.474433

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.034482	2.446681	0.319	0.194
Ca/SO4	6.190476	14.82823	0.152	0.364
Na/Cl	6.519608	10.05394	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-016a-GW	
Sample Date	9/21/2016	
Station	CFMW-016a	
Location		
Geology		
Watertype	Ca-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	37100	uS/cm
Sum of Anions	1.237335	meq/L
Sum of Cations	3.115539	meq/L
Balance	43.14857	%
Total dissolved solids	135.8	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.050524	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	18.6	0.8090555	0.8090555
K	2.78	7.110284E-02	7.110284E-02
Ca	38.1	0.9506463	1.901293
Mg	4.06	0.1670438	0.3340876
Cl	2.28	6.431103E-02	6.431103E-02
SO4	5.88	0.06125	0.1225
NO3			
HCO3	64.1	1.050524	1.050524

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	9.384236	5.691	0.319	0.194
Ca/SO4	6.479591	15.52076	0.152	0.364
Na/Cl	8.157895	12.58035	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-016a-GW	
Sample Date	12/14/2016	
Station	CFMW-016a	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	31900	uS/cm
Sum of Anions	2.428476	meq/L
Sum of Cations	2.939291	meq/L
Balance	9.51634	%
Total dissolved solids	200.73	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.26166	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	13.1	0.5698187	0.5698187
K	1.36	3.478412E-02	3.478412E-02
Ca	31.4	0.7834722	1.566944
Mg	9.33	0.3838716	0.7677432
Cl	1.32	0.0372327	0.0372327
SO4	6.22	6.479166E-02	0.1295833
NO3			
HCO3	138	2.26166	2.26166

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.365488	2.040975	0.319	0.194
Ca/SO4	5.048232	12.09218	0.152	0.364
Na/Cl	9.924242	15.30425	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-016a-GW	
Sample Date	3/27/2017	
Station	CFMW-016a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	252000	uS/cm
Sum of Anions	4.035161	meq/L
Sum of Cations	4.496129	meq/L
Balance	5.403264	%
Total dissolved solids	324.302	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.785821	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.3	0.4045278	0.4045278
K	0.892	2.281429E-02	2.281429E-02
Ca	56.8	1.417236	2.834473
Mg	15	0.617157	1.234314
Cl	1.86	5.246427E-02	5.246427E-02
SO4	9.45	0.0984375	0.196875
NO3			
HCO3	231	3.785821	3.785821

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.786667	2.296395	0.319	0.194
Ca/SO4	6.010582	14.39732	0.152	0.364
Na/Cl	5	7.710539	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-016a-GW	
Sample Date	6/26/2017	
Station	CFMW-016a	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3180	uS/cm
Sum of Anions	1.191472	meq/L
Sum of Cations	5.165647	meq/L
Balance	62.51536	%
Total dissolved solids	172.52	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.073469	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	29.2	1.27013	1.27013
K	1.08	2.762268E-02	2.762268E-02
Ca	62.8	1.566944	3.133889
Mg	8.92	0.3670027	0.7340053
Cl	1.82	0.051336	0.051336
SO4	3.2	3.333334E-02	6.666667E-02
NO3			
HCO3	65.5	1.073469	1.073469

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	7.040359	4.269572	0.319	0.194
Ca/SO4	19.625	47.00833	0.152	0.364
Na/Cl	16.04396	24.74151	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-017-GW	
Sample Date	3/28/2017	
Station	CFMW-017	
Location		
Geology		
Watertype	Na-HCO3	
Temperature (°C)		
pH		
Conductivity	516000	uS/cm
Sum of Anions	6.875788	meq/L
Sum of Cations	7.951498	meq/L
Balance	7.254934	%
Total dissolved solids	587.625	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.670257	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	135	5.872177	5.872177
K	0.865	2.212372E-02	2.212372E-02
Ca	26.4	0.6587155	1.317431
Mg	8.99	0.3698827	0.7397655
Cl	1.4	3.948923E-02	3.948923E-02
SO4	7.97	8.302084E-02	0.1660417
NO3			
HCO3	407	6.670257	6.670257

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.936596	1.780877	0.319	0.194
Ca/SO4	3.312422	7.93434	0.152	0.364
Na/Cl	96.42857	148.7032	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-017-GW	
Sample Date	6/26/2017	
Station	CFMW-017	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3570	uS/cm
Sum of Anions	3.20844	meq/L
Sum of Cations	3.614598	meq/L
Balance	5.952747	%
Total dissolved solids	261.34	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.130268	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	8.96	0.3897386	0.3897386
K	0.476	1.217444E-02	1.217444E-02
Ca	46.9	1.170218	2.340436
Mg	10.6	0.4361243	0.8722485
Cl	0.984	2.775529E-02	2.775529E-02
SO4	2.42	2.520834E-02	5.041667E-02
NO3			
HCO3	191	3.130268	3.130268

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.424528	2.683222	0.319	0.194
Ca/SO4	19.38017	46.42188	0.152	0.364
Na/Cl	9.105691	14.04196	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-018-GW	
Sample Date	3/28/2017	
Station	CFMW-018	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	220000	uS/cm
Sum of Anions	3.520485	meq/L
Sum of Cations	3.872043	meq/L
Balance	4.755579	%
Total dissolved solids	282.569	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	7.64	0.3323217	0.3323217
K	0.509	1.301847E-02	1.301847E-02
Ca	49.4	1.232597	2.465193
Mg	12.9	0.530755	1.06151
Cl	2.29	0.0645931	0.0645931
SO4	3.83	3.989583E-02	7.979167E-02
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.829458	2.322346	0.319	0.194
Ca/SO4	12.89817	30.89537	0.152	0.364
Na/Cl	3.336245	5.144848	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-018-GW	
Sample Date	6/20/2017	
Station	CFMW-018	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4480	uS/cm
Sum of Anions	3.987442	meq/L
Sum of Cations	4.74989	meq/L
Balance	8.726323	%
Total dissolved solids	326.634	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.884154	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.13	0.2231427	0.2231427
K	0.692	1.769898E-02	1.769898E-02
Ca	61.5	1.534508	3.069016
Mg	17.5	0.7200165	1.440033
Cl	0.412	1.162112E-02	1.162112E-02
SO4	4.4	4.583333E-02	9.166667E-02
NO3			
HCO3	237	3.884154	3.884154

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.514286	2.131212	0.319	0.194
Ca/SO4	13.97727	33.48017	0.152	0.364
Na/Cl	12.45146	19.20149	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-019-GW	
Sample Date	9/12/2016	
Station	CFMW-019	
Location		
Geology		
Watertype	Na-Ca-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	83900	uS/cm
Sum of Anions	7.620303	meq/L
Sum of Cations	8.727612	meq/L
Balance	6.773398	%
Total dissolved solids	612.75	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.473872	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	104	4.523751	4.523751
K	1.52	3.887637E-02	3.887637E-02
Ca	55.1	1.374819	2.749638
Mg	17.2	0.7076734	1.415347
Cl	5.93	0.1672651	0.1672651
SO4	95	0.9895834	1.979167
NO3			
HCO3	334	5.473872	5.473872

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.203488	1.942731	0.319	0.194
Ca/SO4	0.58	1.389291	0.152	0.364
Na/Cl	17.53794	27.0454	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-019-GW	
Sample Date	12/15/2016	
Station	CFMW-019	
Location		
Geology		
Watertype	Na-Ca-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	96200	uS/cm
Sum of Anions	8.119848	meq/L
Sum of Cations	9.45618	meq/L
Balance	7.603148	%
Total dissolved solids	655.46	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.604982	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	120	5.219713	5.219713
K	1.84	4.706087E-02	4.706087E-02
Ca	54.6	1.362343	2.724687
Mg	17.8	0.7323596	1.464719
Cl	4.22	0.1190318	0.1190318
SO4	115	1.197917	2.395833
NO3			
HCO3	342	5.604982	5.604982

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.067416	1.860211	0.319	0.194
Ca/SO4	0.4747826	1.137261	0.152	0.364
Na/Cl	28.43602	43.85141	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-019-GW	
Sample Date	3/29/2017	
Station	CFMW-019	
Location		
Geology		
Watertype	Na-Ca-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	756000	uS/cm
Sum of Anions	11.263	meq/L
Sum of Cations	12.17289	meq/L
Balance	3.882432	%
Total dissolved solids	873.07	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.735812	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	149	6.481143	6.481143
K	1.82	4.654934E-02	4.654934E-02
Ca	71.9	1.794002	3.588004
Mg	25	1.028595	2.05719
Cl	8.35	0.2355251	0.2355251
SO4	206	2.145833	4.291667
NO3			
HCO3	411	6.735812	6.735812

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.876	1.744128	0.319	0.194
Ca/SO4	0.3490291	0.8360396	0.152	0.364
Na/Cl	17.84431	27.51785	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-019-GW	
Sample Date	6/29/2017	
Station	CFMW-019	
Location		
Geology		
Watertype	Na-Ca-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	10500	uS/cm
Sum of Anions	9.14378	meq/L
Sum of Cations	10.94291	meq/L
Balance	8.95682	%
Total dissolved solids	744.44	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.276925	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	145	6.307153	6.307153
K	1.72	4.399168E-02	4.399168E-02
Ca	59.2	1.47712	2.954239
Mg	19.9	0.8187615	1.637523
Cl	5.62	0.1585211	0.1585211
SO4	130	1.354167	2.708333
NO3			
HCO3	383	6.276925	6.276925

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.974874	1.80409	0.319	0.194
Ca/SO4	0.4553846	1.090796	0.152	0.364
Na/Cl	25.80071	39.78748	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-020-GW	
Sample Date	9/20/2016	
Station	CFMW-020	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	40800	uS/cm
Sum of Anions	4.087759	meq/L
Sum of Cations	4.087524	meq/L
Balance	-2.875506E-03	%
Total dissolved solids	316.234	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.605544	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.81	0.2092235	0.2092235
K	0.774	1.979626E-02	1.979626E-02
Ca	54.4	1.357353	2.714707
Mg	13.9	0.5718988	1.143798
Cl	2.25	6.346484E-02	6.346484E-02
SO4	20.1	0.209375	0.41875
NO3			
HCO3	220	3.605544	3.605544

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.913669	2.373415	0.319	0.194
Ca/SO4	2.706468	6.482881	0.152	0.364
Na/Cl	2.137778	3.296684	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-020-GW	
Sample Date	12/13/2016	
Station	CFMW-020	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	49100	uS/cm
Sum of Anions	4.147275	meq/L
Sum of Cations	4.776127	meq/L
Balance	7.047221	%
Total dissolved solids	338.466	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.015265	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.68	0.290564	0.290564
K	0.676	1.728975E-02	1.728975E-02
Ca	65.3	1.629323	3.258646
Mg	14.7	0.6048138	1.209628
Cl	0.64	1.805222E-02	1.805222E-02
SO4	5.47	5.697916E-02	0.1139583
NO3			
HCO3	245	4.015265	4.015265

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.442177	2.693925	0.319	0.194
Ca/SO4	11.93784	28.59507	0.152	0.364
Na/Cl	10.4375	16.09575	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-020-GW	
Sample Date	3/21/2017	
Station	CFMW-020	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	304000	uS/cm
Sum of Anions	4.939179	meq/L
Sum of Cations	4.920789	meq/L
Balance	-0.1865184	%
Total dissolved solids	388.062	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.703596	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	12	0.5219713	0.5219713
K	0.622	1.590862E-02	1.590862E-02
Ca	62.6	1.561954	3.123909
Mg	15.3	0.6295001	1.259
Cl	2.17	6.120831E-02	6.120831E-02
SO4	8.37	0.0871875	0.174375
NO3			
HCO3	287	4.703596	4.703596

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.091503	2.481261	0.319	0.194
Ca/SO4	7.479092	17.91489	0.152	0.364
Na/Cl	5.529954	8.527784	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-020-GW	
Sample Date	6/26/2017	
Station	CFMW-020	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	3650	uS/cm
Sum of Anions	3.30506	meq/L
Sum of Cations	3.626034	meq/L
Balance	4.630919	%
Total dissolved solids	265.944	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.212212	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.51	0.1526766	0.1526766
K	0.594	1.519248E-02	1.519248E-02
Ca	50.5	1.260043	2.520086
Mg	11.4	0.4690393	0.9380785
Cl	1.46	4.118163E-02	4.118163E-02
SO4	2.48	2.583333E-02	5.166667E-02
NO3			
HCO3	196	3.212212	3.212212

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.429825	2.686434	0.319	0.194
Ca/SO4	20.3629	48.77586	0.152	0.364
Na/Cl	2.404109	3.707396	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-021-GW	
Sample Date	9/12/2016	
Station	CFMW-021	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	63100	uS/cm
Sum of Anions	5.949224	meq/L
Sum of Cations	7.043441	meq/L
Balance	8.421804	%
Total dissolved solids	481.23	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.65443	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	54.3	2.36192	2.36192
K	1	2.557656E-02	2.557656E-02
Ca	62.3	1.554469	3.108938
Mg	18.8	0.7735034	1.547007
Cl	3.73	0.1052106	0.1052106
SO4	57.1	0.5947917	1.189583
NO3			
HCO3	284	4.65443	4.65443

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.31383	2.009647	0.319	0.194
Ca/SO4	1.091068	2.613468	0.152	0.364
Na/Cl	14.55764	22.44945	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-021-GW	
Sample Date	12/14/2016	
Station	CFMW-021	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	92700	uS/cm
Sum of Anions	8.066786	meq/L
Sum of Cations	9.636606	meq/L
Balance	8.867343	%
Total dissolved solids	669.98	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.260536	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	142	6.17666	6.17666
K	1.07	2.736692E-02	2.736692E-02
Ca	45.7	1.140277	2.280553
Mg	14	0.5760131	1.152026
Cl	4.21	0.1187498	0.1187498
SO4	81	0.84375	1.6875
NO3			
HCO3	382	6.260536	6.260536

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.264286	1.979602	0.319	0.194
Ca/SO4	0.5641975	1.351439	0.152	0.364
Na/Cl	33.72922	52.01408	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-021-GW	
Sample Date	3/29/2017	
Station	CFMW-021	
Location		
Geology		
Watertype	Na-Ca-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	756000	uS/cm
Sum of Anions	11.13577	meq/L
Sum of Cations	12.11217	meq/L
Balance	4.199955	%
Total dissolved solids	876.64	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.981645	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	178	7.742574	7.742574
K	1.36	3.478412E-02	3.478412E-02
Ca	55.7	1.38979	2.77958
Mg	18.9	0.7776178	1.555236
Cl	7.68	0.2166266	0.2166266
SO4	189	1.96875	3.9375
NO3			
HCO3	426	6.981645	6.981645

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.94709	1.787241	0.319	0.194
Ca/SO4	0.294709	0.7059251	0.152	0.364
Na/Cl	23.17708	35.74156	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-021-GW	
Sample Date	6/26/2017	
Station	CFMW-021	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	0	uS/cm
Sum of Anions	4.493408	meq/L
Sum of Cations	4.974395	meq/L
Balance	5.080245	%
Total dissolved solids	363.753	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.884154	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	47.2	2.053087	2.053087
K	0.883	0.0225841	0.0225841
Ca	38.3	0.9556366	1.911273
Mg	12	0.4937256	0.9874511
Cl	2.47	6.967029E-02	6.967029E-02
SO4	25.9	0.2697917	0.5395833
NO3			
HCO3	237	3.884154	3.884154

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.191667	1.935562	0.319	0.194
Ca/SO4	1.478764	3.542128	0.152	0.364
Na/Cl	19.10931	29.46862	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-022-GW	
Sample Date	9/13/2016	
Station	CFMW-022	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	39400	uS/cm
Sum of Anions	3.469352	meq/L
Sum of Cations	2.164814	meq/L
Balance	-23.15407	%
Total dissolved solids	248.888	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.310545	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.09	0.2214028	0.2214028
K	0.318	8.133345E-03	8.133345E-03
Ca	27.7	0.6911523	1.382305
Mg	6.72	0.2764863	0.5529726
Cl	1.59	4.484849E-02	4.484849E-02
SO4	5.47	5.697916E-02	0.1139583
NO3			
HCO3	202	3.310545	3.310545

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.122024	2.499771	0.319	0.194
Ca/SO4	5.063986	12.12991	0.152	0.364
Na/Cl	3.201258	4.936685	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-022-GW	
Sample Date	12/9/2016	
Station	CFMW-022	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	51400	uS/cm
Sum of Anions	4.212771	meq/L
Sum of Cations	4.865205	meq/L
Balance	7.186992	%
Total dissolved solids	345.855	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.097209	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	15.6	0.6785627	0.6785627
K	0.685	1.751994E-02	1.751994E-02
Ca	59.8	1.49209	2.984181
Mg	14.4	0.5924706	1.184941
Cl	0.5	0.0141033	0.0141033
SO4	4.87	5.072917E-02	0.1014583
NO3			
HCO3	250	4.097209	4.097209

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.152778	2.518421	0.319	0.194
Ca/SO4	12.27926	29.41287	0.152	0.364
Na/Cl	31.2	48.11376	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-022-GW	
Sample Date	3/28/2017	
Station	CFMW-022	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	301000	uS/cm
Sum of Anions	4.636841	meq/L
Sum of Cations	5.038188	meq/L
Balance	4.148273	%
Total dissolved solids	374.001	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.424986	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	23.6	1.026543	1.026543
K	0.761	1.946376E-02	1.946376E-02
Ca	55.1	1.374819	2.749638
Mg	15.1	0.6212714	1.242543
Cl	2.06	5.810558E-02	5.810558E-02
SO4	7.38	0.076875	0.15375
NO3			
HCO3	270	4.424986	4.424986

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.649006	2.212913	0.319	0.194
Ca/SO4	7.466125	17.88383	0.152	0.364
Na/Cl	11.45631	17.66686	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-022-GW	
Sample Date	6/26/2017	
Station	CFMW-022	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	3380	uS/cm
Sum of Anions	3.188755	meq/L
Sum of Cations	3.642493	meq/L
Balance	6.642101	%
Total dissolved solids	259.244	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.09749	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.18	0.2253176	0.2253176
K	0.554	1.416941E-02	1.416941E-02
Ca	48.9	1.220121	2.440242
Mg	11.7	0.4813824	0.9627649
Cl	1.33	3.751477E-02	3.751477E-02
SO4	2.58	0.026875	0.05375
NO3			
HCO3	189	3.09749	3.09749

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.179487	2.534619	0.319	0.194
Ca/SO4	18.95349	45.39985	0.152	0.364
Na/Cl	3.894737	6.006104	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-023-GW	
Sample Date	9/21/2016	
Station	CFMW-023	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	44900	uS/cm
Sum of Anions	4.097469	meq/L
Sum of Cations	4.67927	meq/L
Balance	6.628902	%
Total dissolved solids	331.169	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.966099	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.1	0.1783402	0.1783402
K	0.6	1.534594E-02	1.534594E-02
Ca	60.7	1.514547	3.029094
Mg	17.7	0.7282453	1.456491
Cl	0.669	1.887021E-02	1.887021E-02
SO4	5.4	0.05625	0.1125
NO3			
HCO3	242	3.966099	3.966099

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.429379	2.079721	0.319	0.194
Ca/SO4	11.24074	26.92527	0.152	0.364
Na/Cl	6.12855	9.450884	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-023-GW	
Sample Date	12/19/2016	
Station	CFMW-023	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	38500	uS/cm
Sum of Anions	3.992383	meq/L
Sum of Cations	4.64399	meq/L
Balance	7.544913	%
Total dissolved solids	323.312	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.851377	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.87	0.1248381	0.1248381
K	0.532	1.360673E-02	1.360673E-02
Ca	61.1	1.524527	3.049054
Mg	17.7	0.7282453	1.456491
Cl	1.86	5.246427E-02	5.246427E-02
SO4	4.25	4.427084E-02	8.854167E-02
NO3			
HCO3	235	3.851377	3.851377

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.451977	2.093426	0.319	0.194
Ca/SO4	14.37647	34.43638	0.152	0.364
Na/Cl	1.543011	2.379489	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-023-GW	
Sample Date	3/21/2017	
Station	CFMW-023	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	266000	uS/cm
Sum of Anions	4.294035	meq/L
Sum of Cations	4.334109	meq/L
Balance	0.4644608	%
Total dissolved solids	336.425	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.162765	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.0345	1.500667E-03	1.500667E-03
K	0.495	0.0126604	0.0126604
Ca	58.7	1.464644	2.929288
Mg	16.9	0.6953301	1.39066
Cl	0.0155	4.372022E-04	4.372022E-04
SO4	6.28	6.541667E-02	0.1308333
NO3			
HCO3	254	4.162765	4.162765

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.473373	2.106401	0.319	0.194
Ca/SO4	9.347134	22.38946	0.152	0.364
Na/Cl	2.225806	3.432433	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-023-GW	
Sample Date	6/27/2017	
Station	CFMW-023	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	3960	uS/cm
Sum of Anions	3.567009	meq/L
Sum of Cations	4.270921	meq/L
Balance	8.980837	%
Total dissolved solids	292.286	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.474433	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.56	0.1548515	0.1548515
K	0.514	1.314635E-02	1.314635E-02
Ca	56	1.397275	2.794551
Mg	15.9	0.6541864	1.308373
Cl	0.372	1.049285E-02	1.049285E-02
SO4	3.94	4.104167E-02	8.208334E-02
NO3			
HCO3	212	3.474433	3.474433

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.522013	2.135898	0.319	0.194
Ca/SO4	14.2132	34.04529	0.152	0.364
Na/Cl	9.569892	14.75781	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-025b-GW	
Sample Date	9/13/2016	
Station	CFMW-025b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	43000	uS/cm
Sum of Anions	3.816654	meq/L
Sum of Cations	4.479346	meq/L
Balance	7.988086	%
Total dissolved solids	305.802	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.474433	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.43	0.2796896	0.2796896
K	0.932	2.383735E-02	2.383735E-02
Ca	50.7	1.265033	2.530066
Mg	20	0.822876	1.645752
Cl	1.94	5.472079E-02	5.472079E-02
SO4	13.8	0.14375	0.2875
NO3			
HCO3	212	3.474433	3.474433

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.535	1.537332	0.319	0.194
Ca/SO4	3.673913	8.800231	0.152	0.364
Na/Cl	3.314433	5.111213	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-025b-GW	
Sample Date	12/7/2016	
Station	CFMW-025b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	40200	uS/cm
Sum of Anions	3.704024	meq/L
Sum of Cations	4.280962	meq/L
Balance	7.225286	%
Total dissolved solids	295.29	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.392489	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.59	0.2866492	0.2866492
K	1.04	2.659962E-02	2.659962E-02
Ca	46.2	1.152752	2.305504
Mg	20.2	0.8311048	1.66221
Cl	1.96	5.528492E-02	5.528492E-02
SO4	12.3	0.128125	0.25625
NO3			
HCO3	207	3.392489	3.392489

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.287129	1.387012	0.319	0.194
Ca/SO4	3.756098	8.997089	0.152	0.364
Na/Cl	3.362245	5.184944	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-025b-GW	
Sample Date	3/20/2017	
Station	CFMW-025b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	230000	uS/cm
Sum of Anions	4.368303	meq/L
Sum of Cations	4.78607	meq/L
Balance	4.563579	%
Total dissolved solids	343.53	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.900543	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.73	0.2927389	0.2927389
K	1.05	2.685539E-02	2.685539E-02
Ca	55.7	1.38979	2.77958
Mg	20.5	0.8434479	1.686896
Cl	2.55	7.192682E-02	7.192682E-02
SO4	19	0.1979167	0.3958333
NO3			
HCO3	238	3.900543	3.900543

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.717073	1.647749	0.319	0.194
Ca/SO4	2.931579	7.022097	0.152	0.364
Na/Cl	2.639216	4.069955	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-025b-GW	
Sample Date	6/22/2017	
Station	CFMW-025b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4010	uS/cm
Sum of Anions	3.687514	meq/L
Sum of Cations	4.175745	meq/L
Balance	6.209018	%
Total dissolved solids	293.091	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.441656	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.46	0.2809945	0.2809945
K	0.981	2.509061E-02	2.509061E-02
Ca	44.4	1.10784	2.21568
Mg	20.1	0.8269904	1.653981
Cl	1.84	5.190013E-02	5.190013E-02
SO4	9.31	9.697917E-02	0.1939583
NO3			
HCO3	210	3.441656	3.441656

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.208955	1.339604	0.319	0.194
Ca/SO4	4.769065	11.42348	0.152	0.364
Na/Cl	3.51087	5.414139	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-026-GW	
Sample Date	9/13/2016	
Station	CFMW-026	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	46800	uS/cm
Sum of Anions	4.072405	meq/L
Sum of Cations	4.717087	meq/L
Balance	7.334695	%
Total dissolved solids	327.978	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.572767	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	11.6	0.5045723	0.5045723
K	0.858	2.194469E-02	2.194469E-02
Ca	59.9	1.494586	2.989171
Mg	14.6	0.6006995	1.201399
Cl	2.72	7.672194E-02	7.672194E-02
SO4	20.3	0.2114583	0.4229167
NO3			
HCO3	218	3.572767	3.572767

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.10274	2.488075	0.319	0.194
Ca/SO4	2.950739	7.067991	0.152	0.364
Na/Cl	4.264706	6.576636	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-026-GW	
Sample Date	12/5/2016	
Station	CFMW-026	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	52300	uS/cm
Sum of Anions	4.29656	meq/L
Sum of Cations	5.094025	meq/L
Balance	8.49218	%
Total dissolved solids	349.875	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.900543	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.7	0.4654244	0.4654244
K	0.905	2.314679E-02	2.314679E-02
Ca	66.4	1.656769	3.313539
Mg	15.7	0.6459576	1.291915
Cl	2.37	6.684963E-02	6.684963E-02
SO4	15.8	0.1645833	0.3291667
NO3			
HCO3	238	3.900543	3.900543

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.2293	2.564827	0.319	0.194
Ca/SO4	4.202532	10.06645	0.152	0.364
Na/Cl	4.514768	6.962259	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-026-GW	
Sample Date	3/20/2017	
Station	CFMW-026	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	217000	uS/cm
Sum of Anions	4.173661	meq/L
Sum of Cations	4.652833	meq/L
Balance	5.428794	%
Total dissolved solids	333.7	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.703877	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.5	0.4567249	0.4567249
K	0.86	2.199584E-02	2.199584E-02
Ca	59.9	1.494586	2.989171
Mg	14.4	0.5924706	1.184941
Cl	1.44	0.0406175	0.0406175
SO4	20.6	0.2145833	0.4291667
NO3			
HCO3	226	3.703877	3.703877

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.159722	2.522632	0.319	0.194
Ca/SO4	2.907767	6.965059	0.152	0.364
Na/Cl	7.291667	11.24454	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-026-GW	
Sample Date	6/22/2017	
Station	CFMW-026	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4330	uS/cm
Sum of Anions	3.952376	meq/L
Sum of Cations	4.610538	meq/L
Balance	7.686196	%
Total dissolved solids	320.42	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.638322	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	7.61	0.3310168	0.3310168
K	0.63	1.611323E-02	1.611323E-02
Ca	60.7	1.514547	3.029094
Mg	15	0.617157	1.234314
Cl	1.68	4.738708E-02	4.738708E-02
SO4	12.8	0.1333333	0.2666667
NO3			
HCO3	222	3.638322	3.638322

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.046667	2.454071	0.319	0.194
Ca/SO4	4.742188	11.3591	0.152	0.364
Na/Cl	4.529762	6.985381	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-027-GW	
Sample Date	9/13/2016	
Station	CFMW-027	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	61200	uS/cm
Sum of Anions	5.285799	meq/L
Sum of Cations	3.233591	meq/L
Balance	-24.08867	%
Total dissolved solids	377.43	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.65443	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	31	1.348426	1.348426
K	0.52	1.329981E-02	1.329981E-02
Ca	24.5	0.611308	1.222616
Mg	7.89	0.3246246	0.6492491
Cl	2.22	6.261864E-02	6.261864E-02
SO4	27.3	0.284375	0.56875
NO3			
HCO3	284	4.65443	4.65443

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.105196	1.883123	0.319	0.194
Ca/SO4	0.8974359	2.149654	0.152	0.364
Na/Cl	13.96396	21.53394	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-027-GW	
Sample Date	12/14/2016	
Station	CFMW-027	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	62600	uS/cm
Sum of Anions	5.291828	meq/L
Sum of Cations	6.380312	meq/L
Balance	9.32549	%
Total dissolved solids	439.92	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.719985	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	56.5	2.457615	2.457615
K	1.09	2.787845E-02	2.787845E-02
Ca	51.5	1.284994	2.569989
Mg	16.1	0.6624151	1.32483
Cl	2.03	5.725938E-02	5.725938E-02
SO4	24.7	0.2572917	0.5145833
NO3			
HCO3	288	4.719985	4.719985

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.198758	1.939863	0.319	0.194
Ca/SO4	2.08502	4.99431	0.152	0.364
Na/Cl	27.83251	42.92073	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-027-GW	
Sample Date	3/27/2017	
Station	CFMW-027	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	398000	uS/cm
Sum of Anions	6.096688	meq/L
Sum of Cations	6.889419	meq/L
Balance	6.104449	%
Total dissolved solids	493.79	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.146095	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	60.8	2.644655	2.644655
K	1.11	2.838998E-02	2.838998E-02
Ca	55.8	1.392285	2.78457
Mg	17.4	0.715902	1.431804
Cl	2.68	7.559367E-02	7.559367E-02
SO4	42	0.4375	0.875
NO3			
HCO3	314	5.146095	5.146095

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.206897	1.944798	0.319	0.194
Ca/SO4	1.328571	3.182366	0.152	0.364
Na/Cl	22.68657	34.98513	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-027-GW	
Sample Date	6/26/2017	
Station	CFMW-027	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	5620	uS/cm
Sum of Anions	5.311185	meq/L
Sum of Cations	6.227601	meq/L
Balance	7.942046	%
Total dissolved solids	442.148	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.638041	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	76.7	3.336266	3.336266
K	0.998	2.552541E-02	2.552541E-02
Ca	38.3	0.9556366	1.911273
Mg	11.6	0.4772681	0.9545361
Cl	2.15	6.064418E-02	6.064418E-02
SO4	29.4	0.30625	0.6125
NO3			
HCO3	283	4.638041	4.638041

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.301724	2.002306	0.319	0.194
Ca/SO4	1.302721	3.120446	0.152	0.364
Na/Cl	35.67442	55.01379	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-028-GW	
Sample Date	9/13/2016	
Station	CFMW-028	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	42700	uS/cm
Sum of Anions	3.609636	meq/L
Sum of Cations	4.748208	meq/L
Balance	13.6228	%
Total dissolved solids	306.7	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	26	1.130938	1.130938
K	4.23	0.1081888	0.1081888
Ca	44.1	1.100354	2.200709
Mg	15.9	0.6541864	1.308373
Cl	2.09	5.895178E-02	5.895178E-02
SO4	8.38	8.729167E-02	0.1745833
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.773585	1.68202	0.319	0.194
Ca/SO4	5.262529	12.60549	0.152	0.364
Na/Cl	12.44019	19.18412	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-028-GW	
Sample Date	12/5/2016	
Station	CFMW-028	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	49600	uS/cm
Sum of Anions	3.995071	meq/L
Sum of Cations	4.88332	meq/L
Balance	10.00462	%
Total dissolved solids	332.59	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.785821	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	24.9	1.08309	1.08309
K	2.73	6.982401E-02	6.982401E-02
Ca	48.7	1.215131	2.430261
Mg	15.8	0.650072	1.300144
Cl	1.65	4.654088E-02	4.654088E-02
SO4	7.81	8.135417E-02	0.1627083
NO3			
HCO3	231	3.785821	3.785821

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.082278	1.869225	0.319	0.194
Ca/SO4	6.235596	14.9363	0.152	0.364
Na/Cl	15.09091	23.27181	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-028-GW	
Sample Date	3/20/2017	
Station	CFMW-028	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	232000	uS/cm
Sum of Anions	4.127971	meq/L
Sum of Cations	4.801466	meq/L
Balance	7.542417	%
Total dissolved solids	337.48	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.834988	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	23.2	1.009145	1.009145
K	1.63	4.168979E-02	4.168979E-02
Ca	49.6	1.237587	2.475173
Mg	15.5	0.6377289	1.275458
Cl	1.45	4.089956E-02	4.089956E-02
SO4	12.1	0.1260417	0.2520834
NO3			
HCO3	234	3.834988	3.834988

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.2	1.940616	0.319	0.194
Ca/SO4	4.099173	9.818869	0.152	0.364
Na/Cl	16	24.67372	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-028-GW	
Sample Date	6/26/2017	
Station	CFMW-028	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	4500	uS/cm
Sum of Anions	4.247193	meq/L
Sum of Cations	5.195768	meq/L
Balance	10.04531	%
Total dissolved solids	354.03	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.048043	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	29.3	1.27448	1.27448
K	1.23	3.145917E-02	3.145917E-02
Ca	51.4	1.282499	2.564998
Mg	16.1	0.6624151	1.32483
Cl	1.58	4.456642E-02	4.456642E-02
SO4	7.42	7.729167E-02	0.1545833
NO3			
HCO3	247	4.048043	4.048043

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.192547	1.936096	0.319	0.194
Ca/SO4	6.927224	16.59298	0.152	0.364
Na/Cl	18.5443	28.59731	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-028a-GW	
Sample Date	9/20/2016	
Station	CFMW-028a	
Location		
Geology		
Watertype	Mg-Ca-Na-HCO3-SO4-Cl	
Temperature (℃)		
pH		
Conductivity	20300	uS/cm
Sum of Anions	1.943078	meq/L
Sum of Cations	1.950289	meq/L
Balance	0.1852208	%
Total dissolved solids	134.26	mg/L
Total hardness		mg/l CaCO3
Alkalinity	0.7538865	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	13.6	0.5915675	0.5915675
K	3.26	8.337958E-02	8.337958E-02
Ca	12.2	0.3044064	0.6088128
Mg	8.1	0.3332648	0.6665295
Cl	16.9	0.4766914	0.4766914
SO4	34.2	0.35625	0.7125
NO3			
HCO3	46	0.7538865	0.7538865

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.506173	0.9134071	0.319	0.194
Ca/SO4	0.3567251	0.8544741	0.152	0.364
Na/Cl	0.8047338	1.240986	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-028a-GW	
Sample Date	12/9/2016	
Station	CFMW-028a	
Location		
Geology		
Watertype	Ca-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	46400	uS/cm
Sum of Anions	2.18239	meq/L
Sum of Cations	2.637598	meq/L
Balance	9.444184	%
Total dissolved solids	171.232	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.134107	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.32	0.4053977	0.4053977
K	2.08	5.319924E-02	5.319924E-02
Ca	43.2	1.077898	2.155796
Mg	0.282	1.160255E-02	0.0232051
Cl	8.95	0.252449	0.252449
SO4	38.2	0.3979167	0.7958333
NO3			
HCO3	69.2	1.134107	1.134107

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	153.1915	92.90182	0.319	0.194
Ca/SO4	1.13089	2.708854	0.152	0.364
Na/Cl	1.041341	1.60586	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-028a-GW	
Sample Date	3/21/2017	
Station	CFMW-028a	
Location		
Geology		
Watertype	Ca-SO4-HCO3	
Temperature (℃)		
pH		
Conductivity	116000	uS/cm
Sum of Anions	1.716827	meq/L
Sum of Cations	2.378934	meq/L
Balance	16.16565	%
Total dissolved solids	131.25	mg/L
Total hardness		mg/l CaCO3
Alkalinity	0.437582	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.19	0.2692502	0.2692502
K	1.52	3.887637E-02	3.887637E-02
Ca	35	0.8732971	1.746594
Mg	3.94	0.1621066	0.3242131
Cl	9.9	0.2792453	0.2792453
SO4	48	0.5	1
NO3			
HCO3	26.7	0.437582	0.437582

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	8.883248	5.387179	0.319	0.194
Ca/SO4	0.7291667	1.746594	0.152	0.364
Na/Cl	0.6252525	0.9642068	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-028a-GW	
Sample Date	6/27/2017	
Station	CFMW-028a	
Location		
Geology		
Watertype	Ca-Mg-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	2480	uS/cm
Sum of Anions	1.805634	meq/L
Sum of Cations	2.681273	meq/L
Balance	19.51541	%
Total dissolved solids	147.02	mg/L
Total hardness		mg/l CaCO3
Alkalinity	0.9063027	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	7.04	0.3062232	0.3062232
K	1.71	4.373592E-02	4.373592E-02
Ca	35.9	0.8957534	1.791507
Mg	6.56	0.2699033	0.5398066
Cl	7.51	0.2118315	0.2118315
SO4	33	0.34375	0.6875
NO3			
HCO3	55.3	0.9063027	0.9063027

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5.472561	3.318794	0.319	0.194
Ca/SO4	1.087879	2.605828	0.152	0.364
Na/Cl	0.9374167	1.445598	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-029-GW	
Sample Date	9/13/2016	
Station	CFMW-029	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	49600	uS/cm
Sum of Anions	4.113334	meq/L
Sum of Cations	5.731433	meq/L
Balance	16.43614	%
Total dissolved solids	352.998	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.703877	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	35.4	1.539815	1.539815
K	0.898	2.296775E-02	2.296775E-02
Ca	52.7	1.314936	2.629872
Mg	18.7	0.769389	1.538778
Cl	1	2.820659E-02	2.820659E-02
SO4	18.3	0.190625	0.38125
NO3			
HCO3	226	3.703877	3.703877

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.818182	1.709065	0.319	0.194
Ca/SO4	2.879781	6.898025	0.152	0.364
Na/Cl	35.4	54.59061	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-029-GW	
Sample Date	12/14/2016	
Station	CFMW-029	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	47600	uS/cm
Sum of Anions	4.142144	meq/L
Sum of Cations	5.050159	meq/L
Balance	9.877991	%
Total dissolved solids	341.446	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.834988	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	21.5	0.9351985	0.9351985
K	0.923	2.360716E-02	2.360716E-02
Ca	52.8	1.317431	2.634862
Mg	17.7	0.7282453	1.456491
Cl	0.623	1.757271E-02	1.757271E-02
SO4	13.9	0.1447917	0.2895833
NO3			
HCO3	234	3.834988	3.834988

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.983051	1.809049	0.319	0.194
Ca/SO4	3.798561	9.098804	0.152	0.364
Na/Cl	34.51043	53.2188	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-029-GW	
Sample Date	3/24/2017	
Station	CFMW-029	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	330000	uS/cm
Sum of Anions	5.145655	meq/L
Sum of Cations	6.079721	meq/L
Balance	8.321024	%
Total dissolved solids	425.09	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.900262	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	36.4	1.583313	1.583313
K	1.05	2.685539E-02	2.685539E-02
Ca	58.4	1.457159	2.914317
Mg	18.9	0.7776178	1.555236
Cl	1.24	3.497618E-02	3.497618E-02
SO4	10.1	0.1052083	0.2104167
NO3			
HCO3	299	4.900262	4.900262

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.089947	1.873875	0.319	0.194
Ca/SO4	5.782178	13.85022	0.152	0.364
Na/Cl	29.35484	45.26833	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-029-GW	
Sample Date	6/26/2017	
Station	CFMW-029	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	3830	uS/cm
Sum of Anions	3.612469	meq/L
Sum of Cations	4.377706	meq/L
Balance	9.577219	%
Total dissolved solids	304.202	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.507211	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	38.9	1.692057	1.692057
K	0.692	1.769898E-02	1.769898E-02
Ca	34.5	0.8608214	1.721643
Mg	11.5	0.4731537	0.9463074
Cl	1.25	3.525824E-02	3.525824E-02
SO4	3.36	0.035	0.07
NO3			
HCO3	214	3.507211	3.507211

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3	1.819327	0.319	0.194
Ca/SO4	10.26786	24.5949	0.152	0.364
Na/Cl	31.12	47.9904	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP1-GW	
Sample Date	9/13/2016	
Station	CFMW-029	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	49600	uS/cm
Sum of Anions	4.309972	meq/L
Sum of Cations	5.524463	meq/L
Balance	12.34938	%
Total dissolved solids	361.263	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.900543	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	34.2	1.487618	1.487618
K	0.864	2.209815E-02	2.209815E-02
Ca	51.1	1.275014	2.550028
Mg	17.8	0.7323596	1.464719
Cl	0.999	2.817839E-02	2.817839E-02
SO4	18.3	0.190625	0.38125
NO3			
HCO3	238	3.900543	3.900543

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.870787	1.740967	0.319	0.194
Ca/SO4	2.79235	6.688597	0.152	0.364
Na/Cl	34.23423	52.79288	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-031-GW	
Sample Date	9/15/2016	
Station	CFMW-031	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	48200	uS/cm
Sum of Anions	3.992175	meq/L
Sum of Cations	4.781608	meq/L
Balance	8.997627	%
Total dissolved solids	331.526	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.769433	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	29.8	1.296229	1.296229
K	0.736	1.882435E-02	1.882435E-02
Ca	47.7	1.190179	2.380358
Mg	13.2	0.5430981	1.086196
Cl	1.7	4.795121E-02	4.795121E-02
SO4	8.39	8.739584E-02	0.1747917
NO3			
HCO3	230	3.769433	3.769433

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.613636	2.191463	0.319	0.194
Ca/SO4	5.685339	13.61826	0.152	0.364
Na/Cl	17.52941	27.03224	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-031-GW	
Sample Date	12/9/2016	
Station	CFMW-031	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (°C)		
pH		
Conductivity	59500	uS/cm
Sum of Anions	4.737176	meq/L
Sum of Cations	5.854866	meq/L
Balance	10.55216	%
Total dissolved solids	393.062	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.261098	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	32.2	1.400623	1.400623
K	0.842	2.153546E-02	2.153546E-02
Ca	60.3	1.504566	3.009132
Mg	17.3	0.7117876	1.423575
Cl	1.22	3.441205E-02	3.441205E-02
SO4	21.2	0.2208333	0.4416667
NO3			
HCO3	260	4.261098	4.261098

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.485549	2.113785	0.319	0.194
Ca/SO4	2.844339	6.813129	0.152	0.364
Na/Cl	26.39344	40.70153	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-031-GW	
Sample Date	3/21/2017	
Station	CFMW-031	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	331000	uS/cm
Sum of Anions	5.428576	meq/L
Sum of Cations	6.14763	meq/L
Balance	6.211485	%
Total dissolved solids	440.381	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.834707	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	40.6	1.766003	1.766003
K	0.861	2.202142E-02	2.202142E-02
Ca	59	1.472129	2.944259
Mg	17.2	0.7076734	1.415347
Cl	2.22	6.261864E-02	6.261864E-02
SO4	25.5	0.265625	0.53125
NO3			
HCO3	295	4.834707	4.834707

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.430233	2.080239	0.319	0.194
Ca/SO4	2.313725	5.542134	0.152	0.364
Na/Cl	18.28829	28.20251	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-031-GW	
Sample Date	6/21/2017	
Station	CFMW-031	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3900	uS/cm
Sum of Anions	3.783049	meq/L
Sum of Cations	4.557365	meq/L
Balance	9.283904	%
Total dissolved solids	316.312	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.605544	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	35	1.522416	1.522416
K	0.712	1.821051E-02	1.821051E-02
Ca	40.5	1.01053	2.021059
Mg	12.1	0.49784	0.9956799
Cl	1.47	0.0414637	0.0414637
SO4	6.53	6.802084E-02	0.1360417
NO3			
HCO3	220	3.605544	3.605544

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.347107	2.029828	0.319	0.194
Ca/SO4	6.202144	14.85618	0.152	0.364
Na/Cl	23.80952	36.71685	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP13-GW	
Sample Date	6/21/2017	
Station	CFMW-031	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	3900	uS/cm
Sum of Anions	3.790652	meq/L
Sum of Cations	4.469514	meq/L
Balance	8.218498	%
Total dissolved solids	314.877	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.605544	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	34.4	1.496318	1.496318
K	0.697	1.782686E-02	1.782686E-02
Ca	39.6	0.9880733	1.976147
Mg	11.9	0.4896112	0.9792224
Cl	1.71	4.823328E-02	4.823328E-02
SO4	6.57	0.0684375	0.136875
NO3			
HCO3	220	3.605544	3.605544

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.327731	2.018077	0.319	0.194
Ca/SO4	6.027397	14.4376	0.152	0.364
Na/Cl	20.11696	31.02252	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-032-GW	
Sample Date	9/15/2016	
Station	CFMW-032	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	96500	uS/cm
Sum of Anions	7.698585	meq/L
Sum of Cations	9.708385	meq/L
Balance	11.54595	%
Total dissolved solids	673.29	mg/L
Total hardness		mg/l CaCO3
Alkalinity	7.407754	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	155	6.742129	6.742129
K	2.63	6.726635E-02	6.726635E-02
Ca	38.8	0.9681122	1.936224
Mg	11.7	0.4813824	0.9627649
Cl	2.26	0.0637469	0.0637469
SO4	10.9	0.1135417	0.2270833
NO3			
HCO3	452	7.407754	7.407754

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.316239	2.011108	0.319	0.194
Ca/SO4	3.559633	8.526493	0.152	0.364
Na/Cl	68.58407	105.764	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-032-GW	
Sample Date	12/13/2016	
Station	CFMW-032	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	122000	uS/cm
Sum of Anions	11.2844	meq/L
Sum of Cations	12.94237	meq/L
Balance	6.843519	%
Total dissolved solids	950.45	mg/L
Total hardness		mg/l CaCO3
Alkalinity	11.0133	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	153	6.655134	6.655134
K	3.02	7.724121E-02	7.724121E-02
Ca	88	2.195719	4.391437
Mg	22.1	0.9092779	1.818556
Cl	1.93	5.443873E-02	5.443873E-02
SO4	10.4	0.1083333	0.2166667
NO3			
HCO3	672	11.0133	11.0133

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.9819	2.414794	0.319	0.194
Ca/SO4	8.461538	20.26817	0.152	0.364
Na/Cl	79.27461	122.25	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-032-GW	
Sample Date	3/27/2017	
Station	CFMW-032	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	570000	uS/cm
Sum of Anions	10.72335	meq/L
Sum of Cations	11.99899	meq/L
Balance	5.614012	%
Total dissolved solids	893.51	mg/L
Total hardness		mg/l CaCO3
Alkalinity	10.39052	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	132	5.741684	5.741684
K	3.12	7.979886E-02	7.979886E-02
Ca	85.7	2.13833	4.27666
Mg	23.1	0.9504218	1.900844
Cl	1.09	3.074519E-02	3.074519E-02
SO4	14.5	0.1510417	0.3020833
NO3			
HCO3	634	10.39052	10.39052

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.709956	2.249875	0.319	0.194
Ca/SO4	5.910345	14.15722	0.152	0.364
Na/Cl	121.1009	186.7506	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-032-GW	
Sample Date	6/20/2017	
Station	CFMW-032	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	10800	uS/cm
Sum of Anions	9.434141	meq/L
Sum of Cations	11.7914	meq/L
Balance	11.10577	%
Total dissolved solids	825.65	mg/L
Total hardness		mg/l CaCO3
Alkalinity	9.095804	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	198	8.612526	8.612526
K	2.3	5.882609E-02	5.882609E-02
Ca	42.9	1.070413	2.140826
Mg	11.9	0.4896112	0.9792224
Cl	1.95	5.500286E-02	5.500286E-02
SO4	13.6	0.1416667	0.2833334
NO3			
HCO3	555	9.095804	9.095804

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.605042	2.186251	0.319	0.194
Ca/SO4	3.154412	7.555854	0.152	0.364
Na/Cl	101.5385	156.5832	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP12-GW	
Sample Date	6/20/2017	
Station	CFMW-032	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	10800	uS/cm
Sum of Anions	9.298017	meq/L
Sum of Cations	11.88291	meq/L
Balance	12.20388	%
Total dissolved solids	819.47	mg/L
Total hardness		mg/l CaCO3
Alkalinity	8.964694	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	200	8.699521	8.699521
K	2.35	6.010491E-02	6.010491E-02
Ca	42.8	1.067918	2.135835
Mg	12	0.4937256	0.9874511
Cl	1.92	5.415666E-02	5.415666E-02
SO4	13.4	0.1395833	0.2791667
NO3			
HCO3	547	8.964694	8.964694

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.566667	2.162978	0.319	0.194
Ca/SO4	3.19403	7.650753	0.152	0.364
Na/Cl	104.1667	160.6362	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-033-GW	
Sample Date	9/15/2016	
Station	CFMW-033	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	56500	uS/cm
Sum of Anions	4.733789	meq/L
Sum of Cations	5.957048	meq/L
Balance	11.44212	%
Total dissolved solids	395.634	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.195542	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	43.5	1.892146	1.892146
K	0.944	2.414427E-02	2.414427E-02
Ca	53.6	1.337392	2.674784
Mg	16.6	0.682987	1.365974
Cl	2.39	6.741376E-02	6.741376E-02
SO4	22.6	0.2354167	0.4708334
NO3			
HCO3	256	4.195542	4.195542

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.228915	1.958151	0.319	0.194
Ca/SO4	2.371681	5.680957	0.152	0.364
Na/Cl	18.20084	28.06765	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-033-GW	
Sample Date	12/6/2016	
Station	CFMW-033	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	59900	uS/cm
Sum of Anions	4.78943	meq/L
Sum of Cations	5.703226	meq/L
Balance	8.70891	%
Total dissolved solids	395.48	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.343042	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	39.5	1.718156	1.718156
K	1.04	2.659962E-02	2.659962E-02
Ca	53.6	1.337392	2.674784
Mg	15.6	0.6418433	1.283687
Cl	1.94	5.472079E-02	5.472079E-02
SO4	18.8	0.1958333	0.3916667
NO3			
HCO3	265	4.343042	4.343042

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.435897	2.083674	0.319	0.194
Ca/SO4	2.851064	6.829237	0.152	0.364
Na/Cl	20.36082	31.39859	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-033-GW	
Sample Date	3/21/2017	
Station	CFMW-033	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	333000	uS/cm
Sum of Anions	5.306761	meq/L
Sum of Cations	5.844826	meq/L
Balance	4.825012	%
Total dissolved solids	425.811	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.65443	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	37.9	1.648559	1.648559
K	0.891	2.278871E-02	2.278871E-02
Ca	55.6	1.387295	2.77459
Mg	17	0.6994445	1.398889
Cl	2.52	7.108062E-02	7.108062E-02
SO4	27.9	0.290625	0.58125
NO3			
HCO3	284	4.65443	4.65443

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.270588	1.983424	0.319	0.194
Ca/SO4	1.992831	4.773487	0.152	0.364
Na/Cl	15.03968	23.19281	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-033-GW	
Sample Date	6/19/2017	
Station	CFMW-033	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	4730	uS/cm
Sum of Anions	4.046473	meq/L
Sum of Cations	5.052988	meq/L
Balance	11.06126	%
Total dissolved solids	342.236	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.80221	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	44.9	1.953043	1.953043
K	0.806	2.061471E-02	2.061471E-02
Ca	40.6	1.013025	2.026049
Mg	12.8	0.5266406	1.053281
Cl	1.68	4.738708E-02	4.738708E-02
SO4	9.45	0.0984375	0.196875
NO3			
HCO3	232	3.80221	3.80221

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.171875	1.92356	0.319	0.194
Ca/SO4	4.296296	10.29104	0.152	0.364
Na/Cl	26.72619	41.21466	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-034-GW	
Sample Date	9/14/2016	
Station	CFMW-034	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	50900	uS/cm
Sum of Anions	4.501318	meq/L
Sum of Cations	5.440021	meq/L
Balance	9.442411	%
Total dissolved solids	372.528	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.162765	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	27.4	1.191834	1.191834
K	0.918	2.347928E-02	2.347928E-02
Ca	59.1	1.474625	2.949249
Mg	15.5	0.6377289	1.275458
Cl	1.81	5.105393E-02	5.105393E-02
SO4	13.8	0.14375	0.2875
NO3			
HCO3	254	4.162765	4.162765

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.812903	2.312306	0.319	0.194
Ca/SO4	4.282609	10.25826	0.152	0.364
Na/Cl	15.13812	23.34462	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-034-GW	
Sample Date	12/13/2016	
Station	CFMW-034	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	67600	uS/cm
Sum of Anions	5.913666	meq/L
Sum of Cations	7.091877	meq/L
Balance	9.059304	%
Total dissolved solids	491.01	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.63776	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	31.5	1.370175	1.370175
K	0.97	2.480926E-02	2.480926E-02
Ca	82.5	2.058486	4.116972
Mg	19.2	0.7899609	1.579922
Cl	1.14	3.215552E-02	3.215552E-02
SO4	11.7	0.121875	0.24375
NO3			
HCO3	344	5.63776	5.63776

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.296875	2.605807	0.319	0.194
Ca/SO4	7.051282	16.89014	0.152	0.364
Na/Cl	27.63158	42.61087	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-034-GW	
Sample Date	3/21/2017	
Station	CFMW-034	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	394000	uS/cm
Sum of Anions	6.272721	meq/L
Sum of Cations	7.189838	meq/L
Balance	6.81235	%
Total dissolved solids	511.209	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.867204	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	29.2	1.27013	1.27013
K	0.959	2.452792E-02	2.452792E-02
Ca	84	2.095913	4.191826
Mg	20.7	0.8516766	1.703353
Cl	3.15	8.885077E-02	8.885077E-02
SO4	15.2	0.1583333	0.3166667
NO3			
HCO3	358	5.867204	5.867204

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.057971	2.460926	0.319	0.194
Ca/SO4	5.526316	13.23735	0.152	0.364
Na/Cl	9.269841	14.29509	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-034-GW	
Sample Date	6/19/2017	
Station	CFMW-034	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4980	uS/cm
Sum of Anions	4.236146	meq/L
Sum of Cations	5.661372	meq/L
Balance	14.39983	%
Total dissolved solids	368.102	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.080821	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	53.1	2.309723	2.309723
K	0.902	2.307006E-02	2.307006E-02
Ca	45.1	1.125306	2.250611
Mg	13.1	0.5389838	1.077968
Cl	1.57	4.428435E-02	4.428435E-02
SO4	5.33	5.552083E-02	0.1110417
NO3			
HCO3	249	4.080821	4.080821

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.442748	2.087828	0.319	0.194
Ca/SO4	8.461538	20.26817	0.152	0.364
Na/Cl	33.82166	52.15664	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-035-GW	
Sample Date	9/14/2016	
Station	CFMW-035	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	70000	uS/cm
Sum of Anions	6.741404	meq/L
Sum of Cations	8.08116	meq/L
Balance	9.038622	%
Total dissolved solids	544.71	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.932759	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	34.5	1.500667	1.500667
K	2.43	6.215104E-02	6.215104E-02
Ca	76.7	1.913768	3.827536
Mg	32.7	1.345402	2.690804
Cl	6.88	0.1940614	0.1940614
SO4	29.5	0.3072917	0.6145834
NO3			
HCO3	362	5.932759	5.932759

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.345566	1.422451	0.319	0.194
Ca/SO4	2.6	6.227855	0.152	0.364
Na/Cl	5.014535	7.732953	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-035-GW	
Sample Date	12/13/2016	
Station	CFMW-035	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	74500	uS/cm
Sum of Anions	7.088927	meq/L
Sum of Cations	7.883367	meq/L
Balance	5.306066	%
Total dissolved solids	565.6	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.457202	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	32.7	1.422372	1.422372
K	1.93	4.936276E-02	4.936276E-02
Ca	77.2	1.926244	3.852488
Mg	31.1	1.279572	2.559144
Cl	4.67	0.1317248	0.1317248
SO4	24	0.25	0.5
NO3			
HCO3	394	6.457202	6.457202

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.482315	1.505381	0.319	0.194
Ca/SO4	3.216666	7.704976	0.152	0.364
Na/Cl	7.002141	10.79806	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-035-GW	
Sample Date	3/21/2017	
Station	CFMW-035	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	442000	uS/cm
Sum of Anions	7.570427	meq/L
Sum of Cations	8.341955	meq/L
Balance	4.848603	%
Total dissolved solids	599.67	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.850534	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	32	1.391923	1.391923
K	1.89	0.0483397	0.0483397
Ca	79.6	1.986127	3.972254
Mg	35.6	1.464719	2.929438
Cl	5.58	0.1573928	0.1573928
SO4	27	0.28125	0.5625
NO3			
HCO3	418	6.850534	6.850534

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.235955	1.355978	0.319	0.194
Ca/SO4	2.948148	7.061785	0.152	0.364
Na/Cl	5.734767	8.843628	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-035-GW	
Sample Date	6/20/2017	
Station	CFMW-035	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	7570	uS/cm
Sum of Anions	7.423722	meq/L
Sum of Cations	10.94796	meq/L
Balance	19.18301	%
Total dissolved solids	644.13	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.981645	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	33.6	1.461519	1.461519
K	2.91	7.442779E-02	7.442779E-02
Ca	121	3.019113	6.038226
Mg	41	1.686896	3.373791
Cl	4.52	0.1274938	0.1274938
SO4	15.1	0.1572917	0.3145834
NO3			
HCO3	426	6.981645	6.981645

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.95122	1.789745	0.319	0.194
Ca/SO4	8.013245	19.19436	0.152	0.364
Na/Cl	7.433628	11.46346	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-037-GW	
Sample Date	9/16/2016	
Station	CFMW-037	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	37600	uS/cm
Sum of Anions	3.408049	meq/L
Sum of Cations	4.02778	meq/L
Balance	8.334391	%
Total dissolved solids	276.607	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.146657	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	8.93	0.3884336	0.3884336
K	0.807	2.064028E-02	2.064028E-02
Ca	49.1	1.225111	2.450222
Mg	14.2	0.5842419	1.168484
Cl	2.76	0.0778502	0.0778502
SO4	8.81	9.177084E-02	0.1835417
NO3			
HCO3	192	3.146657	3.146657

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.457747	2.096924	0.319	0.194
Ca/SO4	5.573212	13.34968	0.152	0.364
Na/Cl	3.235507	4.989501	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-037-GW	
Sample Date	12/8/2016	
Station	CFMW-037	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	40100	uS/cm
Sum of Anions	3.42188	meq/L
Sum of Cations	3.950979	meq/L
Balance	7.176306	%
Total dissolved solids	277.729	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.261379	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.55	0.4154021	0.4154021
K	0.789	0.0201799	0.0201799
Ca	46.7	1.165228	2.330456
Mg	14.4	0.5924706	1.184941
Cl	1.17	3.300171E-02	3.300171E-02
SO4	6.12	0.06375	0.1275
NO3			
HCO3	199	3.261379	3.261379

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.243056	1.966727	0.319	0.194
Ca/SO4	7.630719	18.27809	0.152	0.364
Na/Cl	8.162394	12.58729	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-037-GW	
Sample Date	3/23/2017	
Station	CFMW-037	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	225000	uS/cm
Sum of Anions	3.747665	meq/L
Sum of Cations	3.870436	meq/L
Balance	1.611573	%
Total dissolved solids	294.833	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.490822	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.64	0.4193169	0.4193169
K	0.783	2.002645E-02	2.002645E-02
Ca	46	1.147762	2.295524
Mg	13.8	0.5677844	1.135569
Cl	2.03	5.725938E-02	5.725938E-02
SO4	9.58	9.979167E-02	0.1995833
NO3			
HCO3	213	3.490822	3.490822

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.333333	2.021475	0.319	0.194
Ca/SO4	4.80167	11.50158	0.152	0.364
Na/Cl	4.748769	7.323113	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-037-GW	
Sample Date	6/20/2017	
Station	CFMW-037	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4310	uS/cm
Sum of Anions	3.691493	meq/L
Sum of Cations	4.405903	meq/L
Balance	8.822718	%
Total dissolved solids	301.879	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.441656	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	16.2	0.7046613	0.7046613
K	0.869	2.222603E-02	2.222603E-02
Ca	48	1.197665	2.395329
Mg	15.6	0.6418433	1.283687
Cl	2.21	6.233658E-02	6.233658E-02
SO4	9	0.09375	0.1875
NO3			
HCO3	210	3.441656	3.441656

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.076923	1.865977	0.319	0.194
Ca/SO4	5.333333	12.77509	0.152	0.364
Na/Cl	7.330317	11.30414	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-038-GW	
Sample Date	9/14/2016	
Station	CFMW-038	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	57900	uS/cm
Sum of Anions	5.081607	meq/L
Sum of Cations	6.014195	meq/L
Balance	8.404878	%
Total dissolved solids	418.74	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.65443	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	37.3	1.622461	1.622461
K	1.03	2.634386E-02	2.634386E-02
Ca	60.6	1.512052	3.024103
Mg	16.3	0.6706439	1.341288
Cl	2.81	7.926053E-02	7.926053E-02
SO4	16.7	0.1739583	0.3479167
NO3			
HCO3	284	4.65443	4.65443

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.717792	2.254627	0.319	0.194
Ca/SO4	3.628742	8.692033	0.152	0.364
Na/Cl	13.27402	20.46997	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-038-GW	
Sample Date	12/9/2016	
Station	CFMW-038	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	56800	uS/cm
Sum of Anions	4.826485	meq/L
Sum of Cations	5.997064	meq/L
Balance	10.81511	%
Total dissolved solids	404.561	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.556097	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	36.5	1.587663	1.587663
K	0.961	2.457907E-02	2.457907E-02
Ca	60	1.497081	2.994162
Mg	16.9	0.6953301	1.39066
Cl	2.2	6.205451E-02	6.205451E-02
SO4	10	0.1041667	0.2083333
NO3			
HCO3	278	4.556097	4.556097

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.550296	2.15305	0.319	0.194
Ca/SO4	6	14.37197	0.152	0.364
Na/Cl	16.59091	25.58497	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-038-GW	
Sample Date	3/24/2017	
Station	CFMW-038	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	305000	uS/cm
Sum of Anions	4.995588	meq/L
Sum of Cations	5.87909	meq/L
Balance	8.124393	%
Total dissolved solids	410.697	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.605263	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	35.7	1.552865	1.552865
K	0.947	0.024221	0.024221
Ca	59	1.472129	2.944259
Mg	16.5	0.6788726	1.357745
Cl	3.35	9.449209E-02	9.449209E-02
SO4	14.2	0.1479167	0.2958333
NO3			
HCO3	281	4.605263	4.605263

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.575758	2.168491	0.319	0.194
Ca/SO4	4.15493	9.952424	0.152	0.364
Na/Cl	10.65672	16.43381	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-038-GW	
Sample Date	6/27/2017	
Station	CFMW-038	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	5760	uS/cm
Sum of Anions	5.115654	meq/L
Sum of Cations	6.456025	meq/L
Balance	11.5832	%
Total dissolved solids	429.32	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.736374	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	40.8	1.774702	1.774702
K	1.04	2.659962E-02	2.659962E-02
Ca	63.1	1.57443	3.14886
Mg	18.3	0.7529315	1.505863
Cl	3.18	8.969697E-02	8.969697E-02
SO4	13.9	0.1447917	0.2895833
NO3			
HCO3	289	4.736374	4.736374

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.448087	2.091067	0.319	0.194
Ca/SO4	4.539568	10.87376	0.152	0.364
Na/Cl	12.83019	19.78553	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-040-GW	
Sample Date	9/14/2016	
Station	CFMW-040	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	55800	uS/cm
Sum of Anions	4.634848	meq/L
Sum of Cations	5.602814	meq/L
Balance	9.454952	%
Total dissolved solids	383.12	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.195542	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	34.7	1.509367	1.509367
K	1.18	3.018034E-02	3.018034E-02
Ca	55.7	1.38979	2.77958
Mg	15.6	0.6418433	1.283687
Cl	3.24	9.138937E-02	9.138937E-02
SO4	16.7	0.1739583	0.3479167
NO3			
HCO3	256	4.195542	4.195542

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.570513	2.165311	0.319	0.194
Ca/SO4	3.335329	7.989212	0.152	0.364
Na/Cl	10.70988	16.51578	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-040-GW	
Sample Date	12/13/2016	
Station	CFMW-040	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	52200	uS/cm
Sum of Anions	4.426551	meq/L
Sum of Cations	5.365316	meq/L
Balance	9.587192	%
Total dissolved solids	366.87	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.064432	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	32.5	1.413672	1.413672
K	1.02	2.608809E-02	2.608809E-02
Ca	53.6	1.337392	2.674784
Mg	15.2	0.6253857	1.250771
Cl	2.35	6.628549E-02	6.628549E-02
SO4	14.2	0.1479167	0.2958333
NO3			
HCO3	248	4.064432	4.064432

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.526316	2.138508	0.319	0.194
Ca/SO4	3.774648	9.041524	0.152	0.364
Na/Cl	13.82979	21.32702	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-040-GW	
Sample Date	3/30/2017	
Station	CFMW-040	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	299000	uS/cm
Sum of Anions	4.751336	meq/L
Sum of Cations	5.435236	meq/L
Balance	6.71374	%
Total dissolved solids	386.31	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.343042	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	31.9	1.387574	1.387574
K	1.04	2.659962E-02	2.659962E-02
Ca	53.7	1.339887	2.679775
Mg	16.3	0.6706439	1.341288
Cl	3.47	9.787688E-02	9.787688E-02
SO4	14.9	0.1552083	0.3104167
NO3			
HCO3	265	4.343042	4.343042

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.294479	1.997912	0.319	0.194
Ca/SO4	3.604027	8.632831	0.152	0.364
Na/Cl	9.193084	14.17672	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-040-GW	
Sample Date	6/20/2017	
Station	CFMW-040	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	5740	uS/cm
Sum of Anions	5.205575	meq/L
Sum of Cations	6.538834	meq/L
Balance	11.35228	%
Total dissolved solids	434.32	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.605263	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	47.2	2.053087	2.053087
K	1.15	2.941304E-02	2.941304E-02
Ca	58.3	1.454664	2.909327
Mg	18.8	0.7735034	1.547007
Cl	2.67	7.531161E-02	7.531161E-02
SO4	25.2	0.2625	0.525
NO3			
HCO3	281	4.605263	4.605263

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.101064	1.880617	0.319	0.194
Ca/SO4	2.313492	5.541575	0.152	0.364
Na/Cl	17.6779	27.26123	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-042-GW	
Sample Date	9/14/2016	
Station	CFMW-042	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	54300	uS/cm
Sum of Anions	4.744164	meq/L
Sum of Cations	6.062987	meq/L
Balance	12.20325	%
Total dissolved solids	397.55	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.129987	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	43.9	1.909545	1.909545
K	1.01	2.583233E-02	2.583233E-02
Ca	56	1.397275	2.794551
Mg	16.2	0.6665295	1.333059
Cl	2.94	8.292739E-02	8.292739E-02
SO4	25.5	0.265625	0.53125
NO3			
HCO3	252	4.129987	4.129987

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.45679	2.096344	0.319	0.194
Ca/SO4	2.196079	5.260331	0.152	0.364
Na/Cl	14.93197	23.02671	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-042-GW	
Sample Date	6/20/2017	
Station	CFMW-042	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	5870	uS/cm
Sum of Anions	5.29785	meq/L
Sum of Cations	6.491642	meq/L
Balance	10.1259	%
Total dissolved solids	440.9	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.605263	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	59.6	2.592457	2.592457
K	1.03	2.634386E-02	2.634386E-02
Ca	50.4	1.257548	2.515096
Mg	16.5	0.6788726	1.357745
Cl	2.47	6.967029E-02	6.967029E-02
SO4	29.9	0.3114583	0.6229167
NO3			
HCO3	281	4.605263	4.605263

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.054546	1.852406	0.319	0.194
Ca/SO4	1.685619	4.037611	0.152	0.364
Na/Cl	24.12955	37.21037	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-043-GW	
Sample Date	9/13/2016	
Station	CFMW-043	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	56100	uS/cm
Sum of Anions	4.774101	meq/L
Sum of Cations	5.831497	meq/L
Balance	9.970163	%
Total dissolved solids	395.169	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.162765	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	44.2	1.922594	1.922594
K	0.999	2.555098E-02	2.555098E-02
Ca	51.6	1.287489	2.574979
Mg	15.9	0.6541864	1.308373
Cl	2.47	6.967029E-02	6.967029E-02
SO4	26	0.2708333	0.5416667
NO3			
HCO3	254	4.162765	4.162765

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.245283	1.968077	0.319	0.194
Ca/SO4	1.984615	4.753807	0.152	0.364
Na/Cl	17.89474	27.59561	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-043-GW	
Sample Date	12/14/2016	
Station	CFMW-043	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	56200	uS/cm
Sum of Anions	4.668849	meq/L
Sum of Cations	5.536768	meq/L
Balance	8.504332	%
Total dissolved solids	384.64	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.22832	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	37.9	1.648559	1.648559
K	0.96	0.0245535	0.0245535
Ca	51.7	1.289985	2.579969
Mg	15.6	0.6418433	1.283687
Cl	1.88	0.0530284	0.0530284
SO4	18.6	0.19375	0.3875
NO3			
HCO3	258	4.22832	4.22832

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.314103	2.009812	0.319	0.194
Ca/SO4	2.77957	6.657985	0.152	0.364
Na/Cl	20.15957	31.08824	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-043-GW	
Sample Date	3/20/2017	
Station	CFMW-043	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	307000	uS/cm
Sum of Anions	4.565315	meq/L
Sum of Cations	5.977932	meq/L
Balance	13.39831	%
Total dissolved solids	390.778	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.441375	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	41.7	1.81385	1.81385
K	0.988	2.526964E-02	2.526964E-02
Ca	55.4	1.382305	2.764609
Mg	16.7	0.6871014	1.374203
Cl	2.71	7.643987E-02	7.643987E-02
SO4	2.28	0.02375	0.0475
NO3			
HCO3	271	4.441375	4.441375

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.317365	2.011791	0.319	0.194
Ca/SO4	24.29825	58.2023	0.152	0.364
Na/Cl	15.38745	23.72911	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-043-GW	
Sample Date	6/21/2017	
Station	CFMW-043	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	6190	uS/cm
Sum of Anions	5.597003	meq/L
Sum of Cations	6.793694	meq/L
Balance	9.657976	%
Total dissolved solids	460.17	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.851096	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	44.9	1.953043	1.953043
K	1.03	2.634386E-02	2.634386E-02
Ca	63	1.571935	3.14387
Mg	20.3	0.835219	1.670438
Cl	2.44	6.882409E-02	6.882409E-02
SO4	32.5	0.3385417	0.6770834
NO3			
HCO3	296	4.851096	4.851096

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.103448	1.882063	0.319	0.194
Ca/SO4	1.938462	4.643253	0.152	0.364
Na/Cl	18.40164	28.37731	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044-GW	
Sample Date	9/16/2016	
Station	CFMW-044	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	56600	uS/cm
Sum of Anions	4.9232	meq/L
Sum of Cations	5.813288	meq/L
Balance	8.290314	%
Total dissolved solids	403.348	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.293875	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	45	1.957392	1.957392
K	0.888	2.271198E-02	2.271198E-02
Ca	50.1	1.250062	2.500125
Mg	16.2	0.6665295	1.333059
Cl	2.96	8.349152E-02	8.349152E-02
SO4	26.2	0.2729167	0.5458333
NO3			
HCO3	262	4.293875	4.293875

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.092592	1.875479	0.319	0.194
Ca/SO4	1.912214	4.580381	0.152	0.364
Na/Cl	15.2027	23.44421	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044-GW	
Sample Date	12/9/2016	
Station	CFMW-044	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	66400	uS/cm
Sum of Anions	5.141649	meq/L
Sum of Cations	5.797367	meq/L
Balance	5.994304	%
Total dissolved solids	418.44	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.621652	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	48.1	2.092235	2.092235
K	1.98	5.064159E-02	5.064159E-02
Ca	45.2	1.127801	2.255602
Mg	17	0.6994445	1.398889
Cl	2.26	0.0637469	0.0637469
SO4	21.9	0.228125	0.45625
NO3			
HCO3	282	4.621652	4.621652

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.658823	1.612424	0.319	0.194
Ca/SO4	2.063927	4.943784	0.152	0.364
Na/Cl	21.28319	32.82096	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044-GW	
Sample Date	3/28/2017	
Station	CFMW-044	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	369000	uS/cm
Sum of Anions	5.470824	meq/L
Sum of Cations	5.822973	meq/L
Balance	3.11807	%
Total dissolved solids	434.138	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.65443	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	42.4	1.844299	1.844299
K	0.958	2.450234E-02	2.450234E-02
Ca	51.7	1.289985	2.579969
Mg	16.7	0.6871014	1.374203
Cl	2.28	6.431103E-02	6.431103E-02
SO4	36.1	0.3760417	0.7520833
NO3			
HCO3	284	4.65443	4.65443

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.095808	1.87743	0.319	0.194
Ca/SO4	1.432133	3.43043	0.152	0.364
Na/Cl	18.59649	28.67779	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044-GW	
Sample Date	6/21/2017	
Station	CFMW-044	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	7390	uS/cm
Sum of Anions	6.272836	meq/L
Sum of Cations	6.154757	meq/L
Balance	-0.9501411	%
Total dissolved solids	493.18	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.719704	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	50.6	2.200979	2.200979
K	3.21	8.210076E-02	8.210076E-02
Ca	45.1	1.125306	2.250611
Mg	19.7	0.8105329	1.621066
Cl	2.77	7.813226E-02	7.813226E-02
SO4	22.8	0.2375	0.475
NO3			
HCO3	349	5.719704	5.719704

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.28934	1.388353	0.319	0.194
Ca/SO4	1.97807	4.738129	0.152	0.364
Na/Cl	18.26715	28.16991	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044a-GW	
Sample Date	9/19/2016	
Station	CFMW-044a	
Location		
Geology		
Watertype	Ca-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	201000	uS/cm
Sum of Anions	7.363105	meq/L
Sum of Cations	9.557683	meq/L
Balance	12.96972	%
Total dissolved solids	625.821	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.899981	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	40.7	1.770353	1.770353
K	1.66	4.245709E-02	4.245709E-02
Ca	155	3.867459	7.734917
Mg	0.121	4.978399E-03	9.956799E-03
Cl	5.34	0.1506232	0.1506232
SO4	63	0.65625	1.3125
NO3			
HCO3	360	5.899981	5.899981

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1280.992	776.8478	0.319	0.194
Ca/SO4	2.460317	5.89327	0.152	0.364
Na/Cl	7.621723	11.75352	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044a-GW	
Sample Date	12/19/2016	
Station	CFMW-044a	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	31200	uS/cm
Sum of Anions	2.48743	meq/L
Sum of Cations	3.695832	meq/L
Balance	19.54313	%
Total dissolved solids	209.2	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.322579	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	38.7	1.683357	1.683357
K	1.12	2.864575E-02	2.864575E-02
Ca	24.6	0.6138031	1.227606
Mg	9.19	0.3781115	0.756223
Cl	2.89	8.151706E-02	8.151706E-02
SO4	52	0.5416667	1.083333
NO3			
HCO3	80.7	1.322579	1.322579

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.676823	1.623339	0.319	0.194
Ca/SO4	0.4730769	1.133175	0.152	0.364
Na/Cl	13.391	20.65037	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044a-GW	
Sample Date	3/21/2017	
Station	CFMW-044a	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	261000	uS/cm
Sum of Anions	3.718618	meq/L
Sum of Cations	3.853587	meq/L
Balance	1.78242	%
Total dissolved solids	285.47	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.573047	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	38.7	1.683357	1.683357
K	0.9	0.0230189	0.0230189
Ca	23.9	0.5963371	1.192674
Mg	11.6	0.4772681	0.9545361
Cl	4.57	0.1289041	0.1289041
SO4	48.8	0.5083333	1.016667
NO3			
HCO3	157	2.573047	2.573047

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.060345	1.24948	0.319	0.194
Ca/SO4	0.4897541	1.173122	0.152	0.364
Na/Cl	8.468271	13.05899	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044a-GW	
Sample Date	6/23/2017	
Station	CFMW-044a	
Location		
Geology		
Watertype	Na-Ca-Mg-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	4280	uS/cm
Sum of Anions	3.672384	meq/L
Sum of Cations	4.31264	meq/L
Balance	8.018203	%
Total dissolved solids	294.647	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.687769	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	44.7	1.944343	1.944343
K	0.987	2.524406E-02	2.524406E-02
Ca	27	0.6736863	1.347373
Mg	12.1	0.49784	0.9956799
Cl	3.96	0.1116981	0.1116981
SO4	41.9	0.4364583	0.8729167
NO3			
HCO3	164	2.687769	2.687769

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.231405	1.353219	0.319	0.194
Ca/SO4	0.6443914	1.54353	0.152	0.364
Na/Cl	11.28788	17.40713	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-045-GW	
Sample Date	9/15/2016	
Station	CFMW-045	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	55200	uS/cm
Sum of Anions	4.724121	meq/L
Sum of Cations	5.683807	meq/L
Balance	9.220723	%
Total dissolved solids	389.176	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.162765	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	39	1.696407	1.696407
K	0.936	2.393966E-02	2.393966E-02
Ca	53.7	1.339887	2.679775
Mg	15.6	0.6418433	1.283687
Cl	2.84	8.010673E-02	8.010673E-02
SO4	23.1	0.240625	0.48125
NO3			
HCO3	254	4.162765	4.162765

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.442308	2.087561	0.319	0.194
Ca/SO4	2.324675	5.568362	0.152	0.364
Na/Cl	13.7324	21.17683	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-045-GW	
Sample Date	12/14/2016	
Station	CFMW-045	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	59500	uS/cm
Sum of Anions	4.691048	meq/L
Sum of Cations	5.710882	meq/L
Balance	9.804277	%
Total dissolved solids	389.536	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.22832	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	40.7	1.770353	1.770353
K	0.986	2.521849E-02	2.521849E-02
Ca	52.9	1.319926	2.639853
Mg	15.5	0.6377289	1.275458
Cl	2.15	6.064418E-02	6.064418E-02
SO4	19.3	0.2010417	0.4020833
NO3			
HCO3	258	4.22832	4.22832

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.412903	2.06973	0.319	0.194
Ca/SO4	2.740933	6.565436	0.152	0.364
Na/Cl	18.93023	29.19246	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-045-GW	
Sample Date	3/23/2017	
Station	CFMW-045	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	316000	uS/cm
Sum of Anions	5.094587	meq/L
Sum of Cations	5.173436	meq/L
Balance	0.7679021	%
Total dissolved solids	400.54	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.424986	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	36	1.565914	1.565914
K	0.86	2.199584E-02	2.199584E-02
Ca	48.6	1.212635	2.425271
Mg	14.1	0.5801275	1.160255
Cl	3.28	9.251763E-02	9.251763E-02
SO4	27.7	0.2885417	0.5770833
NO3			
HCO3	270	4.424986	4.424986

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.446808	2.090291	0.319	0.194
Ca/SO4	1.754513	4.202635	0.152	0.364
Na/Cl	10.97561	16.92557	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-045-GW	
Sample Date	6/28/2017	
Station	CFMW-045	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	5690	uS/cm
Sum of Anions	5.244916	meq/L
Sum of Cations	6.562166	meq/L
Balance	11.15643	%
Total dissolved solids	438.52	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.588874	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	54.2	2.35757	2.35757
K	1.09	2.787845E-02	2.787845E-02
Ca	55.5	1.3848	2.769599
Mg	17.1	0.7035589	1.407118
Cl	2.43	6.854203E-02	6.854203E-02
SO4	28.2	0.29375	0.5875
NO3			
HCO3	280	4.588874	4.588874

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.245614	1.968278	0.319	0.194
Ca/SO4	1.968085	4.714211	0.152	0.364
Na/Cl	22.30453	34.39598	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-045a-GW	
Sample Date	9/19/2016	
Station	CFMW-045a	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	39400	uS/cm
Sum of Anions	4.05247	meq/L
Sum of Cations	4.766883	meq/L
Balance	8.100522	%
Total dissolved solids	331.57	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.5236	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	31.1	1.352776	1.352776
K	2.3	5.882609E-02	5.882609E-02
Ca	45.8	1.142772	2.285543
Mg	13	0.5348694	1.069739
Cl	2.87	8.095292E-02	8.095292E-02
SO4	21.5	0.2239583	0.4479167
NO3			
HCO3	215	3.5236	3.5236

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.523077	2.136543	0.319	0.194
Ca/SO4	2.130233	5.102608	0.152	0.364
Na/Cl	10.83624	16.71065	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-045a-GW	
Sample Date	12/9/2016	
Station	CFMW-045a	
Location		
Geology		
Watertype	Na-Mg-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	25000	uS/cm
Sum of Anions	1.430218	meq/L
Sum of Cations	1.916246	meq/L
Balance	14.52362	%
Total dissolved solids	116.56	mg/L
Total hardness		mg/l CaCO3
Alkalinity	0.7735531	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	27.7	1.204884	1.204884
K	3.59	9.181985E-02	9.181985E-02
Ca	4.5	0.1122811	0.2245621
Mg	4.8	0.1974902	0.3949805
Cl	7.77	0.2191652	0.2191652
SO4	21	0.21875	0.4375
NO3			
HCO3	47.2	0.7735531	0.7735531

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.9374999	0.5685398	0.319	0.194
Ca/SO4	0.2142857	0.5132848	0.152	0.364
Na/Cl	3.564994	5.497604	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-045a-GW	
Sample Date	3/24/2017	
Station	CFMW-045a	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	289000	uS/cm
Sum of Anions	4.605492	meq/L
Sum of Cations	5.336741	meq/L
Balance	7.354976	%
Total dissolved solids	372.48	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.884154	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	31.6	1.374524	1.374524
K	1.56	3.989943E-02	3.989943E-02
Ca	53.7	1.339887	2.679775
Mg	15.1	0.6212714	1.242543
Cl	3.12	8.800457E-02	8.800457E-02
SO4	30.4	0.3166667	0.6333333
NO3			
HCO3	237	3.884154	3.884154

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.556291	2.156686	0.319	0.194
Ca/SO4	1.766447	4.231223	0.152	0.364
Na/Cl	10.12821	15.61878	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-045a-GW	
Sample Date	6/23/2017	
Station	CFMW-045a	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	5430	uS/cm
Sum of Anions	4.964082	meq/L
Sum of Cations	5.619021	meq/L
Balance	6.188532	%
Total dissolved solids	400.99	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.359431	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	32.6	1.418022	1.418022
K	1.24	3.171493E-02	3.171493E-02
Ca	57	1.422227	2.844454
Mg	16.1	0.6624151	1.32483
Cl	2.75	7.756814E-02	7.756814E-02
SO4	25.3	0.2635417	0.5270833
NO3			
HCO3	266	4.359431	4.359431

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.540373	2.147032	0.319	0.194
Ca/SO4	2.252964	5.396592	0.152	0.364
Na/Cl	11.85454	18.28098	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-047-GW	
Sample Date	9/14/2016	
Station	CFMW-047	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	30800	uS/cm
Sum of Anions	4.059892	meq/L
Sum of Cations	4.968528	meq/L
Balance	10.06418	%
Total dissolved solids	335.39	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.769433	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	18.5	0.8047057	0.8047057
K	1.2	3.069187E-02	3.069187E-02
Ca	57.1	1.424722	2.849444
Mg	15.6	0.6418433	1.283687
Cl	2.69	7.587574E-02	7.587574E-02
SO4	10.3	0.1072917	0.2145833
NO3			
HCO3	230	3.769433	3.769433

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.660256	2.219735	0.319	0.194
Ca/SO4	5.543689	13.27896	0.152	0.364
Na/Cl	6.877323	10.60557	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-047-GW	
Sample Date	12/15/2016	
Station	CFMW-047	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	53200	uS/cm
Sum of Anions	4.344989	meq/L
Sum of Cations	5.222951	meq/L
Balance	9.176083	%
Total dissolved solids	359.553	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.162765	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	21.1	0.9177995	0.9177995
K	0.972	2.486042E-02	2.486042E-02
Ca	58.4	1.457159	2.914317
Mg	16.6	0.682987	1.365974
Cl	0.751	2.118315E-02	2.118315E-02
SO4	7.73	8.052084E-02	0.1610417
NO3			
HCO3	254	4.162765	4.162765

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.518072	2.133508	0.319	0.194
Ca/SO4	7.554981	18.09667	0.152	0.364
Na/Cl	28.09587	43.32686	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-047-GW	
Sample Date	3/23/2017	
Station	CFMW-047	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	302000	uS/cm
Sum of Anions	4.759466	meq/L
Sum of Cations	4.953585	meq/L
Balance	1.998533	%
Total dissolved solids	378.457	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.457764	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	23.6	1.026543	1.026543
K	0.907	2.319794E-02	2.319794E-02
Ca	53	1.322421	2.644843
Mg	15.3	0.6295001	1.259
Cl	2.35	6.628549E-02	6.628549E-02
SO4	11.3	0.1177083	0.2354167
NO3			
HCO3	272	4.457764	4.457764

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.464052	2.100748	0.319	0.194
Ca/SO4	4.690265	11.23473	0.152	0.364
Na/Cl	10.04255	15.4867	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-047-GW	
Sample Date	6/21/2017	
Station	CFMW-047	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4840	uS/cm
Sum of Anions	3.966636	meq/L
Sum of Cations	4.705976	meq/L
Balance	8.525001	%
Total dissolved solids	326.229	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.80221	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	19.1	0.8308043	0.8308043
K	0.909	2.324909E-02	2.324909E-02
Ca	51.3	1.280004	2.560008
Mg	15.7	0.6459576	1.291915
Cl	1.9	5.359253E-02	5.359253E-02
SO4	5.32	5.541667E-02	0.1108333
NO3			
HCO3	232	3.80221	3.80221

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.267516	1.98156	0.319	0.194
Ca/SO4	9.642857	23.09782	0.152	0.364
Na/Cl	10.05263	15.50224	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-049-GW	
Sample Date	9/21/2016	
Station	CFMW-049	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	39900	uS/cm
Sum of Anions	3.500267	meq/L
Sum of Cations	4.112071	meq/L
Balance	8.037008	%
Total dissolved solids	285.387	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.1	0.4393258	0.4393258
K	0.857	2.191911E-02	2.191911E-02
Ca	47.6	1.187684	2.375368
Mg	15.5	0.6377289	1.275458
Cl	1.78	5.020774E-02	5.020774E-02
SO4	3.55	3.697917E-02	7.395834E-02
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.070968	1.862365	0.319	0.194
Ca/SO4	13.40845	32.11765	0.152	0.364
Na/Cl	5.674158	8.750162	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-049-GW	
Sample Date	12/15/2016	
Station	CFMW-049	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	41500	uS/cm
Sum of Anions	3.53129	meq/L
Sum of Cations	4.086338	meq/L
Balance	7.286359	%
Total dissolved solids	287.66	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.441656	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.2	0.4436756	0.4436756
K	0.783	2.002645E-02	2.002645E-02
Ca	47.2	1.177704	2.355407
Mg	15.4	0.6336145	1.267229
Cl	0.637	0.0179676	0.0179676
SO4	3.44	3.583334E-02	7.166667E-02
NO3			
HCO3	210	3.441656	3.441656

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.064935	1.858707	0.319	0.194
Ca/SO4	13.72093	32.86615	0.152	0.364
Na/Cl	16.01256	24.69309	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-049-GW	
Sample Date	3/23/2017	
Station	CFMW-049	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	205000	uS/cm
Sum of Anions	3.716785	meq/L
Sum of Cations	4.205445	meq/L
Balance	6.168217	%
Total dissolved solids	299.893	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.572767	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.3	0.4480254	0.4480254
K	0.803	2.053798E-02	2.053798E-02
Ca	48.5	1.21014	2.420281
Mg	16	0.6583008	1.316602
Cl	1.76	4.964361E-02	4.964361E-02
SO4	4.53	0.0471875	9.437501E-02
NO3			
HCO3	218	3.572767	3.572767

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.03125	1.838279	0.319	0.194
Ca/SO4	10.7064	25.64536	0.152	0.364
Na/Cl	5.852273	9.024836	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-049-GW	
Sample Date	6/21/2017	
Station	CFMW-049	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4410	uS/cm
Sum of Anions	3.719937	meq/L
Sum of Cations	4.216287	meq/L
Balance	6.254232	%
Total dissolved solids	300.496	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.589155	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	12.2	0.5306708	0.5306708
K	0.806	2.061471E-02	2.061471E-02
Ca	46.4	1.157743	2.315485
Mg	16.4	0.6747583	1.349517
Cl	1.66	4.682295E-02	4.682295E-02
SO4	4.03	4.197917E-02	8.395834E-02
NO3			
HCO3	219	3.589155	3.589155

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.829268	1.715789	0.319	0.194
Ca/SO4	11.51365	27.57897	0.152	0.364
Na/Cl	7.349398	11.33356	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP6-GW	
Sample Date	12/15/2016	
Station	CFMW-049	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	41500	uS/cm
Sum of Anions	3.514958	meq/L
Sum of Cations	4.086338	meq/L
Balance	7.516881	%
Total dissolved solids	286.662	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.425267	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.2	0.4436756	0.4436756
K	0.783	2.002645E-02	2.002645E-02
Ca	47.2	1.177704	2.355407
Mg	15.4	0.6336145	1.267229
Cl	0.639	1.802401E-02	1.802401E-02
SO4	3.44	3.583334E-02	7.166667E-02
NO3			
HCO3	209	3.425267	3.425267

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.064935	1.858707	0.319	0.194
Ca/SO4	13.72093	32.86615	0.152	0.364
Na/Cl	15.96244	24.6158	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-049a-GW	
Sample Date	9/16/2016	
Station	CFMW-049a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	263000	uS/cm
Sum of Anions	7.07909	meq/L
Sum of Cations	11.50468	meq/L
Balance	23.81427	%
Total dissolved solids	672.201	mg/L
Total hardness		mg/l CaCO3
Alkalinity	6.91609	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	25.2	1.09614	1.09614
K	19.7	0.5038583	0.5038583
Ca	198	4.940367	9.880733
Mg	0.291	1.197285E-02	2.394569E-02
Cl	2.3	6.487516E-02	6.487516E-02
SO4	4.71	0.0490625	0.098125
NO3			
HCO3	422	6.91609	6.91609

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	680.4124	412.631	0.319	0.194
Ca/SO4	42.03822	100.6954	0.152	0.364
Na/Cl	10.95652	16.89614	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-049a-GW	
Sample Date	12/15/2016	
Station	CFMW-049a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	30200	uS/cm
Sum of Anions	1.865977	meq/L
Sum of Cations	3.78109	meq/L
Balance	33.9134	%
Total dissolved solids	182.32	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.769994	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	12	0.5219713	0.5219713
K	3.48	8.900643E-02	8.900643E-02
Ca	41.1	1.0255	2.051001
Mg	13.6	0.5595556	1.119111
Cl	1.32	0.0372327	0.0372327
SO4	2.82	0.029375	0.05875
NO3			
HCO3	108	1.769994	1.769994

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.022059	1.832705	0.319	0.194
Ca/SO4	14.57447	34.91065	0.152	0.364
Na/Cl	9.090909	14.01916	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-049a-GW	
Sample Date	3/23/2017	
Station	CFMW-049a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	895000	uS/cm
Sum of Anions	14.53514	meq/L
Sum of Cations	12.84069	meq/L
Balance	-6.189573	%
Total dissolved solids	1149.505	mg/L
Total hardness		mg/l CaCO3
Alkalinity	14.42218	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	20.4	0.8873512	0.8873512
K	10.8	0.2762268	0.2762268
Ca	233	5.813663	11.62733
Mg	0.605	0.024892	0.049784
Cl	2.04	5.754145E-02	5.754145E-02
SO4	2.66	2.770833E-02	5.541667E-02
NO3			
HCO3	880	14.42218	14.42218

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	385.124	233.5555	0.319	0.194
Ca/SO4	87.59398	209.8164	0.152	0.364
Na/Cl	10	15.42108	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-049a-GW	
Sample Date	6/21/2017	
Station	CFMW-049a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	10500	uS/cm
Sum of Anions	5.226182	meq/L
Sum of Cations	6.092857	meq/L
Balance	7.656793	%
Total dissolved solids	433.88	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.113317	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	13.7	0.5959172	0.5959172
K	3.75	0.0959121	0.0959121
Ca	86.3	2.153301	4.306602
Mg	13.3	0.5472125	1.094425
Cl	1.66	4.682295E-02	4.682295E-02
SO4	3.17	3.302084E-02	6.604167E-02
NO3			
HCO3	312	5.113317	5.113317

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	6.488722	3.935036	0.319	0.194
Ca/SO4	27.22397	65.21038	0.152	0.364
Na/Cl	8.253012	12.72703	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-050-GW	
Sample Date	9/19/2016	
Station	CFMW-050	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	39200	uS/cm
Sum of Anions	3.478468	meq/L
Sum of Cations	4.12498	meq/L
Balance	8.502886	%
Total dissolved solids	285.98	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.408878	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	11.7	0.508922	0.508922
K	0.845	2.161219E-02	2.161219E-02
Ca	46.8	1.167723	2.335446
Mg	15.3	0.6295001	1.259
Cl	0.015	4.230989E-04	4.230989E-04
SO4	3.32	3.458333E-02	6.916667E-02
NO3			
HCO3	208	3.408878	3.408878

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.058823	1.855	0.319	0.194
Ca/SO4	14.09639	33.76548	0.152	0.364
Na/Cl	780	1202.844	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-050-GW	
Sample Date	12/15/2016	
Station	CFMW-050	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	41500	uS/cm
Sum of Anions	3.487231	meq/L
Sum of Cations	4.079705	meq/L
Balance	7.829773	%
Total dissolved solids	284.823	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.392489	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.7	0.4654244	0.4654244
K	0.844	2.158662E-02	2.158662E-02
Ca	46.6	1.162733	2.325465
Mg	15.4	0.6336145	1.267229
Cl	0.759	2.140881E-02	2.140881E-02
SO4	3.52	3.666667E-02	7.333334E-02
NO3			
HCO3	207	3.392489	3.392489

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.025974	1.835079	0.319	0.194
Ca/SO4	13.23864	31.71089	0.152	0.364
Na/Cl	14.0975	21.73986	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-050-GW	
Sample Date	3/23/2017	
Station	CFMW-050	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	211000	uS/cm
Sum of Anions	3.692556	meq/L
Sum of Cations	4.248945	meq/L
Balance	7.006098	%
Total dissolved solids	298.79	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.539989	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.69	0.4214918	0.4214918
K	0.82	2.097278E-02	2.097278E-02
Ca	49.4	1.232597	2.465193
Mg	16.3	0.6706439	1.341288
Cl	2.1	5.923384E-02	5.923384E-02
SO4	4.48	4.666667E-02	9.333333E-02
NO3			
HCO3	216	3.539989	3.539989

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.030675	1.83793	0.319	0.194
Ca/SO4	11.02679	26.41278	0.152	0.364
Na/Cl	4.614286	7.115726	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-050-GW	
Sample Date	6/21/2017	
Station	CFMW-050	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4590	uS/cm
Sum of Anions	3.88218	meq/L
Sum of Cations	4.492179	meq/L
Balance	7.284132	%
Total dissolved solids	315.12	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.736655	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	13	0.5654689	0.5654689
K	0.84	2.148431E-02	2.148431E-02
Ca	49.4	1.232597	2.465193
Mg	17.5	0.7200165	1.440033
Cl	1.71	4.823328E-02	4.823328E-02
SO4	4.67	4.864584E-02	9.729167E-02
NO3			
HCO3	228	3.736655	3.736655

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.822857	1.7119	0.319	0.194
Ca/SO4	10.57816	25.33817	0.152	0.364
Na/Cl	7.602339	11.72363	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-053-GW	
Sample Date	9/14/2016	
Station	CFMW-053	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	53600	uS/cm
Sum of Anions	4.925118	meq/L
Sum of Cations	6.211573	meq/L
Balance	11.55149	%
Total dissolved solids	411.57	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.326653	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	44	1.913895	1.913895
K	1.07	2.736692E-02	2.736692E-02
Ca	58.2	1.452168	2.904337
Mg	16.6	0.682987	1.365974
Cl	2.9	8.179913E-02	8.179913E-02
SO4	24.8	0.2583333	0.5166667
NO3			
HCO3	264	4.326653	4.326653

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.506024	2.126202	0.319	0.194
Ca/SO4	2.346774	5.621297	0.152	0.364
Na/Cl	15.17241	23.3975	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-053-GW	
Sample Date	12/12/2016	
Station	CFMW-053	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	57700	uS/cm
Sum of Anions	4.911477	meq/L
Sum of Cations	5.879354	meq/L
Balance	8.969443	%
Total dissolved solids	406.098	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.424986	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	41.9	1.82255	1.82255
K	0.918	2.347928E-02	2.347928E-02
Ca	55.1	1.374819	2.749638
Mg	15.6	0.6418433	1.283687
Cl	2.18	6.149038E-02	6.149038E-02
SO4	20.4	0.2125	0.425
NO3			
HCO3	270	4.424986	4.424986

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.532051	2.141986	0.319	0.194
Ca/SO4	2.70098	6.469737	0.152	0.364
Na/Cl	19.22018	29.63959	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-053-GW	
Sample Date	6/28/2017	
Station	CFMW-053	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	5160	uS/cm
Sum of Anions	4.777771	meq/L
Sum of Cations	5.606676	meq/L
Balance	7.982173	%
Total dissolved solids	389.88	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.326653	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	28.6	1.244032	1.244032
K	0.92	2.353043E-02	2.353043E-02
Ca	57.6	1.437197	2.874395
Mg	17.8	0.7323596	1.464719
Cl	1.96	5.528492E-02	5.528492E-02
SO4	19	0.1979167	0.3958333
NO3			
HCO3	264	4.326653	4.326653

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.235955	1.96242	0.319	0.194
Ca/SO4	3.031579	7.261629	0.152	0.364
Na/Cl	14.59184	22.50218	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-054-GW	
Sample Date	9/14/2016	
Station	CFMW-054	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	53400	uS/cm
Sum of Anions	4.831796	meq/L
Sum of Cations	6.036528	meq/L
Balance	11.0848	%
Total dissolved solids	402.65	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.293875	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	38.8	1.687707	1.687707
K	1.05	2.685539E-02	2.685539E-02
Ca	59.4	1.48211	2.96422
Mg	16.5	0.6788726	1.357745
Cl	2.6	7.333715E-02	7.333715E-02
SO4	22.3	0.2322917	0.4645833
NO3			
HCO3	262	4.293875	4.293875

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.6	2.183193	0.319	0.194
Ca/SO4	2.663677	6.380384	0.152	0.364
Na/Cl	14.92308	23.01299	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-054-GW	
Sample Date	12/12/2016	
Station	CFMW-054	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	55800	uS/cm
Sum of Anions	4.829661	meq/L
Sum of Cations	5.804087	meq/L
Balance	9.163522	%
Total dissolved solids	399.111	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.343042	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	38.9	1.692057	1.692057
K	0.931	2.381178E-02	2.381178E-02
Ca	56.2	1.402266	2.804531
Mg	15.6	0.6418433	1.283687
Cl	2.48	6.995235E-02	6.995235E-02
SO4	20	0.2083333	0.4166667
NO3			
HCO3	265	4.343042	4.343042

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.602564	2.184748	0.319	0.194
Ca/SO4	2.81	6.730875	0.152	0.364
Na/Cl	15.68548	24.18871	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-054-GW	
Sample Date	3/22/2017	
Station	CFMW-054	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	336000	uS/cm
Sum of Anions	5.195748	meq/L
Sum of Cations	5.945928	meq/L
Balance	6.7331	%
Total dissolved solids	420.72	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.474153	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	41.1	1.787752	1.787752
K	1	2.557656E-02	2.557656E-02
Ca	56.1	1.39977	2.799541
Mg	16.2	0.6665295	1.333059
Cl	3.72	0.1049285	0.1049285
SO4	29.6	0.3083333	0.6166667
NO3			
HCO3	273	4.474153	4.474153

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.462963	2.100088	0.319	0.194
Ca/SO4	1.89527	4.539796	0.152	0.364
Na/Cl	11.04839	17.0378	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-054-GW	
Sample Date	6/21/2017	
Station	CFMW-054	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	5210	uS/cm
Sum of Anions	4.871933	meq/L
Sum of Cations	5.925581	meq/L
Balance	9.758246	%
Total dissolved solids	403.17	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.408597	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	36.4	1.583313	1.583313
K	1.02	2.608809E-02	2.608809E-02
Ca	57.8	1.442188	2.884376
Mg	17.4	0.715902	1.431804
Cl	1.95	5.500286E-02	5.500286E-02
SO4	19.6	0.2041667	0.4083334
NO3			
HCO3	269	4.408597	4.408597

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.321839	2.014504	0.319	0.194
Ca/SO4	2.948979	7.063776	0.152	0.364
Na/Cl	18.66667	28.78601	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056b-GW	
Sample Date	9/13/2016	
Station	CFMW-056b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	49500	uS/cm
Sum of Anions	4.519399	meq/L
Sum of Cations	5.318029	meq/L
Balance	8.118288	%
Total dissolved solids	363.035	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.867766	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.45	0.4110524	0.4110524
K	0.925	2.365832E-02	2.365832E-02
Ca	69	1.721643	3.443286
Mg	17.5	0.7200165	1.440033
Cl	3.16	8.913284E-02	8.913284E-02
SO4	27	0.28125	0.5625
NO3			
HCO3	236	3.867766	3.867766

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.942857	2.391116	0.319	0.194
Ca/SO4	2.555556	6.121397	0.152	0.364
Na/Cl	2.990506	4.611683	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056b-GW	
Sample Date	12/12/2016	
Station	CFMW-056b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	47000	uS/cm
Sum of Anions	4.15503	meq/L
Sum of Cations	4.830117	meq/L
Balance	7.513366	%
Total dissolved solids	337.621	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.900543	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	7	0.3044832	0.3044832
K	0.771	1.971953E-02	1.971953E-02
Ca	64.9	1.619342	3.238685
Mg	15.4	0.6336145	1.267229
Cl	1.88	0.0530284	0.0530284
SO4	9.67	0.1007292	0.2014583
NO3			
HCO3	238	3.900543	3.900543

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.214286	2.555722	0.319	0.194
Ca/SO4	6.711479	16.0762	0.152	0.364
Na/Cl	3.723404	5.74189	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056b-GW	
Sample Date	3/21/2017	
Station	CFMW-056b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	256000	uS/cm
Sum of Anions	4.113633	meq/L
Sum of Cations	4.512227	meq/L
Balance	4.620918	%
Total dissolved solids	329.062	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.94971	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.49	0.1518067	0.1518067
K	0.692	1.769898E-02	1.769898E-02
Ca	61.3	1.529518	3.059035
Mg	15.6	0.6418433	1.283687
Cl	2.51	7.079855E-02	7.079855E-02
SO4	4.47	0.0465625	0.093125
NO3			
HCO3	241	3.94971	3.94971

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.929487	2.383008	0.319	0.194
Ca/SO4	13.71365	32.8487	0.152	0.364
Na/Cl	1.390438	2.144206	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056b-GW	
Sample Date	6/22/2017	
Station	CFMW-056b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	5210	uS/cm
Sum of Anions	4.883934	meq/L
Sum of Cations	5.457845	meq/L
Balance	5.549448	%
Total dissolved solids	386.766	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.179153	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.81	0.4267115	0.4267115
K	0.806	2.061471E-02	2.061471E-02
Ca	69.9	1.744099	3.488198
Mg	18.5	0.7611603	1.522321
Cl	3.05	8.603011E-02	8.603011E-02
SO4	29.7	0.309375	0.61875
NO3			
HCO3	255	4.179153	4.179153

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.778378	2.291369	0.319	0.194
Ca/SO4	2.353535	5.637492	0.152	0.364
Na/Cl	3.216394	4.960025	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP7-GW	
Sample Date	3/21/2017	
Station	CFMW-056b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	263000	uS/cm
Sum of Anions	4.112015	meq/L
Sum of Cations	4.551472	meq/L
Balance	5.072524	%
Total dissolved solids	329.73	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.94971	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.51	0.1526766	0.1526766
K	0.7	1.790359E-02	1.790359E-02
Ca	61.9	1.544488	3.088977
Mg	15.7	0.6459576	1.291915
Cl	2.46	6.938823E-02	6.938823E-02
SO4	4.46	4.645833E-02	9.291667E-02
NO3			
HCO3	241	3.94971	3.94971

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.942675	2.391006	0.319	0.194
Ca/SO4	13.87892	33.24459	0.152	0.364
Na/Cl	1.426829	2.200324	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-059-GW	
Sample Date	9/15/2016	
Station	CFMW-059	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	56300	uS/cm
Sum of Anions	4.805108	meq/L
Sum of Cations	5.543976	meq/L
Balance	7.139456	%
Total dissolved solids	374.53	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.80221	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	20.6	0.8960508	0.8960508
K	1.15	2.941304E-02	2.941304E-02
Ca	69.3	1.729128	3.458257
Mg	14.1	0.5801275	1.160255
Cl	30.4	0.8574805	0.8574805
SO4	6.98	7.270834E-02	0.1454167
NO3			
HCO3	232	3.80221	3.80221

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.914894	2.9806	0.319	0.194
Ca/SO4	9.928368	23.78171	0.152	0.364
Na/Cl	0.6776316	1.044981	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-059-GW	
Sample Date	12/12/2016	
Station	CFMW-059	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	55800	uS/cm
Sum of Anions	4.7888	meq/L
Sum of Cations	5.44498	meq/L
Balance	6.411897	%
Total dissolved solids	375.61	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.998876	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	15.2	0.6611636	0.6611636
K	1	2.557656E-02	2.557656E-02
Ca	72.1	1.798992	3.597984
Mg	14.1	0.5801275	1.160255
Cl	24.6	0.6938822	0.6938822
SO4	4.61	4.802084E-02	9.604167E-02
NO3			
HCO3	244	3.998876	3.998876

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5.113475	3.101028	0.319	0.194
Ca/SO4	15.63991	37.46274	0.152	0.364
Na/Cl	0.6178862	0.9528471	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-059-GW	
Sample Date	3/23/2017	
Station	CFMW-059	
Location		
Geology		
Watertype	Ca-HCO3-Cl	
Temperature (℃)		
pH		
Conductivity	314000	uS/cm
Sum of Anions	6.670677	meq/L
Sum of Cations	5.387039	meq/L
Balance	-10.64578	%
Total dissolved solids	441.21	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.94971	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	18.6	0.8090555	0.8090555
K	1.01	2.583233E-02	2.583233E-02
Ca	68.3	1.704177	3.408354
Mg	13.9	0.5718988	1.143798
Cl	91	2.5668	2.5668
SO4	7.4	7.708333E-02	0.1541667
NO3			
HCO3	241	3.94971	3.94971

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.91367	2.979858	0.319	0.194
Ca/SO4	9.22973	22.10824	0.152	0.364
Na/Cl	0.2043956	0.3152	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-059-GW	
Sample Date	6/21/2017	
Station	CFMW-059	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	5340	uS/cm
Sum of Anions	4.844125	meq/L
Sum of Cations	5.650094	meq/L
Balance	7.680121	%
Total dissolved solids	378.73	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.867766	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	21.6	0.9395483	0.9395483
K	1.23	3.145917E-02	3.145917E-02
Ca	68.7	1.714157	3.428315
Mg	15.2	0.6253857	1.250771
Cl	30.7	0.8659425	0.8659425
SO4	5.3	5.520834E-02	0.1104167
NO3			
HCO3	236	3.867766	3.867766

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.519737	2.74096	0.319	0.194
Ca/SO4	12.96226	31.04889	0.152	0.364
Na/Cl	0.7035831	1.085001	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-061-GW	
Sample Date	9/15/2016	
Station	CFMW-061	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	40700	uS/cm
Sum of Anions	3.570442	meq/L
Sum of Cations	4.231281	meq/L
Balance	8.470426	%
Total dissolved solids	289.867	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.343323	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	8.66	0.3766893	0.3766893
K	0.837	2.140758E-02	2.140758E-02
Ca	50.1	1.250062	2.500125
Mg	16.2	0.6665295	1.333059
Cl	2.35	6.628549E-02	6.628549E-02
SO4	7.72	8.041666E-02	0.1608333
NO3			
HCO3	204	3.343323	3.343323

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.092592	1.875479	0.319	0.194
Ca/SO4	6.489637	15.54482	0.152	0.364
Na/Cl	3.685107	5.682832	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-061-GW	
Sample Date	12/7/2016	
Station	CFMW-061	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	52600	uS/cm
Sum of Anions	4.549172	meq/L
Sum of Cations	5.242368	meq/L
Balance	7.079533	%
Total dissolved solids	368.131	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.37582	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	11.4	0.4958727	0.4958727
K	0.871	2.227718E-02	2.227718E-02
Ca	60.7	1.514547	3.029094
Mg	20.6	0.8475623	1.695125
Cl	2.15	6.064418E-02	6.064418E-02
SO4	5.41	5.635417E-02	0.1127083
NO3			
HCO3	267	4.37582	4.37582

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.946602	1.786945	0.319	0.194
Ca/SO4	11.21996	26.87551	0.152	0.364
Na/Cl	5.302325	8.176757	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-061-GW	
Sample Date	3/23/2017	
Station	CFMW-061	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	221000	uS/cm
Sum of Anions	3.701436	meq/L
Sum of Cations	3.842755	meq/L
Balance	1.873223	%
Total dissolved solids	291.774	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.556378	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.89	0.2562009	0.2562009
K	0.667	1.705956E-02	1.705956E-02
Ca	46.3	1.155247	2.310495
Mg	15.3	0.6295001	1.259
Cl	0.977	2.755784E-02	2.755784E-02
SO4	5.64	0.05875	0.1175
NO3			
HCO3	217	3.556378	3.556378

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.026144	1.835182	0.319	0.194
Ca/SO4	8.20922	19.66378	0.152	0.364
Na/Cl	6.028659	9.296842	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-061-GW	
Sample Date	6/23/2017	
Station	CFMW-061	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	4130	uS/cm
Sum of Anions	3.814581	meq/L
Sum of Cations	4.285638	meq/L
Balance	5.815358	%
Total dissolved solids	306.292	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.703877	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.01	0.2614206	0.2614206
K	0.692	1.769898E-02	1.769898E-02
Ca	51.1	1.275014	2.550028
Mg	17.7	0.7282453	1.456491
Cl	1.48	4.174576E-02	4.174576E-02
SO4	3.31	3.447917E-02	6.895833E-02
NO3			
HCO3	226	3.703877	3.703877

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.887005	1.750803	0.319	0.194
Ca/SO4	15.43807	36.97925	0.152	0.364
Na/Cl	4.060811	6.262208	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP5-GW	
Sample Date	12/7/2016	
Station	CFMW-061	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	52600	uS/cm
Sum of Anions	4.532562	meq/L
Sum of Cations	5.182929	meq/L
Balance	6.694122	%
Total dissolved solids	366.221	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.359431	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	11.1	0.4828235	0.4828235
K	0.861	2.202142E-02	2.202142E-02
Ca	60.6	1.512052	3.024103
Mg	20.1	0.8269904	1.653981
Cl	2.12	5.979798E-02	5.979798E-02
SO4	5.44	5.666667E-02	0.1133333
NO3			
HCO3	266	4.359431	4.359431

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.014925	1.828379	0.319	0.194
Ca/SO4	11.13971	26.68326	0.152	0.364
Na/Cl	5.235849	8.074244	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-064-GW	
Sample Date	9/15/2016	
Station	CFMW-064	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	40600	uS/cm
Sum of Anions	3.530334	meq/L
Sum of Cations	4.23996	meq/L
Balance	9.132541	%
Total dissolved solids	287.628	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.02	0.3923484	0.3923484
K	0.948	2.424658E-02	2.424658E-02
Ca	47.1	1.175208	2.350417
Mg	17.9	0.736474	1.472948
Cl	2.1	5.923384E-02	5.923384E-02
SO4	4.56	0.0475	0.095
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.631285	1.595723	0.319	0.194
Ca/SO4	10.32895	24.74123	0.152	0.364
Na/Cl	4.295238	6.623721	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-064-GW	
Sample Date	12/7/2016	
Station	CFMW-064	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	43400	uS/cm
Sum of Anions	4.536599	meq/L
Sum of Cations	4.331754	meq/L
Balance	-2.309842	%
Total dissolved solids	350.712	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.392209	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.4	0.4523751	0.4523751
K	0.982	2.511618E-02	2.511618E-02
Ca	46.4	1.157743	2.315485
Mg	18.7	0.769389	1.538778
Cl	1.98	5.584906E-02	5.584906E-02
SO4	4.25	4.427084E-02	8.854167E-02
NO3			
HCO3	268	4.392209	4.392209

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.481283	1.504756	0.319	0.194
Ca/SO4	10.91765	26.15136	0.152	0.364
Na/Cl	5.252525	8.099959	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-064-GW	
Sample Date	3/23/2017	
Station	CFMW-064	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	214000	uS/cm
Sum of Anions	3.767699	meq/L
Sum of Cations	4.020051	meq/L
Balance	3.240362	%
Total dissolved solids	297.214	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.572767	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	7.41	0.3223173	0.3223173
K	0.794	2.030779E-02	2.030779E-02
Ca	45	1.122811	2.245621
Mg	17.4	0.715902	1.431804
Cl	2.11	5.951591E-02	5.951591E-02
SO4	6.5	6.770834E-02	0.1354167
NO3			
HCO3	218	3.572767	3.572767

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.586207	1.568386	0.319	0.194
Ca/SO4	6.923077	16.58305	0.152	0.364
Na/Cl	3.511848	5.415649	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-064-GW	
Sample Date	6/23/2017	
Station	CFMW-064	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4310	uS/cm
Sum of Anions	4.065732	meq/L
Sum of Cations	4.541906	meq/L
Balance	5.531992	%
Total dissolved solids	325.124	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.900543	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	11.2	0.4871732	0.4871732
K	0.924	2.363274E-02	2.363274E-02
Ca	47.8	1.192674	2.385349
Mg	20	0.822876	1.645752
Cl	2.06	5.810558E-02	5.810558E-02
SO4	5.14	5.354167E-02	0.1070833
NO3			
HCO3	238	3.900543	3.900543

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.39	1.449397	0.319	0.194
Ca/SO4	9.299611	22.27563	0.152	0.364
Na/Cl	5.436893	8.384275	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP14-GW	
Sample Date	6/23/2017	
Station	CFMW-064	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4310	uS/cm
Sum of Anions	3.929336	meq/L
Sum of Cations	4.514894	meq/L
Balance	6.934418	%
Total dissolved solids	316.455	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.769433	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	11.1	0.4828235	0.4828235
K	0.945	2.416985E-02	2.416985E-02
Ca	47.5	1.185189	2.370378
Mg	19.9	0.8187615	1.637523
Cl	1.88	0.0530284	0.0530284
SO4	5.13	0.0534375	0.106875
NO3			
HCO3	230	3.769433	3.769433

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.386935	1.447539	0.319	0.194
Ca/SO4	9.259259	22.17897	0.152	0.364
Na/Cl	5.904255	9.104999	0.556	0.858
Cl/Br			287	648

APPENDIX P-2

Sample Summary Report of General Chemistry for Monitoring Wells Screened Below the Upper Hydrogeologic Unit

Sample Summary Report

Sample ID	CFMW-003a-GW	
Sample Date	9/20/2016	
Station	CFMW-003a	
Location		
Geology		
Watertype	Ca-Na-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	28100	uS/cm
Sum of Anions	2.84271	meq/L
Sum of Cations	2.834534	meq/L
Balance	-0.1440067	%
Total dissolved solids	214.45	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.83555	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	17.5	0.7612081	0.7612081
K	3.27	8.363535E-02	8.363535E-02
Ca	31	0.7734917	1.546983
Mg	5.38	0.2213536	0.4427073
Cl	8.6	0.2425767	0.2425767
SO4	36.7	0.3822917	0.7645833
NO3			
HCO3	112	1.83555	1.83555

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5.762082	3.494371	0.319	0.194
Ca/SO4	0.8446866	2.023303	0.152	0.364
Na/Cl	2.034884	3.13801	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-003a-GW	
Sample Date	12/12/2016	
Station	CFMW-003a	
Location		
Geology		
Watertype	Ca-Na-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	31200	uS/cm
Sum of Anions	2.451961	meq/L
Sum of Cations	2.79803	meq/L
Balance	6.591808	%
Total dissolved solids	191.83	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.486467	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	19.5	0.8482034	0.8482034
K	4.96	0.1268597	0.1268597
Ca	28.5	0.7111134	1.422227
Mg	4.87	0.2003703	0.4007406
Cl	8.6	0.2425767	0.2425767
SO4	34.7	0.3614584	0.7229167
NO3			
HCO3	90.7	1.486467	1.486467

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5.852156	3.548996	0.319	0.194
Ca/SO4	0.8213257	1.967345	0.152	0.364
Na/Cl	2.267442	3.496639	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-003a-GW	
Sample Date	3/20/2017	
Station	CFMW-003a	
Location		
Geology		
Watertype	Ca-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	198000	uS/cm
Sum of Anions	2.638532	meq/L
Sum of Cations	2.783998	meq/L
Balance	2.682611	%
Total dissolved solids	204.38	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.96666	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	14.5	0.6307153	0.6307153
K	3.1	7.928734E-02	7.928734E-02
Ca	31.7	0.7909577	1.581915
Mg	5.98	0.2460399	0.4920798
Cl	8.9	0.2510387	0.2510387
SO4	20.2	0.2104167	0.4208333
NO3			
HCO3	120	1.96666	1.96666

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5.301003	3.214754	0.319	0.194
Ca/SO4	1.569307	3.759007	0.152	0.364
Na/Cl	1.629214	2.512423	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-003a-GW	
Sample Date	6/19/2017	
Station	CFMW-003a	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	2900	uS/cm
Sum of Anions	2.596141	meq/L
Sum of Cations	3.218681	meq/L
Balance	10.70608	%
Total dissolved solids	212.07	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.130549	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	14.2	0.617666	0.617666
K	2.32	5.933762E-02	5.933762E-02
Ca	36.9	0.9207047	1.841409
Mg	8.51	0.3501337	0.7002674
Cl	6.24	0.1760091	0.1760091
SO4	13.9	0.1447917	0.2895833
NO3			
HCO3	130	2.130549	2.130549

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.336075	2.62958	0.319	0.194
Ca/SO4	2.654676	6.358824	0.152	0.364
Na/Cl	2.275641	3.509284	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-008a-GW	
Sample Date	9/15/2016	
Station	CFMW-008a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	490000	uS/cm
Sum of Anions	18.03078	meq/L
Sum of Cations	21.98534	meq/L
Balance	9.882406	%
Total dissolved solids	1544.294	mg/L
Total hardness		mg/l CaCO3
Alkalinity	17.37217	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	49.6	2.157481	2.157481
K	18	0.4603781	0.4603781
Ca	388	9.681123	19.36225
Mg	0.0636	2.616746E-03	5.233491E-03
Cl	8.43	0.2377816	0.2377816
SO4	20.2	0.2104167	0.4208333
NO3			
HCO3	1060	17.37217	17.37217

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	6100.628	3699.68	0.319	0.194
Ca/SO4	19.20792	46.0093	0.152	0.364
Na/Cl	5.883748	9.073373	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-008a-GW	
Sample Date	12/16/2016	
Station	CFMW-008a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	573000	uS/cm
Sum of Anions	21.88566	meq/L
Sum of Cations	24.99491	meq/L
Balance	6.632289	%
Total dissolved solids	1851.033	mg/L
Total hardness		mg/l CaCO3
Alkalinity	21.63326	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	66.4	2.888241	2.888241
K	23.2	0.5933762	0.5933762
Ca	431	10.75403	21.50806
Mg	0.0636	2.616746E-03	5.233491E-03
Cl	4.93	0.1390585	0.1390585
SO4	5.44	5.666667E-02	0.1133333
NO3			
HCO3	1320	21.63326	21.63326

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	6776.729	4109.696	0.319	0.194
Ca/SO4	79.22794	189.777	0.152	0.364
Na/Cl	13.46856	20.76997	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-008a-GW	
Sample Date	3/28/2017	
Station	CFMW-008a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	1800000	uS/cm
Sum of Anions	22.40676	meq/L
Sum of Cations	23.7848	meq/L
Balance	2.983313	%
Total dissolved solids	1854.692	mg/L
Total hardness		mg/l CaCO3
Alkalinity	22.12493	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	53.2	2.314073	2.314073
K	19.9	0.5089735	0.5089735
Ca	420	10.47957	20.95913
Mg	0.0318	1.308373E-03	2.616746E-03
Cl	5.56	0.1568287	0.1568287
SO4	6	0.0625	0.125
NO3			
HCO3	1350	22.12493	22.12493

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	13207.55	8009.617	0.319	0.194
Ca/SO4	70	167.673	0.152	0.364
Na/Cl	9.568346	14.75542	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-008a-GW	
Sample Date	6/28/2017	
Station	CFMW-008a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	56100	uS/cm
Sum of Anions	21.30316	meq/L
Sum of Cations	23.5664	meq/L
Balance	5.044057	%
Total dissolved solids	1783.486	mg/L
Total hardness		mg/l CaCO3
Alkalinity	20.97771	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	63.5	2.762098	2.762098
K	19.1	0.4885123	0.4885123
Ca	407	10.1552	20.3104
Mg	0.0656	2.699033E-03	5.398066E-03
Cl	5.09	0.1435716	0.1435716
SO4	8.73	0.0909375	0.181875
NO3			
HCO3	1280	20.97771	20.97771

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	6204.268	3762.532	0.319	0.194
Ca/SO4	46.62085	111.6723	0.152	0.364
Na/Cl	12.47544	19.23848	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-011a-GW	
Sample Date	9/20/2016	
Station	CFMW-011a	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	27100	uS/cm
Sum of Anions	2.538544	meq/L
Sum of Cations	2.887563	meq/L
Balance	6.432222	%
Total dissolved solids	204.15	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.163327	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	19.9	0.8656024	0.8656024
K	2.07	5.294348E-02	5.294348E-02
Ca	24.6	0.6138031	1.227606
Mg	9.01	0.3707056	0.7414113
Cl	4.07	0.1148008	0.1148008
SO4	12.5	0.1302083	0.2604167
NO3			
HCO3	132	2.163327	2.163327

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.7303	1.65577	0.319	0.194
Ca/SO4	1.968	4.714008	0.152	0.364
Na/Cl	4.889435	7.540035	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-011a-GW	
Sample Date	12/14/2016	
Station	CFMW-011a	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	39200	uS/cm
Sum of Anions	2.736449	meq/L
Sum of Cations	2.944162	meq/L
Balance	3.656532	%
Total dissolved solids	222.7	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.605825	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	24.1	1.048292	1.048292
K	3.12	7.979886E-02	7.979886E-02
Ca	21.7	0.5414442	1.082888
Mg	8.91	0.3665912	0.7331824
Cl	1.13	3.187345E-02	3.187345E-02
SO4	4.74	0.049375	0.09875
NO3			
HCO3	159	2.605825	2.605825

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.435466	1.47697	0.319	0.194
Ca/SO4	4.57806	10.96596	0.152	0.364
Na/Cl	21.32743	32.88921	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-011a-GW	
Sample Date	3/21/2017	
Station	CFMW-011a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	211000	uS/cm
Sum of Anions	3.293991	meq/L
Sum of Cations	3.533811	meq/L
Balance	3.512401	%
Total dissolved solids	261.47	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.081101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.9	0.4741239	0.4741239
K	1.43	3.657448E-02	3.657448E-02
Ca	37	0.9231998	1.8464
Mg	14.3	0.5883563	1.176713
Cl	1.07	3.018106E-02	3.018106E-02
SO4	8.77	9.135418E-02	0.1827084
NO3			
HCO3	188	3.081101	3.081101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.587413	1.569117	0.319	0.194
Ca/SO4	4.218928	10.10572	0.152	0.364
Na/Cl	10.18692	15.70932	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-011a-GW	
Sample Date	6/29/2017	
Station	CFMW-011a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3830	uS/cm
Sum of Anions	3.372434	meq/L
Sum of Cations	4.05062	meq/L
Balance	9.136219	%
Total dissolved solids	275.908	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.228601	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.74	0.4236667	0.4236667
K	1.85	4.731664E-02	4.731664E-02
Ca	43.7	1.090374	2.180748
Mg	17	0.6994445	1.398889
Cl	0.808	2.279093E-02	2.279093E-02
SO4	5.81	6.052084E-02	0.1210417
NO3			
HCO3	197	3.228601	3.228601

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.570588	1.558914	0.319	0.194
Ca/SO4	7.521515	18.0165	0.152	0.364
Na/Cl	12.05445	18.58927	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-012a-GW	
Sample Date	9/15/2016	
Station	CFMW-012a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	37800	uS/cm
Sum of Anions	3.403457	meq/L
Sum of Cations	3.925702	meq/L
Balance	7.125587	%
Total dissolved solids	277.232	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.277767	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.38	0.2775147	0.2775147
K	0.721	0.0184407	0.0184407
Ca	51.3	1.280004	2.560008
Mg	13	0.5348694	1.069739
Cl	0.571	1.610596E-02	1.610596E-02
SO4	5.26	5.479167E-02	0.1095833
NO3			
HCO3	200	3.277767	3.277767

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.946154	2.393115	0.319	0.194
Ca/SO4	9.752851	23.36129	0.152	0.364
Na/Cl	11.17338	17.23056	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-012a-GW	
Sample Date	12/13/2016	
Station	CFMW-012a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	39800	uS/cm
Sum of Anions	3.436495	meq/L
Sum of Cations	4.003279	meq/L
Balance	7.618294	%
Total dissolved solids	280.277	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.294156	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.49	0.2822995	0.2822995
K	0.767	1.961722E-02	1.961722E-02
Ca	52.9	1.319926	2.639853
Mg	12.9	0.530755	1.06151
Cl	1.73	4.879741E-02	4.879741E-02
SO4	4.49	4.677083E-02	9.354167E-02
NO3			
HCO3	201	3.294156	3.294156

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.100775	2.486884	0.319	0.194
Ca/SO4	11.78174	28.22114	0.152	0.364
Na/Cl	3.751445	5.785132	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-012a-GW	
Sample Date	3/20/2017	
Station	CFMW-012a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	193000	uS/cm
Sum of Anions	3.457298	meq/L
Sum of Cations	3.910004	meq/L
Balance	6.144804	%
Total dissolved solids	281.336	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.408878	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.13	0.2666403	0.2666403
K	0.796	2.035894E-02	2.035894E-02
Ca	51	1.272519	2.545037
Mg	13.1	0.5389838	1.077968
Cl	0.04	1.128264E-03	1.128264E-03
SO4	2.27	2.364583E-02	4.729167E-02
NO3			
HCO3	208	3.408878	3.408878

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.89313	2.360959	0.319	0.194
Ca/SO4	22.46696	53.81577	0.152	0.364
Na/Cl	153.25	236.328	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-012a-GW	
Sample Date	6/20/2017	
Station	CFMW-012a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3950	uS/cm
Sum of Anions	3.484252	meq/L
Sum of Cations	4.076616	meq/L
Balance	7.834605	%
Total dissolved solids	284.577	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.62	0.2879542	0.2879542
K	0.802	0.0205124	0.0205124
Ca	51.6	1.287489	2.574979
Mg	14.5	0.596585	1.19317
Cl	0.385	1.085954E-02	1.085954E-02
SO4	4.67	4.864584E-02	9.729167E-02
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.558621	2.158099	0.319	0.194
Ca/SO4	11.04925	26.46659	0.152	0.364
Na/Cl	17.19481	26.51624	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP2-GW	
Sample Date	9/15/2016	
Station	CFMW-012a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	37800	uS/cm
Sum of Anions	3.478984	meq/L
Sum of Cations	3.892614	meq/L
Balance	5.611134	%
Total dissolved solids	281.026	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.343323	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.19	0.2692502	0.2692502
K	0.726	1.856858E-02	1.856858E-02
Ca	50.8	1.267528	2.535057
Mg	13	0.5348694	1.069739
Cl	0.57	1.607776E-02	1.607776E-02
SO4	5.74	5.979167E-02	0.1195833
NO3			
HCO3	204	3.343323	3.343323

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.907692	2.369791	0.319	0.194
Ca/SO4	8.850175	21.19908	0.152	0.364
Na/Cl	10.85965	16.74675	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-019a-GW	
Sample Date	9/20/2016	
Station	CFMW-019a	
Location		
Geology		
Watertype	Na-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	37400	uS/cm
Sum of Anions	4.025936	meq/L
Sum of Cations	3.499143	meq/L
Balance	-7.000492	%
Total dissolved solids	318.06	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.638322	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	50.9	2.214028	2.214028
K	8.88	0.2271198	0.2271198
Ca	15.1	0.3767653	0.7535307
Mg	3.7	0.1522321	0.3044641
Cl	3.18	8.969697E-02	8.969697E-02
SO4	14.3	0.1489583	0.2979167
NO3			
HCO3	222	3.638322	3.638322

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.081081	2.474941	0.319	0.194
Ca/SO4	1.055944	2.529334	0.152	0.364
Na/Cl	16.00629	24.68342	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-019a-GW	
Sample Date	12/14/2016	
Station	CFMW-019a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	34200	uS/cm
Sum of Anions	3.199551	meq/L
Sum of Cations	3.701035	meq/L
Balance	7.267276	%
Total dissolved solids	258.97	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.015546	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10	0.4349761	0.4349761
K	1.52	3.887637E-02	3.887637E-02
Ca	40.1	1.000549	2.001098
Mg	14.9	0.6130426	1.226085
Cl	1.08	3.046312E-02	3.046312E-02
SO4	7.37	7.677083E-02	0.1535417
NO3			
HCO3	184	3.015546	3.015546

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.691275	1.632103	0.319	0.194
Ca/SO4	5.440977	13.03293	0.152	0.364
Na/Cl	9.259259	14.27877	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-019a-GW	
Sample Date	3/27/2017	
Station	CFMW-019a	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	199000	uS/cm
Sum of Anions	3.155219	meq/L
Sum of Cations	3.476644	meq/L
Balance	4.846677	%
Total dissolved solids	256.33	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.982768	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	22.2	0.9656469	0.9656469
K	2.77	7.084707E-02	7.084707E-02
Ca	30.1	0.7510355	1.502071
Mg	11.4	0.4690393	0.9380785
Cl	1.18	3.328378E-02	3.328378E-02
SO4	6.68	6.958333E-02	0.1391667
NO3			
HCO3	182	2.982768	2.982768

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.640351	1.601221	0.319	0.194
Ca/SO4	4.505988	10.79332	0.152	0.364
Na/Cl	18.81356	29.01254	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-019a-GW	
Sample Date	6/26/2017	
Station	CFMW-019a	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	3460	uS/cm
Sum of Anions	3.099537	meq/L
Sum of Cations	3.62894	meq/L
Balance	7.868092	%
Total dissolved solids	255.737	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.96638	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	19.1	0.8308043	0.8308043
K	3.17	8.107769E-02	8.107769E-02
Ca	34	0.8483458	1.696692
Mg	12.4	0.5101831	1.020366
Cl	0.917	2.586545E-02	2.586545E-02
SO4	5.15	5.364583E-02	0.1072917
NO3			
HCO3	181	2.96638	2.96638

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.741935	1.662826	0.319	0.194
Ca/SO4	6.601942	15.81382	0.152	0.364
Na/Cl	20.82879	32.12024	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP9-GW	
Sample Date	3/27/2017	
Station	CFMW-019a	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	180000	uS/cm
Sum of Anions	3.303167	meq/L
Sum of Cations	4.170893	meq/L
Balance	11.60984	%
Total dissolved solids	291.17	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.113879	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	22.6	0.9830459	0.9830459
K	28.2	0.721259	0.721259
Ca	30.3	0.7560258	1.512052
Mg	11.6	0.4772681	0.9545361
Cl	1.74	4.907947E-02	4.907947E-02
SO4	6.73	7.010417E-02	0.1402083
NO3			
HCO3	190	3.113879	3.113879

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.612069	1.584069	0.319	0.194
Ca/SO4	4.502229	10.78432	0.152	0.364
Na/Cl	12.98851	20.02967	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-025a-GW	
Sample Date	9/13/2016	
Station	CFMW-025a	
Location		
Geology		
Watertype	Mg-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	38600	uS/cm
Sum of Anions	3.317329	meq/L
Sum of Cations	4.332813	meq/L
Balance	13.27406	%
Total dissolved solids	270.73	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.982768	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	8.85	0.3849538	0.3849538
K	2.09	5.345501E-02	5.345501E-02
Ca	38.3	0.9556366	1.911273
Mg	24.1	0.9915655	1.983131
Cl	1.89	5.331046E-02	5.331046E-02
SO4	13.5	0.140625	0.28125
NO3			
HCO3	182	2.982768	2.982768

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.589212	0.9637654	0.319	0.194
Ca/SO4	2.837037	6.795638	0.152	0.364
Na/Cl	4.68254	7.220981	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-025a-GW	
Sample Date	12/5/2016	
Station	CFMW-025a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	115000	uS/cm
Sum of Anions	9.442129	meq/L
Sum of Cations	10.01541	meq/L
Balance	2.94631	%
Total dissolved solids	753.85	mg/L
Total hardness		mg/l CaCO3
Alkalinity	9.177749	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.18	0.3993081	0.3993081
K	2.5	0.0639414	0.0639414
Ca	137	3.418334	6.836669
Mg	33	1.357745	2.715491
Cl	1.47	0.0414637	0.0414637
SO4	10.7	0.1114583	0.2229167
NO3			
HCO3	560	9.177749	9.177749

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.151515	2.517655	0.319	0.194
Ca/SO4	12.80374	30.66917	0.152	0.364
Na/Cl	6.244898	9.630305	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-025a-GW	
Sample Date	3/24/2017	
Station	CFMW-025a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	219000	uS/cm
Sum of Anions	3.680413	meq/L
Sum of Cations	4.15288	meq/L
Balance	6.031515	%
Total dissolved solids	289.32	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.310545	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	7.41	0.3223173	0.3223173
K	1.95	4.987429E-02	4.987429E-02
Ca	38	0.9481512	1.896302
Mg	22.9	0.942193	1.884386
Cl	1.96	5.528492E-02	5.528492E-02
SO4	15.1	0.1572917	0.3145834
NO3			
HCO3	202	3.310545	3.310545

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.659389	1.006324	0.319	0.194
Ca/SO4	2.516556	6.02798	0.152	0.364
Na/Cl	3.780612	5.830112	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-025a-GW	
Sample Date	6/22/2017	
Station	CFMW-025a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3930	uS/cm
Sum of Anions	3.669099	meq/L
Sum of Cations	4.961365	meq/L
Balance	14.97331	%
Total dissolved solids	304.09	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.359712	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	7.37	0.3205774	0.3205774
K	3.11	0.0795431	0.0795431
Ca	48.2	1.202655	2.40531
Mg	26.2	1.077968	2.155935
Cl	1.81	5.105393E-02	5.105393E-02
SO4	12.4	0.1291667	0.2583333
NO3			
HCO3	205	3.359712	3.359712

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.839695	1.115669	0.319	0.194
Ca/SO4	3.887097	9.310878	0.152	0.364
Na/Cl	4.071823	6.27919	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-032a-GW	
Sample Date	9/16/2016	
Station	CFMW-032a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	640000	uS/cm
Sum of Anions	27.14687	meq/L
Sum of Cations	33.00142	meq/L
Balance	9.733514	%
Total dissolved solids	2329.534	mg/L
Total hardness		mg/l CaCO3
Alkalinity	27.04158	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	25.4	1.104839	1.104839
K	21.6	0.5524537	0.5524537
Ca	628	15.66945	31.33889
Mg	0.0636	2.616746E-03	5.233491E-03
Cl	1.65	4.654088E-02	4.654088E-02
SO4	2.82	0.029375	0.05875
NO3			
HCO3	1650	27.04158	27.04158

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	9874.213	5988.142	0.319	0.194
Ca/SO4	222.695	533.4279	0.152	0.364
Na/Cl	15.39394	23.73911	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-032a-GW	
Sample Date	12/16/2016	
Station	CFMW-032a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	391000	uS/cm
Sum of Anions	13.07519	meq/L
Sum of Cations	13.24741	meq/L
Balance	0.6542677	%
Total dissolved solids	1062.719	mg/L
Total hardness		mg/l CaCO3
Alkalinity	12.83246	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	11.9	0.5176215	0.5176215
K	3.86	9.872552E-02	9.872552E-02
Ca	253	6.312691	12.62538
Mg	0.069	2.838922E-03	5.677844E-03
Cl	2.15	6.064418E-02	6.064418E-02
SO4	8.74	9.104167E-02	0.1820833
NO3			
HCO3	783	12.83246	12.83246

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3666.667	2223.623	0.319	0.194
Ca/SO4	28.94737	69.33848	0.152	0.364
Na/Cl	5.534883	8.535387	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-032a-GW	
Sample Date	3/29/2017	
Station	CFMW-032a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	1200000	uS/cm
Sum of Anions	20.49736	meq/L
Sum of Cations	22.5661	meq/L
Balance	4.803927	%
Total dissolved solids	1705.532	mg/L
Total hardness		mg/l CaCO3
Alkalinity	20.32216	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	13.9	0.6046167	0.6046167
K	7.87	0.2012875	0.2012875
Ca	436	10.87879	21.75757
Mg	0.0318	1.308373E-03	2.616746E-03
Cl	1.92	5.415666E-02	5.415666E-02
SO4	5.81	6.052084E-02	0.1210417
NO3			
HCO3	1240	20.32216	20.32216

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	13710.69	8314.745	0.319	0.194
Ca/SO4	75.04303	179.7528	0.152	0.364
Na/Cl	7.239583	11.16422	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-032a-GW	
Sample Date	6/27/2017	
Station	CFMW-032a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	51500	uS/cm
Sum of Anions	19.29964	meq/L
Sum of Cations	20.66761	meq/L
Balance	3.422731	%
Total dissolved solids	1599.649	mg/L
Total hardness		mg/l CaCO3
Alkalinity	19.17494	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	17.7	0.7699077	0.7699077
K	16.2	0.4143403	0.4143403
Ca	390	9.731025	19.46205
Mg	0.259	1.065624E-02	2.131249E-02
Cl	1.4	3.948923E-02	3.948923E-02
SO4	4.09	4.260417E-02	8.520834E-02
NO3			
HCO3	1170	19.17494	19.17494

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1505.792	913.1759	0.319	0.194
Ca/SO4	95.35452	228.4054	0.152	0.364
Na/Cl	12.64286	19.49665	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044b-GW	
Sample Date	9/19/2016	
Station	CFMW-044b	
Location		
Geology		
Watertype	Mg-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	25500	uS/cm
Sum of Anions	2.279258	meq/L
Sum of Cations	2.275506	meq/L
Balance	-8.238038E-02	%
Total dissolved solids	172.946	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.163327	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.9	0.1696407	0.1696407
K	2.52	6.445293E-02	6.445293E-02
Ca	13.7	0.3418334	0.6836669
Mg	16.5	0.6788726	1.357745
Cl	3.5	9.872308E-02	9.872308E-02
SO4	0.826	8.604167E-03	1.720833E-02
NO3			
HCO3	132	2.163327	2.163327

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.830303	0.503531	0.319	0.194
Ca/SO4	16.58596	39.72882	0.152	0.364
Na/Cl	1.114286	1.718349	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044b-GW	
Sample Date	12/19/2016	
Station	CFMW-044b	
Location		
Geology		
Watertype	Mg-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	30500	uS/cm
Sum of Anions	3.0585	meq/L
Sum of Cations	3.544568	meq/L
Balance	7.361241	%
Total dissolved solids	242.15	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.900824	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.06	0.1766003	0.1766003
K	1.44	3.683025E-02	3.683025E-02
Ca	31.3	0.7809771	1.561954
Mg	21.5	0.8845916	1.769183
Cl	2.03	5.725938E-02	5.725938E-02
SO4	4.82	5.020834E-02	0.1004167
NO3			
HCO3	177	2.900824	2.900824

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.455814	0.8828674	0.319	0.194
Ca/SO4	6.493775	15.55473	0.152	0.364
Na/Cl	2	3.084215	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044b-GW	
Sample Date	3/24/2017	
Station	CFMW-044b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	208000	uS/cm
Sum of Anions	3.544952	meq/L
Sum of Cations	3.851208	meq/L
Balance	4.140744	%
Total dissolved solids	277.99	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.408878	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.02	0.1748604	0.1748604
K	1.01	2.583233E-02	2.583233E-02
Ca	37.7	0.9406658	1.881332
Mg	21.5	0.8845916	1.769183
Cl	2.18	6.149038E-02	6.149038E-02
SO4	3.58	3.729167E-02	7.458334E-02
NO3			
HCO3	208	3.408878	3.408878

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.753488	1.06339	0.319	0.194
Ca/SO4	10.53073	25.22456	0.152	0.364
Na/Cl	1.844037	2.843703	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-044b-GW	
Sample Date	6/23/2017	
Station	CFMW-044b	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	4060	uS/cm
Sum of Anions	3.652735	meq/L
Sum of Cations	4.138577	meq/L
Balance	6.23568	%
Total dissolved solids	289.55	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.490822	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.84	0.2105284	0.2105284
K	1	2.557656E-02	2.557656E-02
Ca	41.1	1.0255	2.051001
Mg	22.5	0.9257354	1.851471
Cl	1.87	5.274633E-02	5.274633E-02
SO4	5.24	5.458333E-02	0.1091667
NO3			
HCO3	213	3.490822	3.490822

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.826667	1.107768	0.319	0.194
Ca/SO4	7.843512	18.78779	0.152	0.364
Na/Cl	2.588235	3.991338	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-053a-GW	
Sample Date	9/19/2016	
Station	CFMW-053a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	930000	uS/cm
Sum of Anions	38.2342	meq/L
Sum of Cations	52.11986	meq/L
Balance	15.36805	%
Total dissolved solids	3417.194	mg/L
Total hardness		mg/l CaCO3
Alkalinity	38.0221	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	102	4.436756	4.436756
K	65.2	1.667592	1.667592
Ca	922	23.00514	46.01028
Mg	0.0636	2.616746E-03	5.233491E-03
Cl	6.36	0.1793939	0.1793939
SO4	1.57	1.635417E-02	3.270834E-02
NO3			
HCO3	2320	38.0221	38.0221

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	14496.85	8791.508	0.319	0.194
Ca/SO4	587.2611	1406.684	0.152	0.364
Na/Cl	16.03773	24.73192	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-053a-GW	
Sample Date	12/19/2016	
Station	CFMW-053a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	552000	uS/cm
Sum of Anions	33.28387	meq/L
Sum of Cations	32.00895	meq/L
Balance	-1.952615	%
Total dissolved solids	2680.784	mg/L
Total hardness		mg/l CaCO3
Alkalinity	33.10545	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	47.5	2.066136	2.066136
K	13.5	0.3452836	0.3452836
Ca	593	14.79615	29.5923
Mg	0.0636	2.616746E-03	5.233491E-03
Cl	5.21	0.1469564	0.1469564
SO4	1.51	1.572917E-02	3.145833E-02
NO3			
HCO3	2020	33.10545	33.10545

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	9323.898	5654.408	0.319	0.194
Ca/SO4	392.7152	940.6823	0.152	0.364
Na/Cl	9.117083	14.05952	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-053a-GW	
Sample Date	3/27/2017	
Station	CFMW-053a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	2300000	uS/cm
Sum of Anions	33.86773	meq/L
Sum of Cations	33.69478	meq/L
Balance	-0.2559919	%
Total dissolved solids	2749.352	mg/L
Total hardness		mg/l CaCO3
Alkalinity	33.43323	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	92.7	4.032228	4.032228
K	12.4	0.3171493	0.3171493
Ca	588	14.67139	29.34278
Mg	0.0318	1.308373E-03	2.616746E-03
Cl	13.1	0.3695064	0.3695064
SO4	3.12	0.0325	0.065
NO3			
HCO3	2040	33.43323	33.43323

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	18490.56	11213.46	0.319	0.194
Ca/SO4	188.4615	451.4275	0.152	0.364
Na/Cl	7.076335	10.91247	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-053a-GW	
Sample Date	6/28/2017	
Station	CFMW-053a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	71500	uS/cm
Sum of Anions	30.35826	meq/L
Sum of Cations	31.67739	meq/L
Balance	2.126403	%
Total dissolved solids	2491.742	mg/L
Total hardness		mg/l CaCO3
Alkalinity	30.15546	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	31.2	1.357125	1.357125
K	10.8	0.2762268	0.2762268
Ca	602	15.02071	30.04142
Mg	0.0318	1.308373E-03	2.616746E-03
Cl	5.72	0.1613417	0.1613417
SO4	1.99	2.072917E-02	4.145833E-02
NO3			
HCO3	1840	30.15546	30.15546

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	18930.82	11480.45	0.319	0.194
Ca/SO4	302.5126	724.6171	0.152	0.364
Na/Cl	5.454546	8.411497	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056-GW	
Sample Date	9/20/2016	
Station	CFMW-056	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	37900	uS/cm
Sum of Anions	3.483422	meq/L
Sum of Cations	4.187535	meq/L
Balance	9.17894	%
Total dissolved solids	284.059	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.1	0.1783402	0.1783402
K	1.57	0.0401552	0.0401552
Ca	48.7	1.215131	2.430261
Mg	18.7	0.769389	1.538778
Cl	0.459	1.294683E-02	1.294683E-02
SO4	4.53	0.0471875	9.437501E-02
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.604278	1.579345	0.319	0.194
Ca/SO4	10.75055	25.75111	0.152	0.364
Na/Cl	8.932462	13.77482	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056-GW	
Sample Date	12/13/2016	
Station	CFMW-056	
Location		
Geology		
Watertype	Mg-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	12000	uS/cm
Sum of Anions	0.9413592	meq/L
Sum of Cations	1.092073	meq/L
Balance	7.411807	%
Total dissolved solids	73.64	mg/L
Total hardness		mg/l CaCO3
Alkalinity	0.8440251	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.59	0.199654	0.199654
K	1.59	4.066673E-02	4.066673E-02
Ca	4.8	0.1197665	0.2395329
Mg	7.44	0.3061098	0.6122197
Cl	2.69	7.587574E-02	7.587574E-02
SO4	1.03	1.072917E-02	2.145833E-02
NO3			
HCO3	51.5	0.8440251	0.8440251

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	0.6451613	0.3912532	0.319	0.194
Ca/SO4	4.660194	11.1627	0.152	0.364
Na/Cl	1.70632	2.631329	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056-GW	
Sample Date	3/22/2017	
Station	CFMW-056	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	211000	uS/cm
Sum of Anions	3.757007	meq/L
Sum of Cations	4.095235	meq/L
Balance	4.307409	%
Total dissolved solids	299.077	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.638322	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.98	0.1731205	0.1731205
K	1.53	3.913214E-02	3.913214E-02
Ca	47.8	1.192674	2.385349
Mg	18.2	0.7488171	1.497634
Cl	0.367	1.035182E-02	1.035182E-02
SO4	5.2	5.416667E-02	0.1083333
NO3			
HCO3	222	3.638322	3.638322

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.626374	1.592744	0.319	0.194
Ca/SO4	9.192307	22.0186	0.152	0.364
Na/Cl	10.84469	16.72367	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056-GW	
Sample Date	6/22/2017	
Station	CFMW-056	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3990	uS/cm
Sum of Anions	3.654265	meq/L
Sum of Cations	4.26488	meq/L
Balance	7.710618	%
Total dissolved solids	295.717	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.556378	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.25	0.1848648	0.1848648
K	1.57	0.0401552	0.0401552
Ca	48.8	1.217626	2.435251
Mg	19.5	0.802304	1.604608
Cl	0.287	8.095292E-03	8.095292E-03
SO4	4.31	4.489584E-02	8.979167E-02
NO3			
HCO3	217	3.556378	3.556378

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.502564	1.517661	0.319	0.194
Ca/SO4	11.32251	27.12113	0.152	0.364
Na/Cl	14.80836	22.83609	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP3-GW	
Sample Date	9/20/2016	
Station	CFMW-056	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	37900	uS/cm
Sum of Anions	3.47928	meq/L
Sum of Cations	4.270464	meq/L
Balance	10.20917	%
Total dissolved solids	285.386	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.28	0.1861698	0.1861698
K	1.59	4.066673E-02	4.066673E-02
Ca	49.7	1.240082	2.480164
Mg	19	0.7817321	1.563464
Cl	0.386	1.088775E-02	1.088775E-02
SO4	4.43	4.614583E-02	9.229167E-02
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.615789	1.586326	0.319	0.194
Ca/SO4	11.21896	26.87311	0.152	0.364
Na/Cl	11.08808	17.09902	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056a-GW	
Sample Date	9/20/2016	
Station	CFMW-056a	
Location		
Geology		
Watertype	Na-Ca-SO4-HCO3	
Temperature (℃)		
pH		
Conductivity	29800	uS/cm
Sum of Anions	4.447114	meq/L
Sum of Cations	2.980491	meq/L
Balance	-19.74556	%
Total dissolved solids	295.87	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.933883	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	26.7	1.161386	1.161386
K	10.8	0.2762268	0.2762268
Ca	18.6	0.4640951	0.9281901
Mg	7.47	0.3073442	0.6146883
Cl	17.9	0.504898	0.504898
SO4	96.4	1.004167	2.008333
NO3			
HCO3	118	1.933883	1.933883

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.48996	1.510017	0.319	0.194
Ca/SO4	0.1929461	0.4621693	0.152	0.364
Na/Cl	1.49162	2.300239	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056a-GW	
Sample Date	12/6/2016	
Station	CFMW-056a	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	29800	uS/cm
Sum of Anions	2.53301	meq/L
Sum of Cations	3.12678	meq/L
Balance	10.49103	%
Total dissolved solids	207.43	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.983049	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	18.3	0.7960062	0.7960062
K	6.16	0.1575516	0.1575516
Ca	26.4	0.6587155	1.317431
Mg	10.4	0.4278955	0.855791
Cl	3.47	9.787688E-02	9.787688E-02
SO4	21.7	0.2260417	0.4520833
NO3			
HCO3	121	1.983049	1.983049

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.538462	1.539431	0.319	0.194
Ca/SO4	1.21659	2.914133	0.152	0.364
Na/Cl	5.273775	8.13273	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056a-GW	
Sample Date	3/30/2017	
Station	CFMW-056a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	199000	uS/cm
Sum of Anions	3.221561	meq/L
Sum of Cations	3.680561	meq/L
Balance	6.650124	%
Total dissolved solids	259.98	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.064713	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.29	0.4040928	0.4040928
K	2.67	6.828941E-02	6.828941E-02
Ca	38.4	0.9581317	1.916263
Mg	15.7	0.6459576	1.291915
Cl	1.72	4.851534E-02	4.851534E-02
SO4	5.2	5.416667E-02	0.1083333
NO3			
HCO3	187	3.064713	3.064713

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.44586	1.483273	0.319	0.194
Ca/SO4	7.384616	17.68859	0.152	0.364
Na/Cl	5.401163	8.329175	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-056a-GW	
Sample Date	6/22/2017	
Station	CFMW-056a	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	3150	uS/cm
Sum of Anions	2.790767	meq/L
Sum of Cations	3.582341	meq/L
Balance	12.42054	%
Total dissolved solids	235.97	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.638603	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	17.8	0.7742574	0.7742574
K	7.65	0.1956607	0.1956607
Ca	29.1	0.7260842	1.452168
Mg	14.1	0.5801275	1.160255
Cl	2.78	7.841433E-02	7.841433E-02
SO4	3.54	0.036875	0.07375
NO3			
HCO3	161	2.638603	2.638603

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.06383	1.251594	0.319	0.194
Ca/SO4	8.220339	19.69042	0.152	0.364
Na/Cl	6.402877	9.873927	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP4-GW	
Sample Date	12/6/2016	
Station	CFMW-056a	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	29800	uS/cm
Sum of Anions	2.593379	meq/L
Sum of Cations	3.193983	meq/L
Balance	10.37785	%
Total dissolved solids	212.46	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.048605	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	18.2	0.7916565	0.7916565
K	6.5	0.1662476	0.1662476
Ca	27	0.6736863	1.347373
Mg	10.8	0.444353	0.888706
Cl	3.36	9.477416E-02	9.477416E-02
SO4	21.6	0.225	0.45
NO3			
HCO3	125	2.048605	2.048605

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.5	1.516106	0.319	0.194
Ca/SO4	1.25	2.994161	0.152	0.364
Na/Cl	5.416667	8.353084	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-057-GW	
Sample Date	9/19/2016	
Station	CFMW-057	
Location		
Geology		
Watertype	Mg-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	21200	uS/cm
Sum of Anions	2.099368	meq/L
Sum of Cations	2.51188	meq/L
Balance	8.94579	%
Total dissolved solids	168.957	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.064993	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.7	0.1609412	0.1609412
K	1.73	4.424745E-02	4.424745E-02
Ca	20.5	0.5115026	1.023005
Mg	15.6	0.6418433	1.283687
Cl	0.63	1.777015E-02	1.777015E-02
SO4	0.797	8.302083E-03	1.660417E-02
NO3			
HCO3	126	2.064993	2.064993

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.314103	0.7969276	0.319	0.194
Ca/SO4	25.72146	61.61136	0.152	0.364
Na/Cl	5.873016	9.056824	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-057-GW	
Sample Date	12/5/2016	
Station	CFMW-057	
Location		
Geology		
Watertype	Mg-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	26000	uS/cm
Sum of Anions	2.132926	meq/L
Sum of Cations	2.468543	meq/L
Balance	7.29369	%
Total dissolved solids	170.058	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.097771	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.8	0.1652909	0.1652909
K	1.69	4.322439E-02	4.322439E-02
Ca	19.4	0.4840561	0.9681122
Mg	15.7	0.6459576	1.291915
Cl	0.62	1.748809E-02	1.748809E-02
SO4	0.848	8.833334E-03	1.766667E-02
NO3			
HCO3	128	2.097771	2.097771

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.235669	0.7493621	0.319	0.194
Ca/SO4	22.87736	54.7988	0.152	0.364
Na/Cl	6.129032	9.451628	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-057-GW	
Sample Date	3/29/2017	
Station	CFMW-057	
Location		
Geology		
Watertype	Mg-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	128000	uS/cm
Sum of Anions	2.661444	meq/L
Sum of Cations	2.964103	meq/L
Balance	5.380077	%
Total dissolved solids	209.513	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.638603	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.85	0.1674658	0.1674658
K	1.82	4.654934E-02	4.654934E-02
Ca	21.8	0.5439394	1.087879
Mg	20.2	0.8311048	1.66221
Cl	0.716	2.019592E-02	2.019592E-02
SO4	0.127	1.322917E-03	2.645833E-03
NO3			
HCO3	161	2.638603	2.638603

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.079208	0.6544775	0.319	0.194
Ca/SO4	171.6535	411.1667	0.152	0.364
Na/Cl	5.377095	8.292059	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-057-GW	
Sample Date	6/28/2017	
Station	CFMW-057	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	3940	uS/cm
Sum of Anions	3.684471	meq/L
Sum of Cations	4.245728	meq/L
Balance	7.077469	%
Total dissolved solids	295.004	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.589155	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.88	0.2557659	0.2557659
K	2.36	6.036068E-02	6.036068E-02
Ca	39.5	0.9855782	1.971156
Mg	23.8	0.9792224	1.958445
Cl	0.314	8.856871E-03	8.856871E-03
SO4	4.15	4.322917E-02	8.645834E-02
NO3			
HCO3	219	3.589155	3.589155

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.659664	1.006491	0.319	0.194
Ca/SO4	9.518072	22.79892	0.152	0.364
Na/Cl	18.72611	28.87769	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-DUP11-GW	
Sample Date	3/29/2017	
Station	CFMW-057	
Location		
Geology		
Watertype	Mg-Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	127000	uS/cm
Sum of Anions	2.645056	meq/L
Sum of Cations	2.964103	meq/L
Balance	5.687977	%
Total dissolved solids	208.513	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.622214	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.85	0.1674658	0.1674658
K	1.82	4.654934E-02	4.654934E-02
Ca	21.8	0.5439394	1.087879
Mg	20.2	0.8311048	1.66221
Cl	0.716	2.019592E-02	2.019592E-02
SO4	0.127	1.322917E-03	2.645833E-03
NO3			
HCO3	160	2.622214	2.622214

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	1.079208	0.6544775	0.319	0.194
Ca/SO4	171.6535	411.1667	0.152	0.364
Na/Cl	5.377095	8.292059	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-057a-GW	
Sample Date	9/19/2016	
Station	CFMW-057a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	832000	uS/cm
Sum of Anions	30.68964	meq/L
Sum of Cations	31.55387	meq/L
Balance	1.388459	%
Total dissolved solids	2514.864	mg/L
Total hardness		mg/l CaCO3
Alkalinity	30.48324	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	48.1	2.092235	2.092235
K	18.1	0.4629357	0.4629357
Ca	581	14.49673	28.99346
Mg	0.0636	2.616746E-03	5.233491E-03
Cl	6.52	0.183907	0.183907
SO4	1.08	0.01125	0.0225
NO3			
HCO3	1860	30.48324	30.48324

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	9135.22	5539.985	0.319	0.194
Ca/SO4	537.963	1288.598	0.152	0.364
Na/Cl	7.3773	11.37659	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-057a-GW	
Sample Date	12/16/2016	
Station	CFMW-057a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	289000	uS/cm
Sum of Anions	19.79703	meq/L
Sum of Cations	18.56464	meq/L
Balance	-3.212559	%
Total dissolved solids	1583.754	mg/L
Total hardness		mg/l CaCO3
Alkalinity	19.6666	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	28.2	1.226633	1.226633
K	6.5	0.1662476	0.1662476
Ca	344	8.583263	17.16653
Mg	0.0636	2.616746E-03	5.233491E-03
Cl	3.59	0.1012617	0.1012617
SO4	1.4	1.458333E-02	2.916667E-02
NO3			
HCO3	1200	19.6666	19.6666

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5408.805	3280.129	0.319	0.194
Ca/SO4	245.7143	588.5667	0.152	0.364
Na/Cl	7.855154	12.11349	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-057a-GW	
Sample Date	3/22/2017	
Station	CFMW-057a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (°C)		
pH		
Conductivity	680000	uS/cm
Sum of Anions	8.82348	meq/L
Sum of Cations	9.15926	meq/L
Balance	1.867236	%
Total dissolved solids	722.6118	mg/L
Total hardness		mg/l CaCO3
Alkalinity	8.341918	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	26.6	1.157036	1.157036
K	12.3	0.3145917	0.3145917
Ca	154	3.842507	7.685015
Mg	0.0318	1.308373E-03	2.616746E-03
Cl	6.88	0.1940614	0.1940614
SO4	13.8	0.14375	0.2875
NO3			
HCO3	509	8.341918	8.341918

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4842.767	2936.86	0.319	0.194
Ca/SO4	11.15942	26.73048	0.152	0.364
Na/Cl	3.866279	5.962219	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-057a-GW	
Sample Date	6/28/2017	
Station	CFMW-057a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	15200	uS/cm
Sum of Anions	5.828938	meq/L
Sum of Cations	6.841378	meq/L
Balance	7.990639	%
Total dissolved solids	489.886	mg/L
Total hardness		mg/l CaCO3
Alkalinity	5.129706	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	21.6	0.9395483	0.9395483
K	11.5	0.2941304	0.2941304
Ca	112	2.794551	5.589102
Mg	0.226	9.298498E-03	0.018597
Cl	5.66	0.1596493	0.1596493
SO4	25.9	0.2697917	0.5395833
NO3			
HCO3	313	5.129706	5.129706

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	495.5752	300.5379	0.319	0.194
Ca/SO4	4.324325	10.35818	0.152	0.364
Na/Cl	3.816255	5.885076	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-059a-GW	
Sample Date	9/19/2016	
Station	CFMW-059a	
Location		
Geology		
Watertype	Ca-HCO3	
Temperature (℃)		
pH		
Conductivity	501000	uS/cm
Sum of Anions	18.07872	meq/L
Sum of Cations	17.84458	meq/L
Balance	-0.6517787	%
Total dissolved solids	1460.054	mg/L
Total hardness		mg/l CaCO3
Alkalinity	17.69994	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	15.4	0.6698631	0.6698631
K	7.92	0.2025664	0.2025664
Ca	340	8.483458	16.96692
Mg	0.0636	2.616746E-03	5.233491E-03
Cl	4.27	0.1204422	0.1204422
SO4	12.4	0.1291667	0.2583333
NO3			
HCO3	1080	17.69994	17.69994

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5345.912	3241.988	0.319	0.194
Ca/SO4	27.41936	65.67838	0.152	0.364
Na/Cl	3.606557	5.561699	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-059a-GW	
Sample Date	12/16/2016	
Station	CFMW-059a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	25800	uS/cm
Sum of Anions	2.15036	meq/L
Sum of Cations	2.491342	meq/L
Balance	7.34607	%
Total dissolved solids	172.245	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.917494	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.43	0.1491968	0.1491968
K	1.21	3.094764E-02	3.094764E-02
Ca	29	0.7235891	1.447178
Mg	10.5	0.4320099	0.8640198
Cl	0.205	5.782352E-03	5.782352E-03
SO4	10.9	0.1135417	0.2270833
NO3			
HCO3	117	1.917494	1.917494

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.761905	1.674936	0.319	0.194
Ca/SO4	2.660551	6.372895	0.152	0.364
Na/Cl	16.73171	25.8021	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-059a-GW	
Sample Date	3/29/2017	
Station	CFMW-059a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	129000	uS/cm
Sum of Anions	2.06447	meq/L
Sum of Cations	2.633393	meq/L
Balance	12.11025	%
Total dissolved solids	170.814	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.868327	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.8	0.1652909	0.1652909
K	1.56	3.989943E-02	3.989943E-02
Ca	32.4	0.8084236	1.616847
Mg	9.86	0.4056778	0.8113557
Cl	0.624	1.760091E-02	1.760091E-02
SO4	8.57	8.927083E-02	0.1785417
NO3			
HCO3	114	1.868327	1.868327

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.286004	1.992773	0.319	0.194
Ca/SO4	3.78063	9.055855	0.152	0.364
Na/Cl	6.089744	9.391041	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFMW-059a-GW	
Sample Date	6/28/2017	
Station	CFMW-059a	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	2520	uS/cm
Sum of Anions	2.36343	meq/L
Sum of Cations	3.103856	meq/L
Balance	13.54283	%
Total dissolved solids	198.669	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.212493	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.05	0.1761653	0.1761653
K	1.94	4.961853E-02	4.961853E-02
Ca	39.7	0.9905685	1.981137
Mg	10.9	0.4484674	0.8969347
Cl	0.469	1.322889E-02	1.322889E-02
SO4	6.61	6.885417E-02	0.1377083
NO3			
HCO3	135	2.212493	2.212493

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.642202	2.208786	0.319	0.194
Ca/SO4	6.006052	14.38647	0.152	0.364
Na/Cl	8.635395	13.31671	0.556	0.858
Cl/Br			287	648

APPENDIX P-3

Sample Summary Report of General Chemistry in Surface Water

Sample Summary Report

Sample ID	CFSWP-001-SW	
Sample Date	9/16/2016	
Station	CFSWP-001	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	16800	uS/cm
Sum of Anions	1.492867	meq/L
Sum of Cations	1.782686	meq/L
Balance	8.847943	%
Total dissolved solids	121.769	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.407801	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.07	4.654244E-02	4.654244E-02
K	0.33	8.440265E-03	8.440265E-03
Ca	24.2	0.6038226	1.207645
Mg	6.32	0.2600288	0.5200576
Cl	0.379	0.0106903	0.0106903
SO4	3.57	0.0371875	0.074375
NO3			
HCO3	85.9	1.407801	1.407801

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.829114	2.322137	0.319	0.194
Ca/SO4	6.778712	16.23725	0.152	0.364
Na/Cl	2.823219	4.353708	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-001-SW	
Sample Date	12/2/2016	
Station	CFSWP-001	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	19400	uS/cm
Sum of Anions	1.613083	meq/L
Sum of Cations	1.904407	meq/L
Balance	8.282174	%
Total dissolved solids	129.731	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.443856	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.2	5.219713E-02	5.219713E-02
K	0.341	8.721607E-03	8.721607E-03
Ca	25.3	0.631269	1.262538
Mg	7.06	0.2904752	0.5809504
Cl	1.11	3.130932E-02	3.130932E-02
SO4	6.62	6.895833E-02	0.1379167
NO3			
HCO3	88.1	1.443856	1.443856

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.583569	2.173229	0.319	0.194
Ca/SO4	3.821752	9.154354	0.152	0.364
Na/Cl	1.081081	1.667143	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-001-SW	
Sample Date	4/4/2017	
Station	CFSWP-001	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	17900	uS/cm
Sum of Anions	1.526199	meq/L
Sum of Cations	1.729711	meq/L
Balance	6.250535	%
Total dissolved solids	122.878	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.442218	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.01	4.393258E-02	4.393258E-02
K	0.368	9.412174E-03	9.412174E-03
Ca	23.6	0.5888518	1.177704
Mg	6.06	0.2493314	0.4986628
Cl	0.54	1.523156E-02	1.523156E-02
SO4	3.3	0.034375	0.06875
NO3			
HCO3	88	1.442218	1.442218

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.89439	2.361723	0.319	0.194
Ca/SO4	7.151515	17.13023	0.152	0.364
Na/Cl	1.87037	2.884312	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-001-SW	
Sample Date	6/14/2017	
Station	CFSWP-001	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	13300	uS/cm
Sum of Anions	1.235319	meq/L
Sum of Cations	1.562472	meq/L
Balance	11.69324	%
Total dissolved solids	102.329	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.170163	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.815	3.545055E-02	3.545055E-02
K	0.557	1.424614E-02	1.424614E-02
Ca	20.8	0.518988	1.037976
Mg	5.77	0.2373997	0.4747994
Cl	0.397	1.119802E-02	1.119802E-02
SO4	2.59	2.697917E-02	5.395833E-02
NO3			
HCO3	71.4	1.170163	1.170163

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.604853	2.186136	0.319	0.194
Ca/SO4	8.030888	19.23662	0.152	0.364
Na/Cl	2.052897	3.165787	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-002-SW	
Sample Date	9/16/2016	
Station	CFSWP-002	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	16700	uS/cm
Sum of Anions	1.492656	meq/L
Sum of Cations	1.706566	meq/L
Balance	6.686302	%
Total dissolved solids	120.418	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.407801	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.03	4.480254E-02	4.480254E-02
K	0.306	7.826427E-03	7.826427E-03
Ca	23.2	0.5788713	1.157743
Mg	6.03	0.2480971	0.4961942
Cl	0.342	9.646655E-03	9.646655E-03
SO4	3.61	3.760417E-02	7.520834E-02
NO3			
HCO3	85.9	1.407801	1.407801

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.84743	2.333245	0.319	0.194
Ca/SO4	6.426593	15.39381	0.152	0.364
Na/Cl	3.011696	4.64436	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-002-SW	
Sample Date	12/2/2016	
Station	CFSWP-002	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	18800	uS/cm
Sum of Anions	1.834923	meq/L
Sum of Cations	1.822343	meq/L
Balance	-0.3439803	%
Total dissolved solids	138.439	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.42419	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.06	4.610746E-02	4.610746E-02
K	0.319	8.158923E-03	8.158923E-03
Ca	24.3	0.6063177	1.212635
Mg	6.75	0.2777206	0.5554413
Cl	1.71	4.823328E-02	4.823328E-02
SO4	17.4	0.18125	0.3625
NO3			
HCO3	86.9	1.42419	1.42419

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.6	2.183193	0.319	0.194
Ca/SO4	1.396552	3.345201	0.152	0.364
Na/Cl	0.619883	0.9559263	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-002-SW	
Sample Date	4/4/2017	
Station	CFSWP-002	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	16600	uS/cm
Sum of Anions	1.523803	meq/L
Sum of Cations	1.743693	meq/L
Balance	6.729632	%
Total dissolved solids	122.976	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.43894	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.03	4.480254E-02	4.480254E-02
K	0.396	1.012832E-02	1.012832E-02
Ca	23.7	0.5913469	1.182694
Mg	6.15	0.2530344	0.5060687
Cl	0.49	1.382123E-02	1.382123E-02
SO4	3.41	3.552084E-02	7.104167E-02
NO3			
HCO3	87.8	1.43894	1.43894

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.853659	2.337022	0.319	0.194
Ca/SO4	6.950147	16.64789	0.152	0.364
Na/Cl	2.102041	3.241573	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-002-SW	
Sample Date	6/14/2017	
Station	CFSWP-002	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	12900	uS/cm
Sum of Anions	1.213786	meq/L
Sum of Cations	1.395434	meq/L
Balance	6.961756	%
Total dissolved solids	98.014	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.147219	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.712	0.0309703	0.0309703
K	0.257	6.573176E-03	6.573176E-03
Ca	18.9	0.4715804	0.9431609
Mg	5.04	0.2073647	0.4147295
Cl	0.255	7.192682E-03	7.192682E-03
SO4	2.85	0.0296875	0.059375
NO3			
HCO3	70	1.147219	1.147219

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.75	2.274159	0.319	0.194
Ca/SO4	6.631579	15.88482	0.152	0.364
Na/Cl	2.792157	4.305807	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-003-SW	
Sample Date	9/9/2016	
Station	CFSWP-003	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	20800	uS/cm
Sum of Anions	1.71482	meq/L
Sum of Cations	2.186405	meq/L
Balance	12.08812	%
Total dissolved solids	142.548	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.604467	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.78	0.1644209	0.1644209
K	0.398	1.017947E-02	1.017947E-02
Ca	27.7	0.6911523	1.382305
Mg	7.65	0.31475	0.6295001
Cl	0.5	0.0141033	0.0141033
SO4	4.62	0.048125	0.09625
NO3			
HCO3	97.9	1.604467	1.604467

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.620915	2.195877	0.319	0.194
Ca/SO4	5.995671	14.36161	0.152	0.364
Na/Cl	7.56	11.65833	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-003-SW	
Sample Date	12/1/2016	
Station	CFSWP-003	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	24200	uS/cm
Sum of Anions	1.681605	meq/L
Sum of Cations	2.46349	meq/L
Balance	18.8629	%
Total dissolved solids	144.92	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.507773	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.99	0.2605506	0.2605506
K	0.476	1.217444E-02	1.217444E-02
Ca	30	0.7485404	1.497081
Mg	8.43	0.3468422	0.6936845
Cl	0.904	2.549876E-02	2.549876E-02
SO4	7.12	7.416667E-02	0.1483333
NO3			
HCO3	92	1.507773	1.507773

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.558719	2.158158	0.319	0.194
Ca/SO4	4.213483	10.09268	0.152	0.364
Na/Cl	6.626106	10.21817	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-003-SW	
Sample Date	3/16/2017	
Station	CFSWP-003	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	17000	uS/cm
Sum of Anions	1.608501	meq/L
Sum of Cations	1.784273	meq/L
Balance	5.180791	%
Total dissolved solids	128.317	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.478273	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.05	8.917009E-02	8.917009E-02
K	0.58	0.0148344	0.0148344
Ca	23.2	0.5788713	1.157743
Mg	6.35	0.2612631	0.5225262
Cl	0.887	2.501925E-02	2.501925E-02
SO4	5.05	5.260417E-02	0.1052083
NO3			
HCO3	90.2	1.478273	1.478273

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.653543	2.215664	0.319	0.194
Ca/SO4	4.594059	11.00428	0.152	0.364
Na/Cl	2.311161	3.564059	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-003-SW	
Sample Date	6/14/2017	
Station	CFSWP-003	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	14500	uS/cm
Sum of Anions	1.34948	meq/L
Sum of Cations	1.69644	meq/L
Balance	11.391	%
Total dissolved solids	111.754	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.270135	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.05	8.917009E-02	8.917009E-02
K	0.551	1.409268E-02	1.409268E-02
Ca	21.9	0.5464345	1.092869
Mg	6.08	0.2501543	0.5003086
Cl	0.383	1.080312E-02	1.080312E-02
SO4	3.29	3.427083E-02	6.854167E-02
NO3			
HCO3	77.5	1.270135	1.270135

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.601974	2.18439	0.319	0.194
Ca/SO4	6.656535	15.94459	0.152	0.364
Na/Cl	5.35248	8.254102	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-004-SW	
Sample Date	9/9/2016	
Station	CFSWP-004	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	52000	uS/cm
Sum of Anions	4.790049	meq/L
Sum of Cations	6.138686	meq/L
Balance	12.34029	%
Total dissolved solids	401.58	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.326653	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	36.4	1.583313	1.583313
K	1.12	2.864575E-02	2.864575E-02
Ca	60.7	1.514547	3.029094
Mg	18.2	0.7488171	1.497634
Cl	3.06	8.631217E-02	8.631217E-02
SO4	18.1	0.1885417	0.3770834
NO3			
HCO3	264	4.326653	4.326653

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.335165	2.022586	0.319	0.194
Ca/SO4	3.353591	8.032954	0.152	0.364
Na/Cl	11.89543	18.34403	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-004-SW	
Sample Date	12/1/2016	
Station	CFSWP-004	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	47800	uS/cm
Sum of Anions	3.298759	meq/L
Sum of Cations	5.014036	meq/L
Balance	20.63418	%
Total dissolved solids	290.143	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.933602	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	26.1	1.135288	1.135288
K	0.833	2.130527E-02	2.130527E-02
Ca	52.4	1.307451	2.614901
Mg	15.1	0.6212714	1.242543
Cl	2.31	6.515723E-02	6.515723E-02
SO4	14.4	0.15	0.3
NO3			
HCO3	179	2.933602	2.933602

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.470199	2.104476	0.319	0.194
Ca/SO4	3.638889	8.716336	0.152	0.364
Na/Cl	11.2987	17.42381	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-004-SW	
Sample Date	3/16/2017	
Station	CFSWP-004	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	20700	uS/cm
Sum of Anions	1.899321	meq/L
Sum of Cations	2.115294	meq/L
Balance	5.379676	%
Total dissolved solids	152.091	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.737217	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.78	0.2079186	0.2079186
K	0.581	1.485998E-02	1.485998E-02
Ca	26.2	0.6537253	1.307451
Mg	7.11	0.2925324	0.5850648
Cl	1.02	2.877073E-02	2.877073E-02
SO4	6.4	6.666667E-02	0.1333333
NO3			
HCO3	106	1.737217	1.737217

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.684951	2.23471	0.319	0.194
Ca/SO4	4.09375	9.805879	0.152	0.364
Na/Cl	4.686275	7.22674	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-004-SW	
Sample Date	6/14/2017	
Station	CFSWP-004	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	14500	uS/cm
Sum of Anions	1.319977	meq/L
Sum of Cations	1.634073	meq/L
Balance	10.63273	%
Total dissolved solids	108.897	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.245552	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.06	8.960507E-02	8.960507E-02
K	0.495	0.0126604	0.0126604
Ca	21	0.5239783	1.047957
Mg	5.88	0.2419255	0.4838511
Cl	0.312	8.800457E-03	8.800457E-03
SO4	3.15	0.0328125	0.065625
NO3			
HCO3	76	1.245552	1.245552

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.571429	2.165866	0.319	0.194
Ca/SO4	6.666667	15.96886	0.152	0.364
Na/Cl	6.602564	10.18187	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-005-SW	
Sample Date	9/9/2016	
Station	CFSWP-005	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	51700	uS/cm
Sum of Anions	4.648457	meq/L
Sum of Cations	6.100011	meq/L
Balance	13.50476	%
Total dissolved solids	392.63	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.195542	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	36.9	1.605062	1.605062
K	1.02	2.608809E-02	2.608809E-02
Ca	60.2	1.502071	3.004142
Mg	17.8	0.7323596	1.464719
Cl	2.91	8.208119E-02	8.208119E-02
SO4	17.8	0.1854167	0.3708333
NO3			
HCO3	256	4.195542	4.195542

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.382023	2.051002	0.319	0.194
Ca/SO4	3.382023	8.101057	0.152	0.364
Na/Cl	12.68041	19.55456	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-005-SW	
Sample Date	12/1/2016	
Station	CFSWP-005	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	57200	uS/cm
Sum of Anions	4.874012	meq/L
Sum of Cations	6.172482	meq/L
Balance	11.7546	%
Total dissolved solids	407.47	mg/L
Total hardness		mg/l CaCO3
Alkalinity	4.408597	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	35.6	1.548515	1.548515
K	1.06	2.711115E-02	2.711115E-02
Ca	62.6	1.561954	3.123909
Mg	17.9	0.736474	1.472948
Cl	2.91	8.208119E-02	8.208119E-02
SO4	18.4	0.1916667	0.3833333
NO3			
HCO3	269	4.408597	4.408597

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.497207	2.120855	0.319	0.194
Ca/SO4	3.402174	8.149326	0.152	0.364
Na/Cl	12.23368	18.86565	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-005-SW	
Sample Date	3/16/2017	
Station	CFSWP-005	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	22200	uS/cm
Sum of Anions	1.997888	meq/L
Sum of Cations	2.241021	meq/L
Balance	5.735738	%
Total dissolved solids	160.481	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.83555	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.24	0.2279274	0.2279274
K	0.561	1.434845E-02	1.434845E-02
Ca	27.9	0.6961426	1.392285
Mg	7.37	0.3032298	0.6064596
Cl	1.08	3.046312E-02	3.046312E-02
SO4	6.33	0.0659375	0.131875
NO3			
HCO3	112	1.83555	1.83555

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.785617	2.295759	0.319	0.194
Ca/SO4	4.407583	10.55761	0.152	0.364
Na/Cl	4.851851	7.482077	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-005-SW	
Sample Date	6/14/2017	
Station	CFSWP-005	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	30400	uS/cm
Sum of Anions	2.743762	meq/L
Sum of Cations	3.546252	meq/L
Balance	12.75816	%
Total dissolved solids	231.227	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.54027	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	18.2	0.7916565	0.7916565
K	0.762	1.948934E-02	1.948934E-02
Ca	37	0.9231998	1.8464
Mg	10.8	0.444353	0.888706
Cl	0.855	2.411664E-02	2.411664E-02
SO4	8.61	0.0896875	0.179375
NO3			
HCO3	155	2.54027	2.54027

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.425926	2.077627	0.319	0.194
Ca/SO4	4.297329	10.29352	0.152	0.364
Na/Cl	21.28655	32.82615	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-006-SW	
Sample Date	9/9/2016	
Station	CFSWP-006	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	16500	uS/cm
Sum of Anions	1.496035	meq/L
Sum of Cations	1.806404	meq/L
Balance	9.39815	%
Total dissolved solids	122.22	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.40944	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.03	4.480254E-02	4.480254E-02
K	0.328	8.389112E-03	8.389112E-03
Ca	24.2	0.6038226	1.207645
Mg	6.63	0.2727834	0.5455667
Cl	0.352	9.928721E-03	9.928721E-03
SO4	3.68	3.833333E-02	7.666667E-02
NO3			
HCO3	86	1.40944	1.40944

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.650075	2.213561	0.319	0.194
Ca/SO4	6.576087	15.75189	0.152	0.364
Na/Cl	2.926136	4.512418	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-006-SW	
Sample Date	12/1/2016	
Station	CFSWP-006	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	18300	uS/cm
Sum of Anions	1.521233	meq/L
Sum of Cations	1.836136	meq/L
Balance	9.379454	%
Total dissolved solids	124.295	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.435662	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.15	5.002225E-02	5.002225E-02
K	0.315	8.056616E-03	8.056616E-03
Ca	24.5	0.611308	1.222616
Mg	6.75	0.2777206	0.5554413
Cl	0.36	1.015437E-02	1.015437E-02
SO4	3.62	3.770833E-02	7.541667E-02
NO3			
HCO3	87.6	1.435662	1.435662

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.62963	2.201162	0.319	0.194
Ca/SO4	6.767956	16.21148	0.152	0.364
Na/Cl	3.194444	4.926178	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-006-SW	
Sample Date	3/16/2017	
Station	CFSWP-006	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	16000	uS/cm
Sum of Anions	1.413479	meq/L
Sum of Cations	1.680896	meq/L
Balance	8.642008	%
Total dissolved solids	114.649	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.304551	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.03	4.480254E-02	4.480254E-02
K	0.775	1.982183E-02	1.982183E-02
Ca	22	0.5489296	1.097859
Mg	6.3	0.2592059	0.5184119
Cl	0.804	0.0226781	0.0226781
SO4	4.14	0.043125	0.08625
NO3			
HCO3	79.6	1.304551	1.304551

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.492063	2.117736	0.319	0.194
Ca/SO4	5.31401	12.7288	0.152	0.364
Na/Cl	1.281094	1.975586	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-006-SW	
Sample Date	6/14/2017	
Station	CFSWP-006	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	12700	uS/cm
Sum of Anions	1.19385	meq/L
Sum of Cations	1.491897	meq/L
Balance	11.09736	%
Total dissolved solids	98.596	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.132469	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.71	0.0308833	0.0308833
K	0.605	1.547382E-02	1.547382E-02
Ca	19.7	0.4915415	0.9830831
Mg	5.62	0.2312281	0.4624563
Cl	0.241	6.797789E-03	6.797789E-03
SO4	2.62	2.729167E-02	5.458333E-02
NO3			
HCO3	69.1	1.132469	1.132469

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.505338	2.125786	0.319	0.194
Ca/SO4	7.519084	18.01068	0.152	0.364
Na/Cl	2.946058	4.543139	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-007-SW	
Sample Date	9/16/2016	
Station	CFSWP-007	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	16600	uS/cm
Sum of Anions	1.458381	meq/L
Sum of Cations	1.696621	meq/L
Balance	7.551187	%
Total dissolved solids	118.15	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.375023	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.951	4.136622E-02	4.136622E-02
K	0.311	7.95431E-03	7.95431E-03
Ca	23.1	0.5763761	1.152752
Mg	6.01	0.2472742	0.4945485
Cl	0.348	9.815894E-03	9.815894E-03
SO4	3.53	3.677084E-02	7.354167E-02
NO3			
HCO3	83.9	1.375023	1.375023

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.843594	2.330919	0.319	0.194
Ca/SO4	6.54391	15.67482	0.152	0.364
Na/Cl	2.732759	4.214209	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-007-SW	
Sample Date	12/2/2016	
Station	CFSWP-007	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	18900	uS/cm
Sum of Anions	1.518716	meq/L
Sum of Cations	1.833769	meq/L
Balance	9.397612	%
Total dissolved solids	124.074	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.434023	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.04	4.523751E-02	4.523751E-02
K	0.313	8.005464E-03	8.005464E-03
Ca	24.5	0.611308	1.222616
Mg	6.78	0.278955	0.5579099
Cl	0.351	9.900515E-03	9.900515E-03
SO4	3.59	3.739583E-02	7.479167E-02
NO3			
HCO3	87.5	1.434023	1.434023

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.613569	2.191422	0.319	0.194
Ca/SO4	6.824512	16.34695	0.152	0.364
Na/Cl	2.962963	4.569208	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-007-SW	
Sample Date	3/16/2017	
Station	CFSWP-007	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	16000	uS/cm
Sum of Anions	1.434099	meq/L
Sum of Cations	1.663589	meq/L
Balance	7.408428	%
Total dissolved solids	115.436	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.314385	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.03	4.480254E-02	4.480254E-02
K	0.748	1.913127E-02	1.913127E-02
Ca	21.7	0.5414442	1.082888
Mg	6.28	0.2583831	0.5167661
Cl	0.758	0.0213806	0.0213806
SO4	4.72	4.916666E-02	9.833333E-02
NO3			
HCO3	80.2	1.314385	1.314385

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.455414	2.09551	0.319	0.194
Ca/SO4	4.597458	11.01243	0.152	0.364
Na/Cl	1.358839	2.095476	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-008-SW	
Sample Date	6/14/2017	
Station	CFSWP-007	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	12900	uS/cm
Sum of Anions	1.192267	meq/L
Sum of Cations	1.459142	meq/L
Balance	10.06539	%
Total dissolved solids	97.887	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.13083	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.677	2.944788E-02	2.944788E-02
K	0.547	1.399038E-02	1.399038E-02
Ca	19.3	0.481561	0.963122
Mg	5.5	0.2262909	0.4525818
Cl	0.243	6.854203E-03	6.854203E-03
SO4	2.62	2.729167E-02	5.458333E-02
NO3			
HCO3	69	1.13083	1.13083

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.509091	2.128062	0.319	0.194
Ca/SO4	7.366412	17.64498	0.152	0.364
Na/Cl	2.786008	4.296325	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-008-SW	
Sample Date	9/16/2016	
Station	CFSWP-008	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	16600	uS/cm
Sum of Anions	1.489959	meq/L
Sum of Cations	1.705361	meq/L
Balance	6.741176	%
Total dissolved solids	120.25	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.407801	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.958	4.167071E-02	4.167071E-02
K	0.317	8.107769E-03	8.107769E-03
Ca	23.2	0.5788713	1.157743
Mg	6.05	0.24892	0.49784
Cl	0.335	9.449209E-03	9.449209E-03
SO4	3.49	3.635417E-02	7.270834E-02
NO3			
HCO3	85.9	1.407801	1.407801

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.834711	2.325531	0.319	0.194
Ca/SO4	6.647565	15.92311	0.152	0.364
Na/Cl	2.859701	4.409967	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-008-SW	
Sample Date	12/2/2016	
Station	CFSWP-008	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	19600	uS/cm
Sum of Anions	1.575332	meq/L
Sum of Cations	1.910084	meq/L
Balance	9.604364	%
Total dissolved solids	128.732	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.481551	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.14	4.958727E-02	4.958727E-02
K	0.309	7.903157E-03	7.903157E-03
Ca	25.4	0.6337642	1.267528
Mg	7.11	0.2925324	0.5850648
Cl	0.363	1.023899E-02	1.023899E-02
SO4	4.01	4.177084E-02	8.354168E-02
NO3			
HCO3	90.4	1.481551	1.481551

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.572433	2.166475	0.319	0.194
Ca/SO4	6.334164	15.17241	0.152	0.364
Na/Cl	3.140496	4.842983	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-008-SW	
Sample Date	4/4/2017	
Station	CFSWP-008	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	17000	uS/cm
Sum of Anions	1.571727	meq/L
Sum of Cations	1.792683	meq/L
Balance	6.567447	%
Total dissolved solids	126.641	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.478273	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.08	4.697742E-02	4.697742E-02
K	0.378	9.66794E-03	9.66794E-03
Ca	24.4	0.6088128	1.217626
Mg	6.3	0.2592059	0.5184119
Cl	0.573	1.616238E-02	1.616238E-02
SO4	3.71	3.864583E-02	7.729167E-02
NO3			
HCO3	90.2	1.478273	1.478273

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.873016	2.348761	0.319	0.194
Ca/SO4	6.576819	15.75365	0.152	0.364
Na/Cl	1.884817	2.906591	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-008-SW	
Sample Date	6/14/2017	
Station	CFSWP-008	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	12900	uS/cm
Sum of Anions	1.195862	meq/L
Sum of Cations	1.297729	meq/L
Balance	4.085184	%
Total dissolved solids	95.24699	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.134107	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.666	2.896941E-02	2.896941E-02
K	0.242	6.189527E-03	6.189527E-03
Ca	17.6	0.4391437	0.8782874
Mg	4.67	0.1921415	0.3842831
Cl	0.269	7.587573E-03	7.587573E-03
SO4	2.6	2.708333E-02	5.416667E-02
NO3			
HCO3	69.2	1.134107	1.134107

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.768737	2.285522	0.319	0.194
Ca/SO4	6.769231	16.21454	0.152	0.364
Na/Cl	2.475837	3.818007	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-009-SW	
Sample Date	6/7/2016	
Station	CFSWP-009	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32600	uS/cm
Sum of Anions	2.894153	meq/L
Sum of Cations	3.653056	meq/L
Balance	11.59125	%
Total dissolved solids	240.16	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.786102	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.34	0.1017844	0.1017844
K	0.56	1.432287E-02	1.432287E-02
Ca	50.1	1.250062	2.500125
Mg	12.6	0.5184119	1.036824
Cl	1.77	4.992567E-02	4.992567E-02
SO4	2.79	0.0290625	0.058125
NO3			
HCO3	170	2.786102	2.786102

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.97619	2.411331	0.319	0.194
Ca/SO4	17.95699	43.0129	0.152	0.364
Na/Cl	1.322034	2.038719	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-009-SW	
Sample Date	4/3/2017	
Station	CFSWP-009	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	31700	uS/cm
Sum of Anions	2.924149	meq/L
Sum of Cations	3.322114	meq/L
Balance	6.371256	%
Total dissolved solids	236.15	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.802491	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.36	0.1026543	0.1026543
K	0.46	1.176522E-02	1.176522E-02
Ca	46.8	1.167723	2.335446
Mg	10.6	0.4361243	0.8722485
Cl	2.57	7.249095E-02	7.249095E-02
SO4	2.36	2.458333E-02	4.916666E-02
NO3			
HCO3	171	2.802491	2.802491

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.415094	2.6775	0.319	0.194
Ca/SO4	19.83051	47.5006	0.152	0.364
Na/Cl	0.9182879	1.416099	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-009-SW	
Sample Date	6/12/2017	
Station	CFSWP-009	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	33300	uS/cm
Sum of Anions	3.240235	meq/L
Sum of Cations	3.848656	meq/L
Balance	8.582741	%
Total dissolved solids	264.921	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.130268	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.38	0.1035243	0.1035243
K	0.551	1.409268E-02	1.409268E-02
Ca	53	1.322421	2.644843
Mg	13.2	0.5430981	1.086196
Cl	1.38	0.0389251	0.0389251
SO4	3.41	3.552084E-02	7.104167E-02
NO3			
HCO3	191	3.130268	3.130268

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.015152	2.434958	0.319	0.194
Ca/SO4	15.54252	37.22945	0.152	0.364
Na/Cl	1.724638	2.659577	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-010-SW	
Sample Date	6/7/2016	
Station	CFSWP-010	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	29600	uS/cm
Sum of Anions	2.685212	meq/L
Sum of Cations	3.34652	meq/L
Balance	10.96382	%
Total dissolved solids	222.415	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.589436	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.08	9.047502E-02	9.047502E-02
K	0.535	1.368346E-02	1.368346E-02
Ca	47	1.172713	2.345427
Mg	10.9	0.4484674	0.8969347
Cl	1.97	5.556699E-02	5.556699E-02
SO4	1.93	2.010417E-02	4.020833E-02
NO3			
HCO3	158	2.589436	2.589436

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.311927	2.614936	0.319	0.194
Ca/SO4	24.35233	58.33185	0.152	0.364
Na/Cl	1.055838	1.628215	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-010-SW	
Sample Date	3/15/2017	
Station	CFSWP-010	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	17100	uS/cm
Sum of Anions	2.281658	meq/L
Sum of Cations	2.569924	meq/L
Balance	5.941694	%
Total dissolved solids	185.87	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.179715	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.18	9.482478E-02	9.482478E-02
K	1.1	2.813422E-02	2.813422E-02
Ca	38.3	0.9556366	1.911273
Mg	6.51	0.2678461	0.5356923
Cl	0.32	9.02611E-03	9.02611E-03
SO4	4.46	4.645833E-02	9.291667E-02
NO3			
HCO3	133	2.179715	2.179715

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	5.883256	3.567856	0.319	0.194
Ca/SO4	8.587443	20.56976	0.152	0.364
Na/Cl	6.8125	10.50561	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-010-SW	
Sample Date	6/12/2017	
Station	CFSWP-010	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32300	uS/cm
Sum of Anions	3.019027	meq/L
Sum of Cations	3.634409	meq/L
Balance	9.249074	%
Total dissolved solids	248.013	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.933602	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.22	9.656469E-02	9.656469E-02
K	0.473	1.209771E-02	1.209771E-02
Ca	50.7	1.265033	2.530066
Mg	12.1	0.49784	0.9956799
Cl	1.64	4.625881E-02	4.625881E-02
SO4	1.88	1.958333E-02	3.916667E-02
NO3			
HCO3	179	2.933602	2.933602

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.190083	2.541044	0.319	0.194
Ca/SO4	26.96809	64.59744	0.152	0.364
Na/Cl	1.353659	2.087487	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-011-SW	
Sample Date	6/7/2016	
Station	CFSWP-011	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	29800	uS/cm
Sum of Anions	2.677461	meq/L
Sum of Cations	3.340159	meq/L
Balance	11.01262	%
Total dissolved solids	222.08	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.589436	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.12	9.221492E-02	9.221492E-02
K	0.54	1.381134E-02	1.381134E-02
Ca	47	1.172713	2.345427
Mg	10.8	0.444353	0.888706
Cl	1.71	4.823328E-02	4.823328E-02
SO4	1.91	1.989583E-02	3.979167E-02
NO3			
HCO3	158	2.589436	2.589436

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.351852	2.639148	0.319	0.194
Ca/SO4	24.60733	58.94266	0.152	0.364
Na/Cl	1.239766	1.911853	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-011-SW	
Sample Date	4/3/2017	
Station	CFSWP-011	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	31000	uS/cm
Sum of Anions	2.921957	meq/L
Sum of Cations	3.295957	meq/L
Balance	6.014888	%
Total dissolved solids	235.624	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.802491	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.37	0.1030893	0.1030893
K	0.454	1.161176E-02	1.161176E-02
Ca	46.6	1.162733	2.325465
Mg	10.4	0.4278955	0.855791
Cl	2.64	7.446541E-02	7.446541E-02
SO4	2.16	0.0225	0.045
NO3			
HCO3	171	2.802491	2.802491

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.480769	2.717329	0.319	0.194
Ca/SO4	21.57407	51.67701	0.152	0.364
Na/Cl	0.8977272	1.384392	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-011-SW	
Sample Date	6/12/2017	
Station	CFSWP-011	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32700	uS/cm
Sum of Anions	3.036323	meq/L
Sum of Cations	3.628958	meq/L
Balance	8.891365	%
Total dissolved solids	248.942	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.949991	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.21	9.612972E-02	9.612972E-02
K	0.472	1.207214E-02	1.207214E-02
Ca	50.6	1.262538	2.525076
Mg	12.1	0.49784	0.9956799
Cl	1.65	4.654088E-02	4.654088E-02
SO4	1.91	1.989583E-02	3.979167E-02
NO3			
HCO3	180	2.949991	2.949991

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.181818	2.536032	0.319	0.194
Ca/SO4	26.49215	63.45741	0.152	0.364
Na/Cl	1.339394	2.06549	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-012-SW	
Sample Date	6/7/2016	
Station	CFSWP-012	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	29600	uS/cm
Sum of Anions	2.677535	meq/L
Sum of Cations	3.33659	meq/L
Balance	10.95846	%
Total dissolved solids	221.937	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.589436	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.08	9.047502E-02	9.047502E-02
K	0.537	1.373461E-02	1.373461E-02
Ca	46.8	1.167723	2.335446
Mg	10.9	0.4484674	0.8969347
Cl	1.72	4.851534E-02	4.851534E-02
SO4	1.9	1.979167E-02	3.958333E-02
NO3			
HCO3	158	2.589436	2.589436

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.293578	2.603808	0.319	0.194
Ca/SO4	24.63158	59.00074	0.152	0.364
Na/Cl	1.209302	1.864874	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-012-SW	
Sample Date	4/3/2017	
Station	CFSWP-012	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	31600	uS/cm
Sum of Anions	2.939387	meq/L
Sum of Cations	3.234679	meq/L
Balance	4.782774	%
Total dissolved solids	235.493	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.81888	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.31	0.1004795	0.1004795
K	0.433	1.107465E-02	1.107465E-02
Ca	45.6	1.137781	2.275563
Mg	10.3	0.4237811	0.8475623
Cl	2.64	7.446541E-02	7.446541E-02
SO4	2.21	2.302083E-02	4.604167E-02
NO3			
HCO3	172	2.81888	2.81888

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.427184	2.684833	0.319	0.194
Ca/SO4	20.63348	49.42399	0.152	0.364
Na/Cl	0.8749999	1.349344	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-012-SW	
Sample Date	6/12/2017	
Station	CFSWP-012	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	28700	uS/cm
Sum of Anions	3.036397	meq/L
Sum of Cations	3.589969	meq/L
Balance	8.354074	%
Total dissolved solids	248.224	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.949991	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.19	9.525976E-02	9.525976E-02
K	0.474	1.212329E-02	1.212329E-02
Ca	50	1.247567	2.495135
Mg	12	0.4937256	0.9874511
Cl	1.66	4.682295E-02	4.682295E-02
SO4	1.9	1.979167E-02	3.958333E-02
NO3			
HCO3	180	2.949991	2.949991

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.166667	2.526844	0.319	0.194
Ca/SO4	26.31579	63.03498	0.152	0.364
Na/Cl	1.319277	2.034467	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-DUP5-SW	
Sample Date	4/3/2017	
Station	CFSWP-012	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	31600	uS/cm
Sum of Anions	2.938493	meq/L
Sum of Cations	3.271716	meq/L
Balance	5.365731	%
Total dissolved solids	235.811	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.81888	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.36	0.1026543	0.1026543
K	0.451	1.153503E-02	1.153503E-02
Ca	45.3	1.130296	2.260592
Mg	10.9	0.4484674	0.8969347
Cl	2.66	7.502954E-02	7.502954E-02
SO4	2.14	2.229167E-02	4.458334E-02
NO3			
HCO3	172	2.81888	2.81888

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.155963	2.520353	0.319	0.194
Ca/SO4	21.16822	50.70486	0.152	0.364
Na/Cl	0.887218	1.368186	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-013-SW	
Sample Date	6/7/2016	
Station	CFSWP-013	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	29500	uS/cm
Sum of Anions	3.023601	meq/L
Sum of Cations	3.302808	meq/L
Balance	4.413352	%
Total dissolved solids	242.45	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.933602	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.03	8.830014E-02	8.830014E-02
K	0.53	1.355558E-02	1.355558E-02
Ca	46.5	1.160238	2.320475
Mg	10.7	0.4402386	0.8804772
Cl	1.78	5.020774E-02	5.020774E-02
SO4	1.91	1.989583E-02	3.979167E-02
NO3			
HCO3	179	2.933602	2.933602

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.345795	2.635474	0.319	0.194
Ca/SO4	24.34555	58.31561	0.152	0.364
Na/Cl	1.140449	1.758696	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-013-SW	
Sample Date	11/30/2016	
Station	CFSWP-013	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32100	uS/cm
Sum of Anions	2.50474	meq/L
Sum of Cations	3.047641	meq/L
Balance	9.777806	%
Total dissolved solids	206.015	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.425548	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.34	0.1017844	0.1017844
K	0.778	1.989856E-02	1.989856E-02
Ca	40	0.9980538	1.996108
Mg	11.3	0.4649249	0.9298499
Cl	0.577	0.0162752	0.0162752
SO4	3.02	3.145833E-02	6.291667E-02
NO3			
HCO3	148	2.425548	2.425548

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.539823	2.146699	0.319	0.194
Ca/SO4	13.24503	31.72622	0.152	0.364
Na/Cl	4.055459	6.253955	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-013-SW	
Sample Date	3/15/2017	
Station	CFSWP-013	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	29000	uS/cm
Sum of Anions	2.777822	meq/L
Sum of Cations	3.098341	meq/L
Balance	5.454574	%
Total dissolved solids	223.665	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.687769	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.41	6.133163E-02	6.133163E-02
K	0.556	1.422057E-02	1.422057E-02
Ca	42.6	1.062927	2.125855
Mg	10.9	0.4484674	0.8969347
Cl	0.349	9.844102E-03	9.844102E-03
SO4	3.85	4.010417E-02	8.020833E-02
NO3			
HCO3	164	2.687769	2.687769

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.908257	2.370133	0.319	0.194
Ca/SO4	11.06493	26.50416	0.152	0.364
Na/Cl	4.040114	6.230292	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-013-SW	
Sample Date	6/12/2017	
Station	CFSWP-013	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32000	uS/cm
Sum of Anions	3.052994	meq/L
Sum of Cations	3.637379	meq/L
Balance	8.734716	%
Total dissolved solids	250	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.96638	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.25	9.786962E-02	9.786962E-02
K	0.48	1.227675E-02	1.227675E-02
Ca	50.4	1.257548	2.515096
Mg	12.3	0.5060687	1.012137
Cl	1.66	4.682295E-02	4.682295E-02
SO4	1.91	1.989583E-02	3.979167E-02
NO3			
HCO3	181	2.96638	2.96638

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.097561	2.484935	0.319	0.194
Ca/SO4	26.38744	63.2066	0.152	0.364
Na/Cl	1.355422	2.090206	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-DUP1-SW	
Sample Date	6/7/2016	
Station	CFSWP-013	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	29500	uS/cm
Sum of Anions	2.710998	meq/L
Sum of Cations	3.400186	meq/L
Balance	11.27748	%
Total dissolved solids	225.136	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.622214	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.12	9.221492E-02	9.221492E-02
K	0.556	1.422057E-02	1.422057E-02
Ca	47.7	1.190179	2.380358
Mg	11.1	0.4566962	0.9133923
Cl	1.7	4.795121E-02	4.795121E-02
SO4	1.96	2.041667E-02	4.083334E-02
NO3			
HCO3	160	2.622214	2.622214

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.297297	2.606064	0.319	0.194
Ca/SO4	24.33673	58.29449	0.152	0.364
Na/Cl	1.247059	1.923099	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-014-SW	
Sample Date	8/29/2016	
Station	CFSWP-014	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	20800	uS/cm
Sum of Anions	2.848636	meq/L
Sum of Cations	3.412263	meq/L
Balance	9.002329	%
Total dissolved solids	231.207	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.704158	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.24	0.1409322	0.1409322
K	0.377	9.642364E-03	9.642364E-03
Ca	43.1	1.075403	2.150806
Mg	13.5	0.5554413	1.110883
Cl	2.67	7.531161E-02	7.531161E-02
SO4	3.32	3.458333E-02	6.916667E-02
NO3			
HCO3	165	2.704158	2.704158

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.192592	1.936124	0.319	0.194
Ca/SO4	12.98193	31.09599	0.152	0.364
Na/Cl	1.213483	1.871322	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-014-SW	
Sample Date	11/30/2016	
Station	CFSWP-014	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	37900	uS/cm
Sum of Anions	3.204904	meq/L
Sum of Cations	3.870706	meq/L
Balance	9.409822	%
Total dissolved solids	263.181	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.113879	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.59	0.1126588	0.1126588
K	0.481	1.230233E-02	1.230233E-02
Ca	52.8	1.317431	2.634862
Mg	13.5	0.5554413	1.110883
Cl	1.58	4.456642E-02	4.456642E-02
SO4	2.23	2.322917E-02	4.645833E-02
NO3			
HCO3	190	3.113879	3.113879

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.911111	2.371864	0.319	0.194
Ca/SO4	23.67713	56.71452	0.152	0.364
Na/Cl	1.63924	2.527885	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-014-SW	
Sample Date	3/13/2017	
Station	CFSWP-014	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	35100	uS/cm
Sum of Anions	3.482413	meq/L
Sum of Cations	4.152772	meq/L
Balance	8.779874	%
Total dissolved solids	284.866	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.326934	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.53	0.2405418	0.2405418
K	0.656	1.677822E-02	1.677822E-02
Ca	55.8	1.392285	2.78457
Mg	13.5	0.5554413	1.110883
Cl	3.06	8.631217E-02	8.631217E-02
SO4	3.32	3.458333E-02	6.916667E-02
NO3			
HCO3	203	3.326934	3.326934

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.133333	2.506629	0.319	0.194
Ca/SO4	16.80723	40.25885	0.152	0.364
Na/Cl	1.80719	2.786881	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-014-SW	
Sample Date	6/13/2017	
Station	CFSWP-014	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32200	uS/cm
Sum of Anions	3.074777	meq/L
Sum of Cations	3.669792	meq/L
Balance	8.822136	%
Total dissolved solids	251.797	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.982768	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.24	9.743464E-02	9.743464E-02
K	0.467	1.194425E-02	1.194425E-02
Ca	50.9	1.270024	2.540047
Mg	12.4	0.5101831	1.020366
Cl	1.77	4.992567E-02	4.992567E-02
SO4	2.02	2.104167E-02	4.208333E-02
NO3			
HCO3	182	2.982768	2.982768

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.104839	2.489349	0.319	0.194
Ca/SO4	25.19802	60.35756	0.152	0.364
Na/Cl	1.265537	1.951594	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-DUP3-SW	
Sample Date	11/30/2016	
Station	CFSWP-014	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	37900	uS/cm
Sum of Anions	3.222911	meq/L
Sum of Cations	3.931745	meq/L
Balance	9.907304	%
Total dissolved solids	265.216	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.130268	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.66	0.1157036	0.1157036
K	0.486	1.243021E-02	1.243021E-02
Ca	53.3	1.329907	2.659813
Mg	13.9	0.5718988	1.143798
Cl	1.63	4.597675E-02	4.597675E-02
SO4	2.24	2.333333E-02	4.666667E-02
NO3			
HCO3	191	3.130268	3.130268

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.834532	2.325423	0.319	0.194
Ca/SO4	23.79464	56.996	0.152	0.364
Na/Cl	1.631902	2.516569	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-DUP4-SW	
Sample Date	3/13/2017	
Station	CFSWP-014	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	35100	uS/cm
Sum of Anions	3.525338	meq/L
Sum of Cations	3.775968	meq/L
Balance	3.432669	%
Total dissolved solids	280.036	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.359712	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.49	0.108309	0.108309
K	0.486	1.243021E-02	1.243021E-02
Ca	52.8	1.317431	2.634862
Mg	12.4	0.5101831	1.020366
Cl	3.08	8.687631E-02	8.687631E-02
SO4	3.78	0.039375	0.07875
NO3			
HCO3	205	3.359712	3.359712

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.258065	2.582271	0.319	0.194
Ca/SO4	13.96825	33.45857	0.152	0.364
Na/Cl	0.8084416	1.246704	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-015-SW	
Sample Date	8/29/2016	
Station	CFSWP-015	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	31100	uS/cm
Sum of Anions	2.932912	meq/L
Sum of Cations	3.624686	meq/L
Balance	10.5492	%
Total dissolved solids	240.715	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.802491	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.87	0.1248381	0.1248381
K	0.405	1.035851E-02	1.035851E-02
Ca	47.5	1.185189	2.370378
Mg	13.6	0.5595556	1.119111
Cl	2.6	7.333715E-02	7.333715E-02
SO4	2.74	2.854167E-02	5.708333E-02
NO3			
HCO3	171	2.802491	2.802491

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.492647	2.118089	0.319	0.194
Ca/SO4	17.33577	41.52486	0.152	0.364
Na/Cl	1.103846	1.70225	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-015-SW	
Sample Date	11/30/2016	
Station	CFSWP-015	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	33300	uS/cm
Sum of Anions	3.254647	meq/L
Sum of Cations	3.894852	meq/L
Balance	8.954542	%
Total dissolved solids	266.614	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.163046	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.61	0.1135288	0.1135288
K	0.484	1.237905E-02	1.237905E-02
Ca	53.1	1.324916	2.649833
Mg	13.6	0.5595556	1.119111
Cl	1.63	4.597675E-02	4.597675E-02
SO4	2.19	0.0228125	0.045625
NO3			
HCO3	193	3.163046	3.163046

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.904412	2.367801	0.319	0.194
Ca/SO4	24.24657	58.07853	0.152	0.364
Na/Cl	1.601227	2.469265	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-015-SW	
Sample Date	12/20/2016	
Station	CFSWP-015	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	33300	uS/cm
Sum of Anions	3.400855	meq/L
Sum of Cations	4.127656	meq/L
Balance	9.653985	%
Total dissolved solids	280.109	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.310545	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.94	0.127883	0.127883
K	0.519	1.327423E-02	1.327423E-02
Ca	56.8	1.417236	2.834473
Mg	14	0.5760131	1.152026
Cl	1.37	3.864304E-02	3.864304E-02
SO4	2.48	2.583333E-02	5.166667E-02
NO3			
HCO3	202	3.310545	3.310545

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.057143	2.460424	0.319	0.194
Ca/SO4	22.90322	54.86076	0.152	0.364
Na/Cl	2.145985	3.309341	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-015-SW	
Sample Date	3/13/2017	
Station	CFSWP-015	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	35600	uS/cm
Sum of Anions	3.514235	meq/L
Sum of Cations	3.820842	meq/L
Balance	4.180007	%
Total dissolved solids	280.342	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.359712	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.52	0.109614	0.109614
K	0.502	1.283943E-02	1.283943E-02
Ca	53.5	1.334897	2.669794
Mg	12.5	0.5142975	1.028595
Cl	3.1	8.744044E-02	8.744044E-02
SO4	3.22	3.354167E-02	6.708334E-02
NO3			
HCO3	205	3.359712	3.359712

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.28	2.595574	0.319	0.194
Ca/SO4	16.61491	39.79817	0.152	0.364
Na/Cl	0.8129032	1.253584	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-015-SW	
Sample Date	6/13/2017	
Station	CFSWP-015	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32800	uS/cm
Sum of Anions	3.135416	meq/L
Sum of Cations	3.721668	meq/L
Balance	8.549579	%
Total dissolved solids	256.519	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.048324	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.25	9.786962E-02	9.786962E-02
K	0.469	1.199541E-02	1.199541E-02
Ca	51.6	1.287489	2.574979
Mg	12.6	0.5184119	1.036824
Cl	1.64	4.625881E-02	4.625881E-02
SO4	1.96	2.041667E-02	4.083334E-02
NO3			
HCO3	186	3.048324	3.048324

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.095238	2.483526	0.319	0.194
Ca/SO4	26.32653	63.0607	0.152	0.364
Na/Cl	1.371951	2.115697	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-DUP2-SW	
Sample Date	8/29/2016	
Station	CFSWP-015	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	31100	uS/cm
Sum of Anions	2.907916	meq/L
Sum of Cations	3.451408	meq/L
Balance	8.546385	%
Total dissolved solids	235.687	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.769713	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.62	0.1139637	0.1139637
K	0.357	9.130832E-03	9.130832E-03
Ca	44.6	1.11283	2.22566
Mg	13.4	0.5513269	1.102654
Cl	2.61	7.361921E-02	7.361921E-02
SO4	3.1	3.229167E-02	6.458333E-02
NO3			
HCO3	169	2.769713	2.769713

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.328358	2.018458	0.319	0.194
Ca/SO4	14.3871	34.46183	0.152	0.364
Na/Cl	1.003831	1.548016	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-DUP7-SW	
Sample Date	6/13/2017	
Station	CFSWP-015	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32800	uS/cm
Sum of Anions	3.133393	meq/L
Sum of Cations	3.73568	meq/L
Balance	8.768091	%
Total dissolved solids	256.646	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.048324	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.27	9.873956E-02	9.873956E-02
K	0.466	1.191868E-02	1.191868E-02
Ca	51.7	1.289985	2.579969
Mg	12.7	0.5225262	1.045052
Cl	1.62	4.569468E-02	4.569468E-02
SO4	1.89	0.0196875	0.039375
NO3			
HCO3	186	3.048324	3.048324

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.070866	2.468746	0.319	0.194
Ca/SO4	27.3545	65.52303	0.152	0.364
Na/Cl	1.401235	2.160855	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-016-SW	
Sample Date	8/29/2016	
Station	CFSWP-016	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	31000	uS/cm
Sum of Anions	2.970497	meq/L
Sum of Cations	3.477751	meq/L
Balance	7.86653	%
Total dissolved solids	240.027	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.835269	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	3.26	0.1418022	0.1418022
K	0.367	9.386598E-03	9.386598E-03
Ca	44.4	1.10784	2.21568
Mg	13.5	0.5554413	1.110883
Cl	2.8	7.897846E-02	7.897846E-02
SO4	2.7	0.028125	0.05625
NO3			
HCO3	173	2.835269	2.835269

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.288889	1.994522	0.319	0.194
Ca/SO4	16.44444	39.38986	0.152	0.364
Na/Cl	1.164286	1.795454	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-016-SW	
Sample Date	11/30/2016	
Station	CFSWP-016	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	38500	uS/cm
Sum of Anions	3.272703	meq/L
Sum of Cations	3.920383	meq/L
Balance	9.0042	%
Total dissolved solids	268.013	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.179435	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.63	0.1143987	0.1143987
K	0.483	1.235348E-02	1.235348E-02
Ca	53.1	1.324916	2.649833
Mg	13.9	0.5718988	1.143798
Cl	1.63	4.597675E-02	4.597675E-02
SO4	2.27	2.364583E-02	4.729167E-02
NO3			
HCO3	194	3.179435	3.179435

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.820144	2.316698	0.319	0.194
Ca/SO4	23.39207	56.03171	0.152	0.364
Na/Cl	1.613497	2.488186	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-016-SW	
Sample Date	3/13/2017	
Station	CFSWP-016	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	35100	uS/cm
Sum of Anions	3.559588	meq/L
Sum of Cations	3.837133	meq/L
Balance	3.752274	%
Total dissolved solids	283.465	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.408878	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.48	0.1078741	0.1078741
K	0.495	0.0126604	0.0126604
Ca	53.7	1.339887	2.679775
Mg	12.6	0.5184119	1.036824
Cl	2.95	8.320946E-02	8.320946E-02
SO4	3.24	0.03375	0.0675
NO3			
HCO3	208	3.408878	3.408878

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.261905	2.5846	0.319	0.194
Ca/SO4	16.57407	39.70036	0.152	0.364
Na/Cl	0.840678	1.296416	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-016-SW	
Sample Date	6/12/2017	
Station	CFSWP-016	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	33700	uS/cm
Sum of Anions	3.119088	meq/L
Sum of Cations	3.63189	meq/L
Balance	7.595962	%
Total dissolved solids	253.987	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.031935	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.2	9.569474E-02	9.569474E-02
K	0.477	1.220002E-02	1.220002E-02
Ca	50.5	1.260043	2.520086
Mg	12.2	0.5019543	1.003909
Cl	1.62	4.569468E-02	4.569468E-02
SO4	1.99	2.072917E-02	4.145833E-02
NO3			
HCO3	185	3.031935	3.031935

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.139344	2.510274	0.319	0.194
Ca/SO4	25.37688	60.78599	0.152	0.364
Na/Cl	1.358025	2.09422	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-DUP6-SW	
Sample Date	6/12/2017	
Station	CFSWP-016	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	33700	uS/cm
Sum of Anions	3.118315	meq/L
Sum of Cations	3.673349	meq/L
Balance	8.172281	%
Total dissolved solids	254.659	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.031935	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.2	9.569474E-02	9.569474E-02
K	0.479	1.225117E-02	1.225117E-02
Ca	51	1.272519	2.545037
Mg	12.4	0.5101831	1.020366
Cl	1.6	4.513055E-02	4.513055E-02
SO4	1.98	0.020625	0.04125
NO3			
HCO3	185	3.031935	3.031935

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.112903	2.494239	0.319	0.194
Ca/SO4	25.75758	61.69787	0.152	0.364
Na/Cl	1.375	2.120398	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-017-SW	
Sample Date	9/16/2016	
Station	CFSWP-017	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	27400	uS/cm
Sum of Anions	2.015059	meq/L
Sum of Cations	2.528649	meq/L
Balance	11.30332	%
Total dissolved solids	166.243	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.901105	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.58	6.872622E-02	6.872622E-02
K	0.439	1.122811E-02	1.122811E-02
Ca	33.8	0.8433555	1.686711
Mg	9.26	0.3809916	0.7619832
Cl	0.864	0.0243705	0.0243705
SO4	4.3	4.479167E-02	8.958334E-02
NO3			
HCO3	116	1.901105	1.901105

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.650108	2.21358	0.319	0.194
Ca/SO4	7.860465	18.8284	0.152	0.364
Na/Cl	1.828704	2.820058	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-017-SW	
Sample Date	12/2/2016	
Station	CFSWP-017	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	19500	uS/cm
Sum of Anions	1.584001	meq/L
Sum of Cations	1.906826	meq/L
Balance	9.2478	%
Total dissolved solids	128.984	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.473356	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.1	4.784737E-02	4.784737E-02
K	0.314	8.03104E-03	8.03104E-03
Ca	25.4	0.6337642	1.267528
Mg	7.09	0.2917095	0.5834191
Cl	0.37	1.043644E-02	1.043644E-02
SO4	4.81	5.010417E-02	0.1002083
NO3			
HCO3	89.9	1.473356	1.473356

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.58251	2.172586	0.319	0.194
Ca/SO4	5.280665	12.64893	0.152	0.364
Na/Cl	2.972973	4.584645	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-017-SW	
Sample Date	4/4/2017	
Station	CFSWP-017	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	17100	uS/cm
Sum of Anions	1.553122	meq/L
Sum of Cations	1.76169	meq/L
Balance	6.291988	%
Total dissolved solids	124.95	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.460245	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	1.08	4.697742E-02	4.697742E-02
K	0.367	9.386598E-03	9.386598E-03
Ca	23.9	0.5963371	1.192674
Mg	6.23	0.2563259	0.5126517
Cl	0.523	1.475205E-02	1.475205E-02
SO4	3.75	0.0390625	0.078125
NO3			
HCO3	89.1	1.460245	1.460245

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.836276	2.32648	0.319	0.194
Ca/SO4	6.373333	15.26623	0.152	0.364
Na/Cl	2.06501	3.184467	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-017-SW	
Sample Date	6/14/2017	
Station	CFSWP-017	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	12900	uS/cm
Sum of Anions	1.191608	meq/L
Sum of Cations	1.31303	meq/L
Balance	4.847903	%
Total dissolved solids	95.256	mg/L
Total hardness		mg/l CaCO3
Alkalinity	1.13083	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	0.692	3.010034E-02	3.010034E-02
K	0.247	6.31741E-03	6.31741E-03
Ca	17.7	0.4416389	0.8832777
Mg	4.78	0.1966674	0.3933347
Cl	0.227	6.402897E-03	6.402897E-03
SO4	2.61	0.0271875	0.054375
NO3			
HCO3	69	1.13083	1.13083

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.702929	2.245613	0.319	0.194
Ca/SO4	6.78161	16.24419	0.152	0.364
Na/Cl	3.048458	4.701051	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-018-SW	
Sample Date	6/6/2016	
Station	CFSWP-018	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	35500	uS/cm
Sum of Anions	2.786543	meq/L
Sum of Cations	4.00994	meq/L
Balance	18.00045	%
Total dissolved solids	238.507	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.654992	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.66	0.2461964	0.2461964
K	0.797	2.038452E-02	2.038452E-02
Ca	48.3	1.20515	2.4103
Mg	16.2	0.6665295	1.333059
Cl	2.16	6.092625E-02	6.092625E-02
SO4	3.39	0.0353125	7.062501E-02
NO3			
HCO3	162	2.654992	2.654992

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.981481	1.808097	0.319	0.194
Ca/SO4	14.24779	34.12814	0.152	0.364
Na/Cl	2.62037	4.040893	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-018-SW	
Sample Date	12/1/2016	
Station	CFSWP-018	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	41700	uS/cm
Sum of Anions	3.543447	meq/L
Sum of Cations	5.677293	meq/L
Balance	23.14181	%
Total dissolved solids	317.66	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.392489	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	9.29	0.4040928	0.4040928
K	0.6	1.534594E-02	1.534594E-02
Ca	77	1.921254	3.842507
Mg	17.2	0.7076734	1.415347
Cl	1.91	5.387459E-02	5.387459E-02
SO4	4.66	4.854167E-02	9.708333E-02
NO3			
HCO3	207	3.392489	3.392489

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.476744	2.714888	0.319	0.194
Ca/SO4	16.52361	39.57948	0.152	0.364
Na/Cl	4.863874	7.500618	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-018-SW	
Sample Date	4/3/2017	
Station	CFSWP-018	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	34000	uS/cm
Sum of Anions	3.141631	meq/L
Sum of Cations	3.672285	meq/L
Balance	7.787797	%
Total dissolved solids	254.73	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.999157	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.6	0.200089	0.200089
K	0.7	1.790359E-02	1.790359E-02
Ca	46.3	1.155247	2.310495
Mg	13.9	0.5718988	1.143798
Cl	1.72	4.851534E-02	4.851534E-02
SO4	4.51	4.697917E-02	9.395834E-02
NO3			
HCO3	183	2.999157	2.999157

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.330935	2.020021	0.319	0.194
Ca/SO4	10.26608	24.59063	0.152	0.364
Na/Cl	2.674418	4.124242	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-018-SW	
Sample Date	6/15/2017	
Station	CFSWP-018	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	45600	uS/cm
Sum of Anions	4.137641	meq/L
Sum of Cations	5.604565	meq/L
Balance	15.05741	%
Total dissolved solids	353.06	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.818599	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	25.8	1.122238	1.122238
K	1.06	2.711115E-02	2.711115E-02
Ca	62.4	1.556964	3.113928
Mg	16.3	0.6706439	1.341288
Cl	2.3	6.487516E-02	6.487516E-02
SO4	12.2	0.1270833	0.2541667
NO3			
HCO3	233	3.818599	3.818599

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.828221	2.321596	0.319	0.194
Ca/SO4	5.114754	12.25152	0.152	0.364
Na/Cl	11.21739	17.29843	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-019-SW	
Sample Date	6/6/2016	
Station	CFSWP-019	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	35700	uS/cm
Sum of Anions	2.810333	meq/L
Sum of Cations	4.060582	meq/L
Balance	18.19625	%
Total dissolved solids	241.25	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.687769	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.84	0.254026	0.254026
K	0.91	2.327467E-02	2.327467E-02
Ca	49.1	1.225111	2.450222
Mg	16.2	0.6665295	1.333059
Cl	1.93	5.443873E-02	5.443873E-02
SO4	3.27	0.0340625	0.068125
NO3			
HCO3	164	2.687769	2.687769

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.030864	1.838045	0.319	0.194
Ca/SO4	15.01529	35.96656	0.152	0.364
Na/Cl	3.025907	4.666275	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-019-SW	
Sample Date	12/1/2016	
Station	CFSWP-019	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	40000	uS/cm
Sum of Anions	3.551412	meq/L
Sum of Cations	4.298041	meq/L
Balance	9.511866	%
Total dissolved solids	290.821	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.392489	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	8.71	0.3788642	0.3788642
K	0.641	1.639457E-02	1.639457E-02
Ca	51	1.272519	2.545037
Mg	16.5	0.6788726	1.357745
Cl	1.86	5.246427E-02	5.246427E-02
SO4	5.11	5.322917E-02	0.1064583
NO3			
HCO3	207	3.392489	3.392489

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.090909	1.874459	0.319	0.194
Ca/SO4	9.980431	23.90642	0.152	0.364
Na/Cl	4.682796	7.221375	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-019-SW	
Sample Date	4/3/2017	
Station	CFSWP-019	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	33800	uS/cm
Sum of Anions	3.131628	meq/L
Sum of Cations	3.646324	meq/L
Balance	7.593683	%
Total dissolved solids	253.718	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.999157	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.63	0.2013939	0.2013939
K	0.678	1.734091E-02	1.734091E-02
Ca	45.6	1.137781	2.275563
Mg	14	0.5760131	1.152026
Cl	1.55	4.372022E-02	4.372022E-02
SO4	4.26	0.044375	0.08875
NO3			
HCO3	183	2.999157	2.999157

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.257143	1.97527	0.319	0.194
Ca/SO4	10.70422	25.64014	0.152	0.364
Na/Cl	2.987097	4.606425	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-019-SW	
Sample Date	6/15/2017	
Station	CFSWP-019	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	30300	uS/cm
Sum of Anions	2.843816	meq/L
Sum of Cations	3.19874	meq/L
Balance	5.873746	%
Total dissolved solids	228.009	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.736936	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.33	0.1883446	0.1883446
K	0.769	1.966837E-02	1.966837E-02
Ca	38	0.9481512	1.896302
Mg	13.3	0.5472125	1.094425
Cl	1.47	0.0414637	0.0414637
SO4	3.14	3.270834E-02	6.541667E-02
NO3			
HCO3	167	2.736936	2.736936

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.857143	1.732693	0.319	0.194
Ca/SO4	12.10191	28.98806	0.152	0.364
Na/Cl	2.945578	4.542399	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-020-SW	
Sample Date	6/6/2016	
Station	CFSWP-020	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	34400	uS/cm
Sum of Anions	2.661855	meq/L
Sum of Cations	3.799193	meq/L
Balance	17.60299	%
Total dissolved solids	226.898	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.523881	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.15	0.2240127	0.2240127
K	0.818	2.092163E-02	2.092163E-02
Ca	45.5	1.135286	2.270572
Mg	15.6	0.6418433	1.283687
Cl	2.24	6.318277E-02	6.318277E-02
SO4	3.59	3.739583E-02	7.479167E-02
NO3			
HCO3	154	2.523881	2.523881

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.916667	1.76879	0.319	0.194
Ca/SO4	12.6741	30.35863	0.152	0.364
Na/Cl	2.299107	3.545471	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-020-SW	
Sample Date	12/1/2016	
Station	CFSWP-020	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	35600	uS/cm
Sum of Anions	3.111714	meq/L
Sum of Cations	5.249876	meq/L
Balance	25.57124	%
Total dissolved solids	283.394	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.999157	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.86	0.2113984	0.2113984
K	0.894	2.286544E-02	2.286544E-02
Ca	73.3	1.828934	3.657867
Mg	16.5	0.6788726	1.357745
Cl	1.59	4.484849E-02	4.484849E-02
SO4	3.25	3.385417E-02	6.770834E-02
NO3			
HCO3	183	2.999157	2.999157

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.442424	2.694075	0.319	0.194
Ca/SO4	22.55385	54.02389	0.152	0.364
Na/Cl	3.056604	4.713612	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-020-SW	
Sample Date	3/16/2017	
Station	CFSWP-020	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	31900	uS/cm
Sum of Anions	2.905565	meq/L
Sum of Cations	3.162307	meq/L
Balance	4.231163	%
Total dissolved solids	231.026	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.769713	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.08	0.1774702	0.1774702
K	0.656	1.677822E-02	1.677822E-02
Ca	38.7	0.9656171	1.931234
Mg	12.6	0.5184119	1.036824
Cl	1.5	4.230989E-02	4.230989E-02
SO4	4.49	4.677083E-02	9.354167E-02
NO3			
HCO3	169	2.769713	2.769713

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	3.071429	1.862645	0.319	0.194
Ca/SO4	8.619154	20.64571	0.152	0.364
Na/Cl	2.72	4.194533	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-020-SW	
Sample Date	6/15/2017	
Station	CFSWP-020	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (°C)		
pH		
Conductivity	31500	uS/cm
Sum of Anions	2.972779	meq/L
Sum of Cations	3.418487	meq/L
Balance	6.973697	%
Total dissolved solids	239.882	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.868047	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.57	0.1987841	0.1987841
K	0.652	1.667592E-02	1.667592E-02
Ca	41.1	1.0255	2.051001
Mg	14	0.5760131	1.152026
Cl	1.32	0.0372327	0.0372327
SO4	3.24	0.03375	0.0675
NO3			
HCO3	175	2.868047	2.868047

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	2.935714	1.780342	0.319	0.194
Ca/SO4	12.68518	30.38519	0.152	0.364
Na/Cl	3.462121	5.338964	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-021-SW	
Sample Date	6/6/2016	
Station	CFSWP-021	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	34400	uS/cm
Sum of Anions	2.625396	meq/L
Sum of Cations	3.765145	meq/L
Balance	17.83493	%
Total dissolved solids	225.958	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.425548	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.15	0.2675103	0.2675103
K	0.578	1.478325E-02	1.478325E-02
Ca	50.5	1.260043	2.520086
Mg	11.7	0.4813824	0.9627649
Cl	1.59	4.484849E-02	4.484849E-02
SO4	7.44	0.0775	0.155
NO3			
HCO3	148	2.425548	2.425548

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.316239	2.617551	0.319	0.194
Ca/SO4	6.787634	16.25862	0.152	0.364
Na/Cl	3.867924	5.964756	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-021-SW	
Sample Date	11/30/2016	
Station	CFSWP-021	
Location		
Geology		
Watertype	Ca-Mg-Na-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	59300	uS/cm
Sum of Anions	5.323037	meq/L
Sum of Cations	7.082016	meq/L
Balance	14.17954	%
Total dissolved solids	437.2	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.736655	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	31	1.348426	1.348426
K	1.25	0.0319707	0.0319707
Ca	82.1	2.048506	4.097011
Mg	19.5	0.802304	1.604608
Cl	2.25	6.346484E-02	6.346484E-02
SO4	73.1	0.7614583	1.522917
NO3			
HCO3	228	3.736655	3.736655

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.210256	2.553278	0.319	0.194
Ca/SO4	1.123119	2.69024	0.152	0.364
Na/Cl	13.77778	21.24682	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-021-SW	
Sample Date	3/15/2017	
Station	CFSWP-021	
Location		
Geology		
Watertype	Ca-Na-Mg-HCO3-SO4	
Temperature (℃)		
pH		
Conductivity	51500	uS/cm
Sum of Anions	5.06893	meq/L
Sum of Cations	4.935248	meq/L
Balance	-1.336264	%
Total dissolved solids	381.239	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.376101	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	26.3	1.143987	1.143987
K	0.499	0.0127627	0.0127627
Ca	55.6	1.387295	2.77459
Mg	12.2	0.5019543	1.003909
Cl	1.74	4.907947E-02	4.907947E-02
SO4	78.9	0.821875	1.64375
NO3			
HCO3	206	3.376101	3.376101

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.557377	2.763787	0.319	0.194
Ca/SO4	0.7046894	1.687963	0.152	0.364
Na/Cl	15.11494	23.30887	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-021-SW	
Sample Date	6/15/2017	
Station	CFSWP-021	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	39800	uS/cm
Sum of Anions	3.746379	meq/L
Sum of Cations	4.246494	meq/L
Balance	6.25702	%
Total dissolved solids	300.363	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.277767	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	10.7	0.4654244	0.4654244
K	0.443	1.133042E-02	1.133042E-02
Ca	54.6	1.362343	2.724687
Mg	12.7	0.5225262	1.045052
Cl	1.62	4.569468E-02	4.569468E-02
SO4	20.3	0.2114583	0.4229167
NO3			
HCO3	200	3.277767	3.277767

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.299212	2.607225	0.319	0.194
Ca/SO4	2.689655	6.44261	0.152	0.364
Na/Cl	6.604938	10.18553	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-022-SW	
Sample Date	6/6/2016	
Station	CFSWP-022	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	34600	uS/cm
Sum of Anions	2.542501	meq/L
Sum of Cations	3.392903	meq/L
Balance	14.32761	%
Total dissolved solids	214.365	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.359993	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.9	0.3001335	0.3001335
K	0.785	0.0200776	0.0200776
Ca	43.6	1.087879	2.175757
Mg	10.9	0.4484674	0.8969347
Cl	1.64	4.625881E-02	4.625881E-02
SO4	6.54	0.068125	0.13625
NO3			
HCO3	144	2.359993	2.359993

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4	2.42577	0.319	0.194
Ca/SO4	6.666667	15.96886	0.152	0.364
Na/Cl	4.207317	6.488136	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-022-SW	
Sample Date	4/3/2017	
Station	CFSWP-022	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32300	uS/cm
Sum of Anions	2.96015	meq/L
Sum of Cations	3.330169	meq/L
Balance	5.882356	%
Total dissolved solids	238.499	mg/L
Total hardness		mg/l CaCO3
Alkalinity	2.786102	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	4.49	0.1953042	0.1953042
K	0.459	1.173964E-02	1.173964E-02
Ca	45.6	1.137781	2.275563
Mg	10.3	0.4237811	0.8475623
Cl	1.99	5.613112E-02	5.613112E-02
SO4	5.66	5.895833E-02	0.1179167
NO3			
HCO3	170	2.786102	2.786102

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.427184	2.684833	0.319	0.194
Ca/SO4	8.056537	19.29806	0.152	0.364
Na/Cl	2.256281	3.479429	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-023-SW	
Sample Date	4/3/2017	
Station	CFSWP-023	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	41300	uS/cm
Sum of Anions	3.876508	meq/L
Sum of Cations	4.548828	meq/L
Balance	7.979734	%
Total dissolved solids	314.926	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.556378	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	5.28	0.2296674	0.2296674
K	0.646	1.652246E-02	1.652246E-02
Ca	63.3	1.57942	3.15884
Mg	13.9	0.5718988	1.143798
Cl	1.6	4.513055E-02	4.513055E-02
SO4	13.2	0.1375	0.275
NO3			
HCO3	217	3.556378	3.556378

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.553957	2.761713	0.319	0.194
Ca/SO4	4.795455	11.48669	0.152	0.364
Na/Cl	3.3	5.088956	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-024-SW	
Sample Date	6/15/2017	
Station	CFSWP-024	
Location		
Geology		
Watertype	Ca-Na-HCO3	
Temperature (℃)		
pH		
Conductivity	11900	uS/cm
Sum of Anions	0.3584703	meq/L
Sum of Cations	0.7719526	meq/L
Balance	36.57766	%
Total dissolved solids	35.888	mg/L
Total hardness		mg/l CaCO3
Alkalinity	0.2278048	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	6.73	0.2927389	0.2927389
K	0.814	2.081932E-02	2.081932E-02
Ca	7.86	0.1961176	0.3922352
Mg	0.804	3.307961E-02	6.615923E-02
Cl	1.39	3.920716E-02	3.920716E-02
SO4	4.39	4.572917E-02	9.145834E-02
NO3			
HCO3	13.9	0.2278048	0.2278048

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	9.776119	5.928654	0.319	0.194
Ca/SO4	1.790433	4.288676	0.152	0.364
Na/Cl	4.841727	7.466464	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-025-SW	
Sample Date	12/20/2016	
Station	CFSWP-025	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	33400	uS/cm
Sum of Anions	3.385937	meq/L
Sum of Cations	4.112058	meq/L
Balance	9.684201	%
Total dissolved solids	278.918	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.294156	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.88	0.1252731	0.1252731
K	0.528	1.350442E-02	1.350442E-02
Ca	56.7	1.414741	2.829483
Mg	13.9	0.5718988	1.143798
Cl	1.4	3.948923E-02	3.948923E-02
SO4	2.51	2.614583E-02	5.229167E-02
NO3			
HCO3	201	3.294156	3.294156

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.079137	2.473762	0.319	0.194
Ca/SO4	22.58964	54.10963	0.152	0.364
Na/Cl	2.057143	3.172336	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-025-SW	
Sample Date	3/13/2017	
Station	CFSWP-025	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	38000	uS/cm
Sum of Anions	3.543407	meq/L
Sum of Cations	3.872846	meq/L
Balance	4.442118	%
Total dissolved solids	283.139	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.392489	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.53	0.1100489	0.1100489
K	0.509	1.301847E-02	1.301847E-02
Ca	54.2	1.352363	2.704726
Mg	12.7	0.5225262	1.045052
Cl	2.95	8.320946E-02	8.320946E-02
SO4	3.25	3.385417E-02	6.770834E-02
NO3			
HCO3	207	3.392489	3.392489

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.267717	2.588125	0.319	0.194
Ca/SO4	16.67692	39.94672	0.152	0.364
Na/Cl	0.8576271	1.322553	0.556	0.858
Cl/Br			287	648

Sample Summary Report

Sample ID	CFSWP-025-SW	
Sample Date	6/13/2017	
Station	CFSWP-025	
Location		
Geology		
Watertype	Ca-Mg-HCO3	
Temperature (℃)		
pH		
Conductivity	32300	uS/cm
Sum of Anions	3.119591	meq/L
Sum of Cations	3.679926	meq/L
Balance	8.240808	%
Total dissolved solids	254.826	mg/L
Total hardness		mg/l CaCO3
Alkalinity	3.031935	mg/l CaCO3

Major ion composition	mg/l	mmol/l	meq/l
Na	2.25	9.786962E-02	9.786962E-02
K	0.456	1.166291E-02	1.166291E-02
Ca	51.1	1.275014	2.550028
Mg	12.4	0.5101831	1.020366
Cl	1.66	4.682295E-02	4.682295E-02
SO4	1.96	2.041667E-02	4.083334E-02
NO3			
HCO3	185	3.031935	3.031935

Ratios	Sample		Standard Seawater	
	mg/l	mmol/l	mg/l	mmol/l
Ca/Mg	4.120968	2.49913	0.319	0.194
Ca/SO4	26.07143	62.44965	0.152	0.364
Na/Cl	1.355422	2.090206	0.556	0.858
Cl/Br			287	648

APPENDIX Q

General Chemistry Ion Balance

Appendix Q - General Chemistry Ion Balance - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample ID	Station ID	Sample Date	Conductivity (uS/cm)	pH	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Cl (mg/l)	SO4 (mg/l)	HCO3 (mg/l)	Cation Totals (mg/l)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Sum Cations (meq/L)	Anion Totals (mg/l)	Cl (meq/L)	SO4 (meq/L)	HCO3 (meq/L)	Sum Anions (meq/L)	Ion Balance (%)
CFSWP-001-SW	CFSWP-001	9/16/2016	16800	7.71	1.07	0.33	6.32	24.2	0.379	3.57	85.9	31.92	1.2076	0.5201	0.0465	0.0084	1.7826	89.849	0.0107	0.0743	1.4079	1.4929	8.8449
CFSWP-002-SW	CFSWP-002	9/16/2016	16700	7.69	1.03	0.306	6.03	23.2	0.342	3.61	85.9	30.566	1.1577	0.4962	0.0448	0.0078	1.7065	89.852	0.0096	0.0752	1.4079	1.4927	6.6832
CFSWP-003-SW	CFSWP-003	9/9/2016	20800	6.18	3.78	0.398	7.65	27.7	0.5	4.62	97.9	39.528	1.3822	0.6295	0.1644	0.0102	2.1864	103.02	0.0141	0.0962	1.6046	1.7149	12.0855
CFSWP-004-SW	CFSWP-004	9/9/2016	52000	6.75	36.4	1.12	18.2	60.7	3.06	18.1	264	116.42	3.0289	1.4977	1.5834	0.0286	6.1387	285.16	0.0863	0.3768	4.3270	4.7901	12.3393
CFSWP-005-SW	CFSWP-005	9/9/2016	51700	6.75	36.9	1.02	17.8	60.2	2.91	17.8	256	115.92	3.0040	1.4648	1.6052	0.0261	6.1000	276.71	0.0821	0.3706	4.1958	4.6485	13.5038
CFSWP-006-SW	CFSWP-006	9/9/2016	16500	7.53	1.03	0.328	6.63	24.2	0.352	3.68	86	32.188	1.2076	0.5456	0.0448	0.0084	1.8064	90.032	0.0099	0.0766	1.4095	1.4961	9.3952
CFSWP-007-SW	CFSWP-007	9/16/2016	16600	7.56	0.951	0.311	6.01	23.1	0.348	3.53	83.9	30.372	1.1527	0.4946	0.0414	0.0080	1.6966	87.778	0.0098	0.0735	1.3751	1.4584	7.5481
CFSWP-008-SW	CFSWP-008	9/16/2016	16600	7.31	0.958	0.317	6.05	23.2	0.335	3.49	85.9	30.525	1.1577	0.4979	0.0417	0.0081	1.7053	89.725	0.0095	0.0727	1.4079	1.4900	6.7381
CFSWP-009-SW	CFSWP-009	6/7/2016	32600	8	2.34	0.56	12.6	50.1	1.77	2.79	170	65.6	2.5000	1.0369	0.1018	0.0143	3.6530	174.56	0.0499	0.0581	2.7863	2.8943	11.5871
CFSWP-010-SW	CFSWP-010	6/7/2016	29600	8.06	2.08	0.535	10.9	47	1.97	1.93	158	60.515	2.3453	0.8970	0.0905	0.0137	3.3464	161.9	0.0556	0.0402	2.5896	2.6854	10.9594
CFSWP-011-SW	CFSWP-011	6/7/2016	29800	7.94	2.12	0.54	10.8	47	1.71	1.91	158	60.46	2.3453	0.8887	0.0922	0.0138	3.3401	161.62	0.0482	0.0398	2.5896	2.6776	11.0082
CFSWP-012-SW	CFSWP-012	6/7/2016	29600	7.88	2.08	0.537	10.9	46.8	1.72	1.9	158	60.317	2.3353	0.8970	0.0905	0.0137	3.3365	161.62	0.0485	0.0396	2.5896	2.6777	10.9541
CFSWP-013-SW	CFSWP-013	6/7/2016	29500	7.81	2.03	0.53	10.7	46.5	1.78	1.91	179	59.76	2.3204	0.8805	0.0883	0.0136	3.3027	182.69	0.0502	0.0398	2.9338	3.0238	4.4088
CFSWP-DUP1-SW	CFSWP-013	6/7/2016	29500	7.81	2.12	0.556	11.1	47.7	1.7	1.96	160	61.476	2.3802	0.9134	0.0922	0.0142	3.4001	163.66	0.0480	0.0408	2.6224	2.7112	11.2731
CFSWP-014-SW	CFSWP-014	8/29/2016	20800	7.35	3.24	0.377	13.5	43.1	2.67	3.32	165	60.217	2.1507	1.1109	0.1409	0.0096	3.4122	170.99	0.0753	0.0691	2.7044	2.8488	8.9985
CFSWP-015-SW	CFSWP-015	8/29/2016	31100	7.38	2.87	0.405	13.6	47.5	2.6	2.74	171	64.375	2.3703	1.1191	0.1248	0.0104	3.6246	176.34	0.0733	0.0570	2.8027	2.9331	10.5451
CFSWP-DUP2-SW	CFSWP-015	8/29/2016	31100	7.38	2.62	0.357	13.4	44.6	2.61	3.1	169	60.977	2.2255	1.1027	0.1140	0.0091	3.4513	174.71	0.0736	0.0645	2.7699	2.9081	8.5424
CFSWP-016-SW	CFSWP-016	8/29/2016	31000	7.44	3.26	0.367	13.5	44.4	2.8	2.7	173	61.527	2.2156	1.1109	0.1418	0.0094	3.4777	178.5	0.0790	0.0562	2.8355	2.9707	7.8625
CFSWP-017-SW	CFSWP-017	9/16/2016	27400	7.28	1.58	0.439	9.26	33.8	0.864	4.3	116	45.079	1.6866	0.7620	0.0687	0.0112	2.5286	121.164	0.0244	0.0895	1.9012	2.0151	11.3001
CFSWP-018-SW	CFSWP-018	6/6/2016	35500	7.29	5.66	0.797	16.2	48.3	2.16	3.39	162	70.957	2.4102	1.3331	0.2462	0.0204	4.0099	167.55	0.0609	0.0706	2.6552	2.7867	17.9969
CFSWP-019-SW	CFSWP-019	6/6/2016	35700	7.54	5.84	0.91	16.2	49.1	1.93	3.27	164	72.05	2.4501	1.3331	0.2540	0.0233	4.0605	169.2	0.0544	0.0681	2.6880	2.8105	18.1927
CFSWP-020-SW	CFSWP-020	6/6/2016	34400	7.69	5.15	0.818	15.6	45.5	2.24	3.59	154	67.068	2.2705	1.2837	0.2240	0.0209	3.7991	159.83	0.0632	0.0747	2.5241	2.6620	17.5996
CFSWP-021-SW	CFSWP-021	6/6/2016	34400	7.7	6.15	0.578	11.7	50.5	1.59	7.44	148	68.928	2.5200	0.9628	0.2675	0.0148	3.7651	157.03	0.0449	0.1549	2.4257	2.6255	17.8323
CFSWP-022-SW	CFSWP-022	6/6/2016	34600	7.62	6.9	0.785	10.9	43.6	1.64	6.54	144	62.185	2.1756	0.8970	0.3002	0.0201	3.3928	152.18	0.0463	0.1362	2.3602	2.5426	14.3249
CFMW-001-GW	UU_MW-001	9/20/2016	34700	6.67	8.36	0.74	14.1	60.3	0.611	6.6	200	83.5	3.0090	1.1603	0.3637	0.0189	4.5518	7.211	0.0172	0.1374	3.2780	3.4326	14.0172
CFMW-002-GW	UU_MW-002	9/12/2016	90900	8.1	173	1.02	10.9	31.8	4.13	14.4	416	216.72	1.5868	0.8970	7.5255	0.0261	10.0354	434.53	0.1165	0.2998	6.8182	7.2346	16.2179
CFMW-003-GW	UU_MW-003	9/14/2016	262000	7.36	322	2.1	45.8	178	39.1	694	664	547.9	8.8822	3.7689	14.0070	0.0537	26.7118	1397.1	1.1030	14.4491	10.8830	26.4351	0.5207
CFMW-003a-GW	BUU_MW-003a	9/20/2016	28100	9.1	17.5	3.27	5.38	31	8.6	36.7	112	57.15	1.5469	0.4427	0.7613	0.0836	2.8345	157.3	0.2426	0.7641	1.8357	2.8424	-0.1385
CFMW-007-GW	UU_MW-007	9/21/2016	36200	8.46	3.05	0.579	12.8	50.2	1.86	5.53	374	66.629	2.5050	1.0533	0.1327	0.0148	3.7058	381.39	0.0525	0.1151	6.1299	6.2975	-25.9085
CFMW-008-GW	UU_MW-008	9/21/2016	63000	9.32	138	1.19	4.32	6.37	2.02	7.03	347	149.88	0.3179	0.3555	6.0030	0.0304	6.7068	356.05	0.0570	0.1464	5.6873	5.8907	6.4784
CFMW-008a-GW	UU_MW-008a	9/15/2016	490000	14	49.6	18	0.0636	388	8.43	20.2	1060	455.6636	19.3612	0.0052	2.1576	0.4604	21.9845	1088.63	0.2378	0.4206	17.3734	18.0318	9.8777
CFMW-010-GW	UU_MW-010	9/12/2016	201000	9	445	1.46	16.5	35.5	4.63	48	875	498.46	1.7715	1.3578	19.3575	0.0373	22.5241	927.63	0.1306	0.9994	14.3413	15.4712	18.5625
CFMW-011-GW	UU_MW-011	9/13/2016	38500	7.28	9.95	0.657	14.1	47.6	1.59	4.63	196	72.307	2.3752	1.1603	0.4328	0.0168	3.9852	202.22	0.0449	0.0964	3.2124	3.3537	8.6045
CFMW-011a-GW	BUU_MW-011a	9/20/2016	27100	10.18	19.9	2.07	9.01	24.6	4.07	12.5	132	55.58	1.2275	0.7414	0.8657	0.0530	2.8876	148.57	0.1148	0.2603	2.1635	2.5385	6.4324
CFMW-012-GW	UU_MW-012	9/12/2016	105000	9.04	226	0.817	4.13	8.66	3.49	21.5	474	239.607	0.4321	0.3399	9.8310	0.0209	10.6239	498.99	0.0985	0.4476	7.7689	8.3149	12.1916
CFMW-012a-GW	BUU_MW-012a	9/15/2016	37800	7.13	6.38	0.721	13	51.3	0.571	5.26	200	71.401	2.5599	1.0698	0.2775	0.0184	3.9256	205.831	0.0161	0.1095	3.2780	3.4036	7.1221
CFMW-DUP2-GW	BUU_MW-012a	9/15/2016	37800	7.13	6.19	0.726	13	50.8	0.57	5.74	204	70.716	2.5349	1.0698	0.2693	0.0186	3.8925	210.31	0.0161	0.1195	3.3436	3.4791	5.6077
CFMW-014-GW	UU_MW-014	9/12/2016	104000	7.33	168	1.12	16.8	44.9	2.45	35	476	230.82	2.2405	1.3825	7.3080	0.0286	10.9596	513.45	0.0691	0.7287	7.8016	8.5995	12.0669
CFMW-015-GW	UU_MW-015	9/12/2016	256000	9.47	620	2.4	4.01	2.71	5.77	87.4	1190	629.12	0.1352	0.3300	26.9700	0.0614	27.4966	1283.17	0.1628	1.8197	19.5041	21.4865	12.2697
CFMW-016a-GW	UU_MW-016a	9/21/2016	37100	11.39	18.6	2.78	4.06	38.1	2.28	5.88	64.1	63.54	1.9012	0.3341	0.8091	0.0711	3.1155	72.26	0.0643	0.1224	1.0506	1.2373	43.1479
CFMW-019-GW	UU_MW-019	9/12/2016	83900	7.69	104	1.52	17.2	55.1	5.93	95	334	177.82	2.7495	1.4154	4.5240	0.0389	8.7278	434.93	0.1673	1.9779	5.4743	7.6194	6.7798
CFMW-019a-GW	BUU_MW-019a	9/20/2016	37400	10.24	50.9	8.88	3.7	15.1	3.18	14.3	222	78.58	0.7535	0.3045	2.2142	0.2272	3.4993	239.48	0.0897	0.2977	3.6386	4.0260	-6.9997
CFMW-020-GW	UU_MW-020	9/20/2016	40800	7.22	4.81	0.774	13.9	54.4	2.25	20.1	220	73.884	2.7146	1.1438	0.2092	0.0198	4.0874	242.35	0.0635	0.4185	3.6058	4.0878	-0.0040
CFMW-021-GW	UU_MW-021	9/12/2016	63100	7.11	54.3	1	18.8	62.3	3.73	57.1	284	136.4	3.1088	1.5471	2.3621	0.0256	7.0435	344.83	0.1052	1.1888	4.6548	5.9488	8.4254
CFMW-022-GW	UU_MW-022	9/13/2016	39400	7.61	5.09	0.318	6.72	27.7	1.59	5.47	202	39.828	1.3822	0.5530	0.2214	0.0081	2.1648	209.06	0.0449	0.1139	3.3108	3.4695	-23.1573
CFMW-023-GW	UU_MW-023	9/21/2016	44900	7.59	4.1	0.6	17.7	60.7	0.669	5.4	242	83.1	3.0289	1.4565	0.1784	0.0153	4.6792	248.069	0.0189	0.1124	3.9664	4.0977	6.6252
CFMW-025a-GW	BUU_MW-025a	9/13/2016	38600	7.92	8.85	2.09	24.1	38.3	1.89	13.5	182	73.34	1.9112	1.9832	0.3850	0.0535	4.3328	197.39	0.0533	0.2811	2.9830	3.3174	13.2733
CFMW-025b-GW	UU_MW-025b	9/13/2016	43000	8.3	6.43	0.932	20	50.7	1.94	13.8	212	78.062	2.5299	1.6458	0.2797	0.0238	4.4793	227.74	0.0547	0.2873	3.4747	3.8167	7.9864
CFMW-026-GW	UU_MW-026	9/13/2016	46800	7.94	11.6	0.858	14.6	59.9	2.72	20.3	218	86.958	2.9890	1.2014	0.5046	0.0219	4.7170	241.02	0.0767	0.4226	3.5730	4.0724	7.3338
CFMW-027-GW	UU_MW-027	9/13/2016	61200	7.7	31	0.52	7.89	24.5	2.22	27.3	284	63.91	1.2226	0.6493	1.3485	0.0133	3.2336	313.52	0.0626	0.5684	4.6548	5.2858	-24.0880
CFMW-028-GW	UU_MW-028	9/13/2016	42700	7.93	26	4.23	15.9	44.1	2.09	8.38	206	90.23	2.2006	1.3084	1.1310	0.1082	4.7482	216.47	0.0590	0.1745	3.3763	3.6098	13.6209
CFMW-028a-GW	UU_MW-028a	9/20/2016	20300	9.02	13.6	3.26	8.1	12.2	16.9	34.2	46	37.16	0.6088	0.6665	0.5916	0.0834	1.9503	97.1	0.4767	0.7120	0.7539	1.9427	0.1949
CFMW-029-GW	UU_MW-029	9/13/2016	49600	7.38	35.4	0.898	18.7	52.7	1	18.3	226	107.698	2.6297	1.5388	1.5399	0.0230	5.7314	245.3	0.0282	0.3810	3.7041	4.1134	16.4358
CFMW-DUP1-GW	UU_MW-029	9/13/2016	49600	7.38	34.2	0.864	17.8	51.1	0.999	18.3	238	103.964	2.5499	1.4648	1.4877	0.0221	5.5245	257.299	0.0282	0.3810	3.9008	4.3100	12.3489

Appendix Q - General Chemistry Ion Balance - Round 1
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample ID	Station ID	Sample Date	Conductivity (uS/cm)	pH	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Cl (mg/l)	SO4 (mg/l)	HCO3 (mg/l)	Cation Totals (mg/l)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Sum Cations (meq/L)	Anion Totals (mg/l)	Cl (meq/L)	SO4 (meq/L)	HCO3 (meq/L)	Sum Anions (meq/L)	Ion Balance (%)
CFMW-031-GW	UU_MW-031	9/15/2016	48200	8.12	29.8	0.736	13.2	47.7	1.7	8.39	230	91.436	2.3802	1.0862	1.2963	0.0188	4.7816	240.09	0.0480	0.1747	3.7697	3.9923	8.9954
CFMW-032-GW	UU_MW-032	9/15/2016	96500	7.77	155	2.63	11.7	38.8	2.26	10.9	452	208.13	1.9361	0.9628	6.7425	0.0673	9.7087	465.16	0.0638	0.2269	7.4083	7.6990	11.5450
CFMW-032a-GW	BUU_MW-032a	9/16/2016	640000	14	25.4	21.6	0.0636	628	1.65	2.82	1650	675.0636	31.3372	0.0052	1.1049	0.5525	32.9999	1654.47	0.0465	0.0587	27.0435	27.1488	9.7277
CFMW-033-GW	UU_MW-033	9/15/2016	56500	8.08	43.5	0.944	16.6	53.6	2.39	22.6	256	114.644	2.6746	1.3660	1.8923	0.0241	5.9571	280.99	0.0674	0.4705	4.1958	4.7338	11.4421
CFMW-034-GW	UU_MW-034	9/14/2016	50900	7.2	27.4	0.918	15.5	59.1	1.81	13.8	254	102.918	2.9491	1.2755	1.1919	0.0235	5.4400	269.61	0.0511	0.2873	4.1631	4.5014	9.4406
CFMW-035-GW	UU_MW-035	9/14/2016	70000	7.1	34.5	2.43	32.7	76.7	6.88	29.5	362	146.33	3.8273	2.6909	1.5008	0.0622	8.0811	398.38	0.1941	0.6142	5.9332	6.7415	9.0380
CFMW-037-GW	UU_MW-037	9/16/2016	37600	8.25	8.93	0.807	14.2	49.1	2.76	8.81	192	73.037	2.4501	1.1685	0.3885	0.0206	4.0277	203.57	0.0779	0.1834	3.1469	3.4082	8.3318
CFMW-038-GW	UU_MW-038	9/14/2016	57900	8.18	37.3	1.03	16.3	60.6	2.81	16.7	284	115.23	3.0239	1.3413	1.6226	0.0263	6.0142	303.51	0.0793	0.3477	4.6548	5.0817	8.4035
CFMW-040-GW	UU_MW-040	9/14/2016	55800	7.47	34.7	1.18	15.6	55.7	3.24	16.7	256	107.18	2.7794	1.2837	1.5095	0.0302	5.6028	275.94	0.0914	0.3477	4.1958	4.6349	9.4538
CFMW-042-GW	UU_MW-042	9/14/2016	54300	7.41	43.9	1.01	16.2	56	2.94	25.5	252	117.11	2.7944	1.3331	1.9097	0.0258	6.0630	280.44	0.0829	0.5309	4.1303	4.7441	12.2036
CFMW-043-GW	UU_MW-043	9/13/2016	56100	7.33	44.2	0.999	15.9	51.6	2.47	26	254	112.699	2.5748	1.3084	1.9227	0.0256	5.8315	282.47	0.0697	0.5413	4.1631	4.7741	9.9707
CFMW-044-GW	UU_MW-044	9/16/2016	56600	8.09	45	0.888	16.2	50.1	2.96	26.2	262	112.188	2.5000	1.3331	1.9575	0.0227	5.8133	291.16	0.0835	0.5455	4.2942	4.9232	8.2908
CFMW-044a-GW	UU_MW-044a	9/19/2016	201000	12.25	40.7	1.66	0.121	155	5.34	63	360	197.481	7.7345	0.0100	1.7705	0.0425	9.5574	428.34	0.1506	1.3117	5.9004	7.3627	12.9708
CFMW-044b-GW	BUU_MW-044b	9/19/2016	25500	8.26	3.9	2.52	16.5	13.7	3.5	0.826	132	36.62	0.6836	1.3578	0.1697	0.0645	2.2755	136.326	0.0987	0.0172	2.1635	2.2794	-0.0853
CFMW-045-GW	UU_MW-045	9/15/2016	55200	7.49	39	0.936	15.6	53.7	2.84	23.1	254	109.236	2.6796	1.2837	1.6965	0.0239	5.6838	279.94	0.0801	0.4809	4.1631	4.7241	9.2207
CFMW-045a-GW	UU_MW-045a	9/19/2016	39400	9.85	31.1	2.3	13	45.8	2.87	21.5	215	92.2	2.2854	1.0698	1.3529	0.0588	4.7669	239.37	0.0810	0.4476	3.5239	4.0524	8.1008
CFMW-047-GW	UU_MW-047	9/14/2016	30800	10.86	18.5	1.2	15.6	57.1	2.69	10.3	230	92.4	2.8493	1.2837	0.8048	0.0307	4.9685	242.99	0.0759	0.2144	3.7697	4.0600	10.0618
CFMW-049-GW	UU_MW-049	9/21/2016	39900	7.37	10.1	0.857	15.5	47.6	1.78	3.55	206	74.057	2.3752	1.2755	0.4394	0.0219	4.1120	211.33	0.0502	0.0739	3.3763	3.5005	8.0334
CFMW-049a-GW	UU_MW-049a	9/16/2016	263000	12.46	25.2	19.7	0.291	198	2.3	4.71	422	243.191	9.8802	0.0239	1.0962	0.5039	11.5043	429.01	0.0649	0.0981	6.9166	7.0795	23.8097
CFMW-050-GW	UU_MW-050	9/19/2016	39200	8.18	11.7	0.845	15.3	46.8	0.015	3.32	208	74.645	2.3353	1.2590	0.5090	0.0216	4.1249	211.335	0.0004	0.0691	3.4091	3.4787	8.4994
CFMW-053-GW	UU_MW-053	9/14/2016	53600	7.55	44	1.07	16.6	58.2	2.9	24.8	264	119.87	2.9042	1.3660	1.9140	0.0274	6.2116	291.7	0.0818	0.5163	4.3270	4.9251	11.5516
CFMW-053a-GW	BUU_MW-053a	9/19/2016	930000	14	102	65.2	0.0636	922	6.36	1.57	2320	1089.2636	46.0078	0.0052	4.4370	1.6678	52.1178	2327.93	0.1794	0.0327	38.0248	38.2369	15.3627
CFMW-054-GW	UU_MW-054	9/14/2016	53400	7.51	38.8	1.05	16.5	59.4	2.6	22.3	262	115.75	2.9641	1.3578	1.6878	0.0269	6.0365	286.9	0.0733	0.4643	4.2942	4.8318	11.0844
CFMW-056-GW	BUU_MW-056	9/20/2016	37900	7.21	4.1	1.57	18.7	48.7	0.459	4.53	206	73.07	2.4301	1.5388	0.1784	0.0402	4.1875	210.989	0.0129	0.0943	3.3763	3.4836	9.1755
CFMW-DUP3-GW	BUU_MW-056	9/20/2016	37900	7.21	4.28	1.59	19	49.7	0.386	4.43	206	74.57	2.4800	1.5635	0.1862	0.0407	4.2704	210.816	0.0109	0.0922	3.3763	3.4795	10.2057
CFMW-056a-GW	BUU-MW-056a	9/20/2016	29800	8.11	26.7	10.8	7.47	18.6	17.9	96.4	118	63.57	0.9281	0.6147	1.1615	0.2763	2.9806	232.3	0.5050	2.0070	1.9340	4.4460	-19.7327
CFMW-056b-GW	UU_MW-056b	9/13/2016	49500	7.98	9.45	0.925	17.5	69	3.16	27	236	96.875	3.4431	1.4401	0.4111	0.0237	5.3179	266.16	0.0891	0.5621	3.8680	4.5193	8.1180
CFMW-057-GW	BUU_MW-057	9/19/2016	21200	8.01	3.7	1.73	15.6	20.5	0.63	0.797	126	41.53	1.0230	1.2837	0.1610	0.0443	2.5119	127.427	0.0178	0.0166	2.0651	2.0995	8.9425
CFMW-057a-GW	BUU_MW-057a	9/19/2016	832000	12.8	48.1	18.1	0.0636	581	6.52	1.08	1860	647.2636	28.9919	0.0052	2.0924	0.4630	31.5525	1867.6	0.1839	0.0225	30.4854	30.6918	1.3827
CFMW-059-GW	UU_MW-059	9/15/2016	56300	7.48	20.6	1.15	14.1	69.3	30.4	6.98	232	105.15	3.4581	1.1603	0.8961	0.0294	5.5439	269.38	0.8576	0.1453	3.8025	4.8054	7.1357
CFMW-059a-GW	BUU_MW-059a	9/19/2016	501000	14	15.4	7.92	0.0636	340	4.27	12.4	1080	363.3836	16.9660	0.0052	0.6699	0.2026	17.8437	1096.67	0.1205	0.2582	17.7012	18.0798	-0.6572
CFMW-061-GW	UU_MW-061	9/15/2016	40700	7.6	8.66	0.837	16.2	50.1	2.35	7.72	204	75.797	2.5000	1.3331	0.3767	0.0214	4.2312	214.07	0.0663	0.1607	3.3436	3.5706	8.4676
CFMW-064-GW	UU_MW-064	9/15/2016	40600	7.66	9.02	0.948	17.9	47.1	2.1	4.56	206	74.968	2.3503	1.4730	0.3924	0.0242	4.2399	212.66	0.0592	0.0949	3.3763	3.5305	9.1292

Conversion Factor	
Calcium (Ca)	0.0499
Magnesium (Mg)	0.08229
Sodium (Na)	0.0435
Potassium (K)	0.02558
Chloride (Cl)	0.02821
Sulfate (SO4)	0.02082
Bicarbonate (HCO3)	0.01639

Appendix Q - General Chemistry Ion Balance - Round 2
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample ID	Station ID	Sample Date	Conductivity (uS/cm)	pH	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Cl (mg/l)	SO4 (mg/l)	HCO3 (mg/l)	Cation Totals (mg/l)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Sum Cations (meq/L)	Anion Totals (mg/l)	Cl (meq/L)	SO4 (meq/L)	HCO3 (meq/L)	Sum Anions (meq/L)	Ion Balance (%)
CFSWP-001-SW	CFSWP-001	12/02/2016	19400	7.98	1.2	0.341	7.06	25.3	1.11	6.62	88.1	33.901	1.2625	0.5810	0.0522	0.0087	1.9044	95.83	0.0313	0.1378	1.4440	1.6131	8.2804
CFSWP-002-SW	CFSWP-002	12/02/2016	18800	8.04	1.06	0.319	6.75	24.3	1.71	17.4	86.9	32.429	1.2126	0.5555	0.0461	0.0082	1.8223	106.01	0.0482	0.3623	1.4243	1.8348	-0.3418
CFSWP-003-SW	CFSWP-003	12/01/2016	24200	7.78	5.99	0.476	8.43	30	0.904	7.12	92	44.896	1.4970	0.6937	0.2606	0.0122	2.4634	100.024	0.0255	0.1482	1.5079	1.6816	18.8616
CFSWP-004-SW	CFSWP-004	12/01/2016	47800	7.52	26.1	0.833	15.1	52.4	2.31	14.4	179	94.433	2.6148	1.2426	1.1354	0.0213	5.0140	195.71	0.0652	0.2998	2.9338	3.2988	20.6335
CFSWP-005-SW	CFSWP-005	12/01/2016	57200	7.5	35.6	1.06	17.9	62.6	2.91	18.4	269	117.16	3.1237	1.4730	1.5486	0.0271	6.1724	290.31	0.0821	0.3831	4.4089	4.8741	11.7535
CFSWP-006-SW	CFSWP-006	12/01/2016	18300	8.23	1.15	0.315	6.75	24.5	0.36	3.62	87.6	32.715	1.2226	0.5555	0.0500	0.0081	1.8361	91.58	0.0102	0.0754	1.4358	1.5213	9.3764
CFSWP-007-SW	CFSWP-007	12/02/2016	18900	8.02	1.04	0.313	6.78	24.5	0.351	3.59	87.5	32.633	1.2226	0.5579	0.0452	0.0080	1.8337	91.441	0.0099	0.0747	1.4341	1.5188	9.3946
CFSWP-008-SW	CFSWP-008	12/02/2016	19600	8.05	1.14	0.309	7.11	25.4	0.363	4.01	90.4	33.959	1.2675	0.5851	0.0496	0.0079	1.9100	94.773	0.0102	0.0835	1.4817	1.5754	9.6015
CFSWP-013-SW	CFSWP-013	11/30/2016	32100	7.72	2.34	0.778	11.3	40	0.577	3.02	148	54.418	1.9960	0.9299	0.1018	0.0199	3.0476	151.597	0.0163	0.0629	2.4257	2.5049	9.7740
CFSWP-014-SW	CFSWP-014	11/30/2016	37900	8.14	2.59	0.481	13.5	52.8	1.58	2.23	190	69.371	2.6347	1.1109	0.1127	0.0123	3.8706	193.81	0.0446	0.0464	3.1141	3.2051	9.4055
CFSWP-DUP3-SW	CFSWP-014	11/30/2016	37900	8.14	2.66	0.486	13.9	53.3	1.63	2.24	191	70.346	2.6597	1.1438	0.1157	0.0124	3.9316	194.87	0.0460	0.0466	3.1305	3.2231	9.9030
CFSWP-015-SW	CFSWP-015	11/30/2016	33300	8.21	2.61	0.484	13.6	53.1	1.63	2.19	193	69.794	2.6497	1.1191	0.1135	0.0124	3.8947	196.82	0.0460	0.0456	3.1633	3.2548	8.9502
CFSWP-015-SW	CFSWP-015	12/20/2016	33300	7.48	2.94	0.519	14	56.8	1.37	2.48	202	74.259	2.8343	1.1521	0.1279	0.0133	4.1275	205.85	0.0386	0.0516	3.3108	3.4011	9.6497
CFSWP-016-SW	CFSWP-016	11/30/2016	38500	8	2.63	0.483	13.9	53.1	1.63	2.27	194	70.113	2.6497	1.1438	0.1144	0.0124	3.9203	197.9	0.0460	0.0473	3.1797	3.2729	8.9999
CFSWP-017-SW	CFSWP-017	12/02/2016	19500	7.69	1.1	0.314	7.09	25.4	0.37	4.81	89.9	33.904	1.2675	0.5834	0.0479	0.0080	1.9068	95.08	0.0104	0.1001	1.4735	1.5840	9.2453
CFSWP-018-SW	CFSWP-018	12/01/2016	41700	7.46	9.29	0.6	17.2	77	1.91	4.66	207	104.09	3.8423	1.4154	0.4041	0.0153	5.6772	213.57	0.0539	0.0970	3.3927	3.5436	23.1382
CFSWP-019-SW	CFSWP-019	12/01/2016	40000	7.39	8.71	0.641	16.5	51	1.86	5.11	207	76.851	2.5449	1.3578	0.3789	0.0164	4.2980	213.97	0.0525	0.1064	3.3927	3.5516	9.5085
CFSWP-020-SW	CFSWP-020	12/01/2016	35600	7.58	4.86	0.894	16.5	73.3	1.59	3.25	183	95.554	3.6577	1.3578	0.2114	0.0229	5.2497	187.84	0.0449	0.0677	2.9994	3.1119	25.5673
CFSWP-021-SW	CFSWP-021	11/30/2016	59300	8.37	31	1.25	19.5	82.1	2.25	73.1	228	133.85	4.0968	1.6047	1.3485	0.0320	7.0819	303.35	0.0635	1.5219	3.7369	5.3223	14.1853
CFSWP-025-SW	CFSWP-025	12/20/2016	33400	7.35	2.88	0.528	13.9	56.7	1.4	2.51	201	74.008	2.8293	1.1438	0.1253	0.0135	4.1119	204.91	0.0395	0.0523	3.2944	3.3861	9.6799
CFMW-001-GW	CFMW-001	12/12/2016	43100	6.81	4.38	0.737	13.1	54.9	0.799	4.98	206	73.117	2.7395	1.0780	0.1905	0.0189	4.0269	211.779	0.0225	0.1037	3.3763	3.5026	6.9637
CFMW-003-GW	CFMW-003	12/09/2016	256000	7.09	360	2.04	49.8	184	33.4	618	673	595.84	9.1816	4.0980	15.6600	0.0522	28.9918	1324.4	0.9422	12.8668	11.0305	24.8394	7.7137
CFMW-003a-GW	CFMW-003a	12/12/2016	31200	8.58	19.5	4.96	4.87	28.5	8.6	34.7	90.7	57.83	1.4222	0.4008	0.8483	0.1269	2.7980	134	0.2426	0.7225	1.4866	2.4516	6.5984
CFMW-007-GW	CFMW-007	12/12/2016	43500	7.41	5.97	0.668	14.1	56.6	1.48	16.1	203	77.338	2.8243	1.1603	0.2597	0.0171	4.2614	220.58	0.0418	0.3352	3.3272	3.7041	6.9962
CFMW-008-GW	CFMW-008	12/16/2016	83200	7.15	86	2.22	16.3	38.1	3.65	15.3	340	142.62	1.9012	1.3413	3.7410	0.0568	7.0403	358.95	0.1030	0.3185	5.5726	5.9941	8.0264
CFMW-008a-GW	CFMW-008a	12/16/2016	573000	13.14	66.4	23.2	0.0636	431	4.93	5.44	1320	520.6636	21.5069	0.0052	2.8884	0.5935	24.9940	1330.37	0.1391	0.1133	21.6348	21.8871	6.6271
CFMW-010-GW	CFMW-010	12/15/2016	106000	9.25	231	0.89	9.81	14.8	0.442	17.9	514	256.5	0.7385	0.8073	10.0485	0.0228	11.6171	532.342	0.0125	0.3727	8.4245	8.8096	13.7440
CFMW-011-GW	CFMW-011	12/08/2016	45100	7.7	11.2	0.709	16	52.4	0.681	7.35	218	80.309	2.6148	1.3166	0.4872	0.0181	4.4367	226.031	0.0192	0.1530	3.5730	3.7453	8.4512
CFMW-011a-GW	CFMW-011a	12/14/2016	39200	7.67	24.1	3.12	8.91	21.7	1.13	4.74	159	57.83	1.0828	0.7332	1.0484	0.0798	2.9442	164.87	0.0319	0.0987	2.6060	2.7366	3.6548
CFMW-012-GW	CFMW-012	12/14/2016	114000	9.2	234	0.937	6.07	11.7	0.494	13.1	566	252.707	0.5838	0.4995	10.1790	0.0240	11.2863	579.594	0.0139	0.2727	9.2767	9.5634	8.2633
CFMW-012a-GW	CFMW-012a	12/13/2016	39800	7.49	6.49	0.767	12.9	52.9	1.73	4.49	201	73.057	2.6397	1.0615	0.2823	0.0196	4.0032	207.22	0.0488	0.0935	3.2944	3.4367	7.6145
CFMW-014-GW	CFMW-014	12/15/2016	138000	7.7	239	1.16	16.1	42	1.61	45	548	298.26	2.0958	1.3249	10.3965	0.0297	13.8468	594.61	0.0454	0.9369	8.9817	9.9640	16.3068
CFMW-015-GW	CFMW-015	12/15/2016	176000	9.83	365	1.52	1.64	1.41	1.57	44.8	762	369.57	0.0704	0.1350	15.8775	0.0389	16.1217	808.37	0.0443	0.9327	12.4892	13.4662	8.9749
CFMW-016a-GW	CFMW-016a	12/14/2016	31900	8.84	13.1	1.36	9.33	31.4	1.32	6.22	138	55.19	1.5669	0.7678	0.5699	0.0348	2.9393	145.54	0.0372	0.1295	2.2618	2.4286	9.5142
CFMW-019-GW	CFMW-019	12/15/2016	96200	7.86	120	1.84	17.8	54.6	4.22	115	342	194.24	2.7245	1.4648	5.2200	0.0471	9.4564	461.22	0.1190	2.3943	5.6054	8.1187	7.6110
CFMW-019a-GW	CFMW-019a	12/14/2016	34200	8.38	10	1.52	14.9	40.1	1.08	7.37	184	66.52	2.0010	1.2261	0.4350	0.0389	3.7010	192.45	0.0305	0.1534	3.0158	3.1997	7.2648
CFMW-020-GW	CFMW-020	12/13/2016	49100	7.54	6.68	0.676	14.7	65.3	0.64	5.47	245	87.356	3.2585	1.2097	0.2906	0.0173	4.7760	251.11	0.0181	0.1139	4.0156	4.1475	7.0434
CFMW-021-GW	CFMW-021	12/14/2016	92700	7.84	142	1.07	14	45.7	4.21	81	382	202.77	2.2804	1.1521	6.1770	0.0274	9.6369	467.21	0.1188	1.6864	6.2610	8.0662	8.8725
CFMW-022-GW	CFMW-022	12/09/2016	51400	7.24	15.6	0.685	14.4	59.8	0.5	4.87	250	90.485	2.9840	1.1850	0.6786	0.0175	4.8651	255.37	0.0141	0.1014	4.0975	4.2130	7.1834
CFMW-023-GW	CFMW-023	12/19/2016	38500	6.72	2.87	0.532	17.7	61.1	1.86	4.25	235	82.202	3.0489	1.4565	0.1248	0.0136	4.6439	241.11	0.0525	0.0885	3.8517	3.9926	7.5409
CFMW-025a-GW	CFMW-025a	12/05/2016	115000	6.16	9.18	2.5	33	137	1.47	10.7	560	181.68	6.8363	2.7156	0.3993	0.0640	10.0152	572.17	0.0415	0.2228	9.1784	9.4426	2.9423
CFMW-025b-GW	CFMW-025b	12/07/2016	40200	7.77	6.59	1.04	20.2	46.2	1.96	12.3	207	74.03	2.3054	1.6623	0.2867	0.0266	4.2809	221.26	0.0553	0.2561	3.3927	3.7041	7.2235
CFMW-026-GW	CFMW-026	12/05/2016	52300	7.64	10.7	0.905	15.7	66.4	2.37	15.8	238	93.705	3.3134	1.2920	0.4655	0.0231	5.0939	256.17	0.0669	0.3290	3.9008	4.2966	8.4902
CFMW-027-GW	CFMW-027	12/14/2016	62600	7.78	56.5	1.09	16.1	51.5	2.03	24.7	288	125.19	2.5699	1.3249	2.4578	0.0279	6.3804	314.73	0.0573	0.5143	4.7203	5.2918	9.3257
CFMW-028-GW	CFMW-028	12/05/2016	49600	7.96	24.9	2.73	15.8	48.7	1.65	7.81	231	92.13	2.4301	1.3002	1.0832	0.0698	4.8833	240.46	0.0465	0.1626	3.7861	3.9952	10.0023
CFMW-028a-GW	CFMW-028a	12/09/2016	46400	11.72	9.32	2.08	0.282	43.2	8.95	38.2	69.2	54.882	2.1557	0.0232	0.4054	0.0532	2.6375	116.35	0.2525	0.7953	1.1342	2.1820	9.4516
CFMW-029-GW	CFMW-029	12/14/2016	47600	7.66	21.5	0.923	17.7	52.8	0.623	13.9	234	92.923	2.6347	1.4565	0.9353	0.0236	5.0501	248.523	0.0176	0.2894	3.8353	4.1422	9.8765
CFMW-031-GW	CFMW-031	12/09/2016	59500	7.67	32.2	0.842	17.3	60.3	1.22	21.2	260	110.642	3.0090	1.4236	1.4007	0.0215	5.8548	282.42	0.0344	0.4414	4.2614	4.7372	10.5516
CFMW-032-GW	CFMW-032	12/13/2016	122000	6.8	153	3.02	22.1	88	1.93	10.4	672	266.12	4.3912	1.8186	6.6555	0.0773	12.9426	684.33	0.0544	0.2165	11.0141	11.2851	6.8414
CFMW-032a-GW	CFMW-032a	12/16/2016	391000	12.74	11.9	3.86	0.069	253	2.15	8.74	783	268.829	12.6247	0.0057	0.5177	0.0987	13.2468	793.89	0.0607	0.1820	12.8334	13.0760	0.6488
CFMW-033-GW	CFMW-033	12/06/2016	59900	4.49	39.5	1.04	15.6	53.6	1.94	18.8	265	109.74	2.6746	1.2837	1.7183	0.0266	5.7032	285.74	0.0547	0.3914	4.3434	4.7895	8.7082
CFMW-034-GW	CFMW-034	12/13/2016	67600	7.32	31.5	0.97	19.2	82.5	1.14	11.7	344	134.17	4.1168	1.5800	1.3703	0.0248	7.0918	356.84	0.0322	0.2436	5.6382	5.9139	9.0566
CFMW-035-GW	CFMW-035	12/13/2016	74500	7.44	32.7	1.93	31.1	77.2	4.67	24	394	142.93	3.8523	2.5592	1.4225	0.0494	7.8833	422.67	0.1317	0.4997	6.4577	7.0891	5.3047
CFMW-037-GW	CFMW-037	12/08/2016	40100	7.74	9.55	0.789	14.4	46.7	1.17	6.12	199	71.439	2.3303	1.1850	0.4154	0.0202	3.9509	206.29	0.0330	0.1274	3.2616	3.4220	7.1732

Appendix Q - General Chemistry Ion Balance - Round 2
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample ID	Station ID	Sample Date	Conductivity (uS/cm)	pH	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Cl (mg/l)	SO4 (mg/l)	HCO3 (mg/l)	Cation Totals (mg/l)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Sum Cations (meq/L)	Anion Totals (mg/l)	Cl (meq/L)	SO4 (meq/L)	HCO3 (meq/L)	Sum Anions (meq/L)	Ion Balance (%)
CFMW-038-GW	CFMW-038	12/09/2016	56800	6.44	36.5	0.961	16.9	60	2.2	10	278	114.361	2.9940	1.3907	1.5878	0.0246	5.9970	290.2	0.0621	0.2082	4.5564	4.8267	10.8128
CFMW-040-GW	CFMW-040	12/13/2016	52200	7.61	32.5	1.02	15.2	53.6	2.35	14.2	248	102.32	2.6746	1.2508	1.4138	0.0261	5.3653	264.55	0.0663	0.2956	4.0647	4.4267	9.5858
CFMW-043-GW	CFMW-043	12/14/2016	56200	7.65	37.9	0.96	15.6	51.7	1.88	18.6	258	106.16	2.5798	1.2837	1.6487	0.0246	5.5368	278.48	0.0530	0.3873	4.2286	4.6689	8.5036
CFMW-044-GW	CFMW-044	12/09/2016	66400	7.49	48.1	1.98	17	45.2	2.26	21.9	282	112.28	2.2555	1.3989	2.0924	0.0506	5.7974	306.16	0.0638	0.4560	4.6220	5.1417	5.9942
CFMW-044a-GW	CFMW-044a	12/19/2016	31200	9.1	38.7	1.12	9.19	24.6	2.89	52	80.7	73.61	1.2275	0.7562	1.6835	0.0286	3.6959	135.59	0.0815	1.0826	1.3227	2.4868	19.5552
CFMW-044b-GW	CFMW-044b	12/19/2016	30500	7.54	4.06	1.44	21.5	31.3	2.03	4.82	177	58.3	1.5619	1.7692	0.1766	0.0368	3.5446	183.85	0.0573	0.1004	2.9010	3.0586	7.3586
CFMW-045-GW	CFMW-045	12/14/2016	59500	7.58	40.7	0.986	15.5	52.9	2.15	19.3	258	110.086	2.6397	1.2755	1.7705	0.0252	5.7109	279.45	0.0607	0.4018	4.2286	4.6911	9.8037
CFMW-045a-GW	CFMW-045a	12/09/2016	25000	9.63	27.7	3.59	4.8	4.5	7.77	21	47.2	40.59	0.2246	0.3950	1.2050	0.0918	1.9163	75.97	0.2192	0.4372	0.7736	1.4300	14.5324
CFMW-047-GW	CFMW-047	12/15/2016	53200	7.81	21.1	0.972	16.6	58.4	0.751	7.73	254	97.072	2.9142	1.3660	0.9179	0.0249	5.2229	262.481	0.0212	0.1609	4.1631	4.3452	9.1733
CFMW-049-GW	CFMW-049	12/15/2016	41500	7.73	10.2	0.783	15.4	47.2	0.637	3.44	210	73.583	2.3553	1.2673	0.4437	0.0200	4.0863	214.077	0.0180	0.0716	3.4419	3.5315	7.2828
CFMW-DUP6-GW	CFMW-049	12/15/2016	41500	7.73	10.2	0.783	15.4	47.2	.639	3.44	209	73.583	2.3553	1.2673	0.4437	0.0200	4.0863	209	0.0180	0.0716	3.4255	3.5152	7.5133
CFMW-049a-GW	CFMW-049a	12/15/2016	30200	10.49	12	3.48	13.6	41.1	1.32	2.82	108	70.18	2.0509	1.1191	0.5220	0.0890	3.7811	112.14	0.0372	0.0587	1.7701	1.8661	33.9108
CFMW-050-GW	CFMW-050	12/15/2016	41500	7.79	10.7	0.844	15.4	46.6	0.759	3.52	207	73.544	2.3253	1.2673	0.4655	0.0216	4.0796	211.279	0.0214	0.0733	3.3927	3.4874	7.8262
CFMW-053-GW	CFMW-053	12/12/2016	57700	7.64	41.9	0.918	15.6	55.1	2.18	20.4	270	113.518	2.7495	1.2837	1.8227	0.0235	5.8793	292.58	0.0615	0.4247	4.4253	4.9115	8.9689
CFMW-053a-GW	CFMW-053a	12/19/2016	552000	12.46	47.5	13.5	0.0636	593	5.21	1.51	2020	654.0636	29.5907	0.0052	2.0663	0.3453	32.0075	2026.72	0.1470	0.0314	33.1078	33.2862	-1.9584
CFMW-054-GW	CFMW-054	12/12/2016	55800	7.67	38.9	0.931	15.6	56.2	2.48	20	265	111.631	2.8044	1.2837	1.6922	0.0238	5.8041	287.48	0.0700	0.4164	4.3434	4.8297	9.1629
CFMW-056-GW	CFMW-056	12/13/2016	12000	9.57	4.59	1.59	7.44	4.8	2.69	1.03	51.5	18.42	0.2395	0.6122	0.1997	0.0407	1.0921	55.22	0.0759	0.0214	0.8441	0.9414	7.4099
CFMW-056a-GW	CFMW-056a	12/06/2016	29800	9.63	18.3	6.16	10.4	26.4	3.47	21.7	121	61.26	1.3174	0.8558	0.7961	0.1576	3.1268	146.17	0.0979	0.4518	1.9832	2.5329	10.4940
CFMW-DUP4-GW	CFMW-056a	12/06/2016	29800	9.63	18.2	6.5	10.8	27	3.36	21.6	125	62.5	1.3473	0.8887	0.7917	0.1663	3.1940	125	0.0948	0.4497	2.0488	2.5932	10.3807
CFMW-056b-GW	CFMW-056b	12/12/2016	47000	7.52	7	0.771	15.4	64.9	1.88	9.67	238	88.071	3.2385	1.2673	0.3045	0.0197	4.8300	249.55	0.0530	0.2013	3.9008	4.1552	7.5103
CFMW-057-GW	CFMW-057	12/05/2016	26000	8.36	3.8	1.69	15.7	19.4	0.62	0.848	128	40.59	0.9681	1.2920	0.1653	0.0432	2.4685	129.468	0.0175	0.0177	2.0979	2.1331	7.2904
CFMW-057a-GW	CFMW-057a	12/16/2016	289000	12.91	28.2	6.5	0.0636	344	3.59	1.4	1200	378.7636	17.1656	0.0052	1.2267	0.1663	18.5638	1204.99	0.1013	0.0291	19.6680	19.7984	-3.2183
CFMW-059-GW	CFMW-059	12/12/2016	55800	7.08	15.2	1	14.1	72.1	24.6	4.61	244	102.4	3.5978	1.1603	0.6612	0.0256	5.4449	273.21	0.6940	0.0960	3.9992	4.7891	6.4076
CFMW-059a-GW	CFMW-059a	12/16/2016	25800	8.86	3.43	1.21	10.5	29	0.205	10.9	117	44.14	1.4471	0.8640	0.1492	0.0310	2.4913	128.105	0.0058	0.2269	1.9176	2.1504	7.3455
CFMW-061-GW	CFMW-061	12/07/2016	52600	7.21	11.4	0.871	20.6	60.7	2.15	5.41	267	93.571	3.0289	1.6952	0.4959	0.0223	5.2423	274.56	0.0607	0.1126	4.3761	4.5494	7.0761
CFMW-DUP5-GW	CFMW-061	12/7/2016	52600	7.21	11.1	0.861	20.1	60.6	2.12	5.44	266	92.661	3.0239	1.6540	0.4829	0.0220	5.1828	266	0.0598	0.1133	4.3597	4.5328	6.6906
CFMW-064-GW	CFMW-064	12/07/2016	43400	7.8	10.4	0.982	18.7	46.4	1.98	4.25	268	76.482	2.3154	1.5388	0.4524	0.0251	4.3317	274.23	0.0559	0.0885	4.3925	4.5369	-2.3133

Conversion Factor	
Calcium (Ca)	0.0499
Magnesium (Mg)	0.08229
Sodium (Na)	0.0435
Potassium (K)	0.02558
Chloride (Cl)	0.02821
Sulfate (SO4)	0.02082
Bicarbonate (HCO3)	0.01639

Appendix Q - General Chemistry Ion Balance - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample ID	Station ID	Sample Date	Conductivity (uS/cm)	pH	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Cl (mg/l)	SO4 (mg/l)	HCO3 (mg/l)	Cation Totals (mg/l)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Sum Cations (meq/L)	Anion Totals (mg/l)	Cl (meq/L)	SO4 (meq/L)	HCO3 (meq/L)	Sum Anions (meq/L)	Ion Balance (%)
CFSWP-001-SW	CFSWP-001	04/04/2017	17900	7.08	1.01	0.368	6.06	23.6	0.54	3.3	88	31.038	1.1776	0.4987	0.0439	0.0094	1.7297	91.84	0.0152	0.0687	1.4423	1.5263	6.2473
CFSWP-002-SW	CFSWP-002	04/04/2017	16600	7.26	1.03	0.396	6.15	23.7	0.49	3.41	87.8	31.276	1.1826	0.5061	0.0448	0.0101	1.7436	91.7	0.0138	0.0710	1.4390	1.5239	6.7264
CFSWP-003-SW	CFSWP-003	03/16/2017	17000	3.33	2.05	0.58	6.35	23.2	0.887	5.05	90.2	32.18	1.1577	0.5225	0.0892	0.0148	1.7842	96.137	0.0250	0.1051	1.4784	1.6085	5.1784
CFSWP-004-SW	CFSWP-004	03/16/2017	20700	3.72	4.78	0.581	7.11	26.2	1.02	6.4	106	38.671	1.3074	0.5851	0.2079	0.0149	2.1153	113.42	0.0288	0.1332	1.7373	1.8994	5.3776
CFSWP-005-SW	CFSWP-005	03/16/2017	22200	3.65	5.24	0.561	7.37	27.9	1.08	6.33	112	41.071	1.3922	0.6065	0.2279	0.0144	2.2410	119.41	0.0305	0.1318	1.8357	1.9979	5.7335
CFSWP-006-SW	CFSWP-006	03/16/2017	16000	3.73	1.03	0.775	6.3	22	0.804	4.14	79.6	30.105	1.0978	0.5184	0.0448	0.0198	1.6809	84.544	0.0227	0.0862	1.3046	1.4135	8.6394
CFSWP-007-SW	CFSWP-007	03/16/2017	16000	3.93	1.03	0.748	6.28	21.7	0.758	4.72	80.2	29.758	1.0828	0.5168	0.0448	0.0191	1.6636	85.678	0.0214	0.0983	1.3145	1.4341	7.4061
CFSWP-008-SW	CFSWP-008	04/04/2017	17000	7.14	1.08	0.378	6.3	24.4	0.573	3.71	90.2	32.158	1.2176	0.5184	0.0470	0.0097	1.7926	94.483	0.0162	0.0772	1.4784	1.5718	6.5643
CFSWP-009-SW	CFSWP-009	04/03/2017	31700	7.79	2.36	0.46	10.6	46.8	2.57	2.36	171	60.22	2.3353	0.8723	0.1027	0.0118	3.3220	175.93	0.0725	0.0491	2.8027	2.9243	6.3669
CFSWP-010-SW	CFSWP-010	03/15/2017	17100	3.1	2.18	1.1	6.51	38.3	0.32	4.46	133	48.09	1.9112	0.5357	0.0948	0.0281	2.5698	137.78	0.0090	0.0929	2.1799	2.2818	5.9381
CFSWP-011-SW	CFSWP-011	04/03/2017	31000	7.94	2.37	0.454	10.4	46.6	2.64	2.16	171	59.824	2.3253	0.8558	0.1031	0.0116	3.2959	175.8	0.0745	0.0450	2.8027	2.9221	6.0104
CFSWP-012-SW	CFSWP-012	04/03/2017	31600	7.46	2.31	0.433	10.3	45.6	2.64	2.21	172	58.643	2.2754	0.8476	0.1005	0.0111	3.2346	176.85	0.0745	0.0460	2.8191	2.9396	4.7783
CFSWP-DUP5-SW	CFSWP-012	04/03/2017	31600	7.46	2.36	0.451	10.9	45.3	2.66	2.14	172	59.011	2.2605	0.8970	0.1027	0.0115	3.2716	174.14	0.0750	0.0446	2.8191	2.9387	5.3613
CFSWP-013-SW	CFSWP-013	03/15/2017	29000	3.32	1.41	0.556	10.9	42.6	0.349	3.85	164	55.466	2.1257	0.8970	0.0613	0.0142	3.0983	168.199	0.0098	0.0802	2.6880	2.7780	5.4507
CFSWP-014-SW	CFSWP-014	03/13/2017	35100	3.06	5.53	0.656	13.5	55.8	3.06	3.32	203	75.486	2.7844	1.1109	0.2406	0.0168	4.1527	209.38	0.0863	0.0691	3.3272	3.4826	8.7758
CFSWP-DUP4-SW	CFSWP-014	03/13/2017	35100	3.06	2.49	0.486	12.4	52.8	3.08	3.78	205	68.176	2.6347	1.0204	0.1083	0.0124	3.7759	205	0.0869	0.0787	3.3600	3.5255	3.4285
CFSWP-015-SW	CFSWP-015	03/13/2017	35600	3.25	2.52	0.502	12.5	53.5	3.1	3.22	205	69.022	2.6697	1.0286	0.1096	0.0128	3.8207	211.32	0.0875	0.0670	3.3600	3.5144	4.1757
CFSWP-016-SW	CFSWP-016	03/13/2017	35100	3.64	2.48	0.495	12.6	53.7	2.95	3.24	208	69.275	2.6796	1.0369	0.1079	0.0127	3.8370	214.19	0.0832	0.0675	3.4091	3.5598	3.7480
CFSWP-017-SW	CFSWP-017	04/04/2017	17100	5.87	1.08	0.367	6.23	23.9	0.523	3.75	89.1	31.577	1.1926	0.5127	0.0470	0.0094	1.7616	93.373	0.0148	0.0781	1.4603	1.5532	6.2889
CFSWP-018-SW	CFSWP-018	04/03/2017	34000	7.22	4.6	0.7	13.9	46.3	1.72	4.51	183	65.5	2.3104	1.1438	0.2001	0.0179	3.6722	189.23	0.0485	0.0939	2.9994	3.1418	7.7842
CFSWP-019-SW	CFSWP-019	04/03/2017	33800	7.26	4.63	0.678	14	45.6	1.55	4.26	183	64.908	2.2754	1.1521	0.2014	0.0173	3.6462	188.81	0.0437	0.0887	2.9994	3.1318	7.5901
CFSWP-020-SW	CFSWP-020	03/16/2017	31900	4.05	4.08	0.656	12.6	38.7	1.5	4.49	169	56.036	1.9311	1.0369	0.1775	0.0168	3.1622	174.99	0.0423	0.0935	2.7699	2.9057	4.2277
CFSWP-021-SW	CFSWP-021	03/15/2017	51500	2.96	26.3	0.499	12.2	55.6	1.74	78.9	206	94.599	2.7744	1.0039	1.1441	0.0128	4.9352	286.64	0.0491	1.6427	3.3763	5.0681	-1.3289
CFSWP-022-SW	CFSWP-022	04/03/2017	32300	7.09	4.49	0.459	10.3	45.6	1.99	5.66	170	60.849	2.2754	0.8476	0.1953	0.0117	3.3301	177.65	0.0561	0.1178	2.7863	2.9603	5.8789
CFSWP-023-SW	CFSWP-023	04/03/2017	41300	7.14	5.28	0.646	13.9	63.3	1.6	13.2	217	83.126	3.1587	1.1438	0.2297	0.0165	4.5487	231.8	0.0451	0.2748	3.5566	3.8766	7.9774
CFSWP-025-SW	CFSWP-025	03/13/2017	38000	3.4	2.53	0.509	12.7	54.2	2.95	3.25	207	69.939	2.7046	1.0451	0.1101	0.0130	3.8727	213.2	0.0832	0.0677	3.3927	3.5436	4.4378
CFMW-001-GW	CFMW-001	03/20/2017	174000	7.67	4.2	0.676	13.2	53.5	0.393	7	212	71.576	2.6697	1.0862	0.1827	0.0173	3.9559	212	0.0111	0.1457	3.4747	3.6315	4.2750
CFMW-002-GW	CFMW-002	03/24/2017	704000	7.72	191	1.06	13.8	37.2	1.8	22	482	243.06	1.8563	1.1356	8.3085	0.0271	11.3275	505.8	0.0508	0.4580	7.9000	8.4088	14.7885
CFMW-003-GW	CFMW-003	03/22/2017	1950000	6.94	320	1.92	48.3	165	46.6	961	695	535.22	8.2335	3.9746	13.9200	0.0491	26.1772	1702.6	1.3146	20.0080	11.3911	32.7137	-11.0992
CFMW-003a-GW	CFMW-003a	3/20/2017	198000	8.94	14.5	3.1	5.98	31.7	8.9	20.2	120	55.28	1.5818	0.4921	0.6308	0.0793	2.7840	120	0.2511	0.4206	1.9668	2.6384	2.6840
CFMW-007-GW	CFMW-007	03/28/2017	242000	8.03	3.89	0.643	14.2	54.9	1.52	16.3	204	73.633	2.7395	1.1685	0.1692	0.0164	4.0937	221.82	0.0429	0.3394	3.3436	3.7258	4.7047
CFMW-008-GW	CFMW-008	03/28/2017	396000	7.06	89.8	2.21	16.2	28.8	1.46	10.4	368	137.01	1.4371	1.3331	3.9063	0.0565	6.7330	379.86	0.0412	0.2165	6.0315	6.2892	3.4081
CFMW-008a-GW	CFMW-008a	03/28/2017	1800000	12.73	53.2	19.9	0.0318	420	5.56	6	1350	493.1318	20.9580	0.0026	2.3142	0.5090	23.7839	1361.56	0.1568	0.1249	22.1265	22.4083	2.9780
CFMW-010-GW	CFMW-010	03/24/2017	632000	8.38	198	0.81	9.07	23.1	1.89	15.6	458	230.98	1.1527	0.7464	8.6130	0.0207	10.5328	475.49	0.0533	0.3248	7.5066	7.8847	14.3779
CFMW-011-GW	CFMW-011	03/27/2017	270000	7.6	13.3	0.798	18	62.3	1.81	14.6	260	94.398	3.1088	1.4812	0.5786	0.0204	5.1890	276.41	0.0511	0.3040	4.2614	4.6164	5.8388
CFMW-011a-GW	CFMW-011a	03/21/2017	211000	7.97	10.9	1.43	14.3	37	1.07	8.77	188	63.63	1.8463	1.1767	0.4742	0.0366	3.5338	197.84	0.0302	0.1826	3.0813	3.2941	3.5103
CFMW-012-GW	CFMW-012	03/22/2017	836000	8.06	232	1.6	17.1	31	1.41	43.5	522	281.7	1.5469	1.4072	10.0920	0.0409	13.0870	566.91	0.0398	0.9057	8.5556	9.5010	15.8755
CFMW-012a-GW	CFMW-012a	3/20/2017	193000	7.06	6.13	0.796	13.1	51	0.04	2.27	208	71.026	2.5449	1.0780	0.2667	0.0204	3.9099	208	0.0011	0.0473	3.4091	3.4575	6.1406
CFMW-014-GW	CFMW-014	03/29/2017	772000	7.36	191	1.14	22.1	60.2	2.27	48.6	514	274.44	3.0040	1.8186	8.3085	0.0292	13.1603	564.87	0.0640	1.0119	8.4245	9.5003	16.1509
CFMW-015-GW	CFMW-015	03/29/2017	1650000	9.29	601	2.56	5.54	4.21	2.57	22.5	1110	613.31	0.2101	0.4559	26.1435	0.0655	26.8750	1135.07	0.0725	0.4685	18.1929	18.7338	17.8498
CFMW-016-GW	CFMW-016	03/28/2017	235000	7.13	13.3	0.648	11.6	46.8	2.04	7.56	209	72.348	2.3353	0.9546	0.5786	0.0166	3.8850	218.6	0.0575	0.1574	3.4255	3.6405	3.2497
CFMW-DUP10-GW	CFMW-016	3/28/2017	234000	7.13	13.3	0.648	11.6	46.8	2.04	7.56	212	72.348	2.3353	0.9546	0.5786	0.0166	3.8850	212	0.0575	0.1574	3.4747	3.6896	2.5794
CFMW-016a-GW	CFMW-016a	03/27/2017	252000	7.34	9.3	0.892	15	56.8	1.86	9.45	231	81.992	2.8343	1.2344	0.4046	0.0228	4.4960	242.31	0.0525	0.1967	3.7861	4.0353	5.4004
CFMW-017-GW	CFMW-017	03/28/2017	516000	8.52	135	0.865	8.99	26.4	1.4	7.97	407	171.255	1.3174	0.7398	5.8725	0.0221	7.9518	416.37	0.0395	0.1659	6.6707	6.8762	7.2540
CFMW-018-GW	CFMW-018	03/28/2017	220000	7.46	7.64	0.509	12.9	49.4	2.29	3.83	206	70.449	2.4651	1.0615	0.3323	0.0130	3.8720	212.12	0.0646	0.0797	3.3763	3.5207	4.7517
CFMW-019-GW	CFMW-019	03/29/2017	756000	7.27	149	1.82	25	71.9	8.35	206	411	247.72	3.5878	2.0573	6.4815	0.0466	12.1731	625.35	0.2356	4.2889	6.7363	11.2608	3.8933
CFMW-019a-GW	CFMW-019a	03/27/2017	199000	8.62	22.2	2.77	11.4	30.1	1.18	6.68	182	66.47	1.5020	0.9381	0.9657	0.0709	3.4767	189.86	0.0333	0.1391	2.9830	3.1553	4.8448
CFMW-DUP9-GW	CFMW-019a	03/27/2017	180000	8.62	22.6	28.2	11.6	30.3	1.74	6.73	190	92.7	1.5120	0.9546	0.9831	0.7214	4.1710	190	0.0491	0.1401	3.1141	3.3033	11.6089
CFMW-020-GW	CFMW-020	03/21/2017	304000	7.14	12	0.622	15.3	62.6	2.17	8.37	287	90.522	3.1237	1.2590	0.5220	0.0159	4.9207	297.54	0.0612	0.1743	4.7039	4.9394	-0.1899
CFMW-021-GW	CFMW-021	03/29/2017	756000	7.69	178	1.36	18.9	55.7	7.68	189	426	253.96	2.7794	1.5553	7.7430	0.0348	12.1125	622.68	0.2167	3.9350	6.9821	11.1338	4.2103
CFMW-022-GW	CFMW-022	03/28/2017	301000	7.48	23.6	0.761	15.1	55.1	2.06	7.38	270	94.561	2.7495	1.2426	1.0266	0.0195	5.0381	279.44	0.0581	0.1537	4.4253	4.6371	4.1454
CFMW-023-GW	CFMW-023	03/21/2017	266000	7.35	0.0345	0.495	16.9	58.7	0.0155	6.28	254	76.1295	2.9291	1.3907	0.0015	0.0127	4.3340	260.2955	0.0004	0.1307	4.1631	4.2942	0.4607
CFMW-025a-GW	CFMW-025a	03/24/2017	219000	7.71	7.41	1.95	22.9	38	1.96	15.1	202	70.26	1.8962	1.8844	0.3223	0.0499	4.1529	219.06	0.0553	0.3144	3.3108	3.6805	6.0307
CFMW-025b-GW	CFMW-025b	3/20/2017	230000	7.72	6.73	1.05	20.5	55.7	2.55	19	238	83.98	2.7794	1.6869	0.2928	0.0269	4.7860	238	0.0719	0.3956	3.9008	4.3683	4.5624

Appendix Q - General Chemistry Ion Balance - Round 3
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample ID	Station ID	Sample Date	Conductivity (uS/cm)	pH	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Cl (mg/l)	SO4 (mg/l)	HCO3 (mg/l)	Cation Totals (mg/l)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Sum Cations (meq/L)	Anion Totals (mg/l)	Cl (meq/L)	SO4 (meq/L)	HCO3 (meq/L)	Sum Anions (meq/L)	Ion Balance (%)
CFMW-026-GW	CFMW-026	3/20/2017	217000	7.49	10.5	0.86	14.4	59.9	1.44	20.6	226	85.66	2.9890	1.1850	0.4568	0.0220	4.6527	226	0.0406	0.4289	3.7041	4.1737	5.4278
CFMW-027-GW	CFMW-027	03/27/2017	398000	7.03	60.8	1.11	17.4	55.8	2.68	42	314	135.11	2.7844	1.4318	2.6448	0.0284	6.8895	358.68	0.0756	0.8744	5.1465	6.0965	6.1063
CFMW-028-GW	CFMW-028	3/20/2017	232000	7.65	23.2	1.63	15.5	49.6	1.45	12.1	234	89.93	2.4750	1.2755	1.0092	0.0417	4.8014	246.1	0.0409	0.2519	3.8353	4.1281	7.5407
CFMW-028a-GW	CFMW-028a	03/21/2017	116000	10.54	6.19	1.52	3.94	35	9.9	48	26.7	46.65	1.7465	0.3242	0.2693	0.0389	2.3789	84.6	0.2793	0.9994	0.4376	1.7163	16.1806
CFMW-029-GW	CFMW-029	03/24/2017	330000	7.39	36.4	1.05	18.9	58.4	1.24	10.1	299	114.75	2.9142	1.5553	1.5834	0.0269	6.0797	310.34	0.0350	0.2103	4.9006	5.1459	8.3188
CFMW-031-GW	CFMW-031	03/21/2017	331000	7.52	40.6	0.861	17.2	59	2.22	25.5	295	117.661	2.9441	1.4154	1.7661	0.0220	6.1476	322.72	0.0626	0.5309	4.8351	5.4286	6.2112
CFMW-032-GW	CFMW-032	03/27/2017	570000	7.13	132	3.12	23.1	85.7	1.09	14.5	634	243.92	4.2764	1.9009	5.7420	0.0798	11.9991	649.59	0.0307	0.3019	10.3913	10.7239	5.6121
CFMW-032a-GW	CFMW-032a	03/29/2017	1200000	13.11	13.9	7.87	0.0318	436	1.92	5.81	1240	457.8018	21.7564	0.0026	0.6047	0.2013	22.5650	1247.73	0.0542	0.1210	20.3236	20.4987	4.7981
CFMW-033-GW	CFMW-033	03/21/2017	333000	7.57	37.9	0.891	17	55.6	2.52	27.9	284	111.391	2.7744	1.3989	1.6487	0.0228	5.8448	314.42	0.0711	0.5809	4.6548	5.3067	4.8252
CFMW-034-GW	CFMW-034	03/21/2017	394000	7.19	29.2	0.959	20.7	84	3.15	15.2	358	134.859	4.1916	1.7034	1.2702	0.0245	7.1897	376.35	0.0889	0.3165	5.8676	6.2729	6.8099
CFMW-035-GW	CFMW-035	03/21/2017	442000	7.44	32	1.89	35.6	79.6	5.58	27	418	149.09	3.9720	2.9295	1.3920	0.0483	8.3419	450.58	0.1574	0.5621	6.8510	7.5706	4.8474
CFMW-037-GW	CFMW-037	03/23/2017	225000	7.66	9.64	0.783	13.8	46	2.03	9.58	213	70.223	2.2954	1.1356	0.4193	0.0200	3.8704	224.61	0.0573	0.1995	3.4911	3.7478	1.6090
CFMW-038-GW	CFMW-038	03/24/2017	305000	7.26	35.7	0.947	16.5	59	3.35	14.2	281	112.147	2.9441	1.3578	1.5530	0.0242	5.8791	298.55	0.0945	0.2956	4.6056	4.9957	8.1227
CFMW-040-GW	CFMW-040	03/30/2017	299000	6.99	31.9	1.04	16.3	53.7	3.47	14.9	265	102.94	2.6796	1.3413	1.3877	0.0266	5.4352	283.37	0.0979	0.3102	4.3434	4.7515	6.7122
CFMW-043-GW	CFMW-043	3/20/2017	307000	7.48	41.7	0.988	16.7	55.4	2.71	2.28	271	114.788	2.7645	1.3742	1.8140	0.0253	5.9779	271	0.0764	0.0475	4.4417	4.5656	13.3951
CFMW-044-GW	CFMW-044	03/28/2017	369000	7.37	42.4	0.958	16.7	51.7	2.28	36.1	284	111.758	2.5798	1.3742	1.8444	0.0245	5.8230	322.38	0.0643	0.7516	4.6548	5.4707	3.1194
CFMW-044a-GW	CFMW-044a	03/21/2017	261000	9.18	38.7	0.9	11.6	23.9	4.57	48.8	157	75.1	1.1926	0.9546	1.6835	0.0230	3.8536	210.37	0.1289	1.0160	2.5732	3.7182	1.7893
CFMW-044b-GW	CFMW-044b	03/24/2017	208000	8.41	4.02	1.01	21.5	37.7	2.18	3.58	208	64.23	1.8812	1.7692	0.1749	0.0258	3.8512	213.76	0.0615	0.0745	3.4091	3.5452	4.1374
CFMW-045-GW	CFMW-045	03/23/2017	316000	7.01	36	0.86	14.1	48.6	3.28	27.7	270	99.56	2.4251	1.1603	1.5660	0.0220	5.1734	300.98	0.0925	0.5767	4.4253	5.0945	0.7683
CFMW-045a-GW	CFMW-045a	03/24/2017	289000	7.99	31.6	1.56	15.1	53.7	3.12	30.4	237	101.96	2.6796	1.2426	1.3746	0.0399	5.3367	270.52	0.0880	0.6329	3.8844	4.6054	7.3560
CFMW-047-GW	CFMW-047	03/23/2017	302000	7.44	23.6	0.907	15.3	53	2.35	11.3	272	92.807	2.6447	1.2590	1.0266	0.0232	4.9535	285.65	0.0663	0.2353	4.4581	4.7596	1.9962
CFMW-049-GW	CFMW-049	03/23/2017	205000	7.16	10.3	0.803	16	48.5	1.76	4.53	218	75.603	2.4202	1.3166	0.4481	0.0205	4.2054	224.29	0.0496	0.0943	3.5730	3.7170	6.1648
CFMW-049a-GW	CFMW-049a	03/23/2017	895000	12.84	20.4	10.8	0.605	233	2.04	2.66	880	264.805	11.6267	0.0498	0.8874	0.2763	12.8401	884.7	0.0575	0.0554	14.4232	14.5361	-6.1951
CFMW-050-GW	CFMW-050	03/23/2017	211000	7.5	9.69	0.82	16.3	49.4	2.1	4.48	216	76.21	2.4651	1.3413	0.4215	0.0210	4.2489	222.58	0.0592	0.0933	3.5402	3.6928	7.0026
CFMW-053a-GW	CFMW-053a	3/27/2017	2300000	13.22	92.7	12.4	0.0318	588	13.1	3.12	2040	693.1318	29.3412	0.0026	4.0325	0.3172	33.6935	2056.22	0.3696	0.0650	33.4356	33.8701	-0.2615
CFMW-054-GW	CFMW-054	03/22/2017	336000	7.49	41.1	1	16.2	56.1	3.72	29.6	273	114.4	2.7994	1.3331	1.7879	0.0256	5.9459	306.32	0.1049	0.6163	4.4745	5.1957	6.7336
CFMW-056-GW	CFMW-056	03/22/2017	211000	7.87	3.98	1.53	18.2	47.8	0.367	5.2	222	71.51	2.3852	1.4977	0.1731	0.0391	4.0952	227.567	0.0104	0.1083	3.6386	3.7572	4.3040
CFMW-056a-GW	CFMW-056a	03/30/2017	199000	8.15	9.29	2.67	15.7	38.4	1.72	5.2	187	66.06	1.9162	1.2920	0.4041	0.0683	3.6805	193.92	0.0485	0.1083	3.0649	3.2217	6.6473
CFMW-056b-GW	CFMW-056b	03/21/2017	256000	7.4	3.49	0.692	15.6	61.3	2.51	4.47	241	81.082	3.0589	1.2837	0.1518	0.0177	4.5121	247.98	0.0708	0.0931	3.9500	4.1139	4.6168
CFMW-DUP7-GW	CFMW-056b	3/21/2017	263000	7.4	3.51	0.7	15.7	61.9	2.46	4.46	241	81.81	3.0888	1.2920	0.1527	0.0179	4.5514	247.92	0.0694	0.0929	3.9500	4.1122	5.0685
CFMW-057-GW	CFMW-057	03/29/2017	128000	8.21	3.85	1.82	20.2	21.8	0.716	0.127	161	47.67	1.0878	1.6623	0.1675	0.0466	2.9641	161.843	0.0202	0.0026	2.6388	2.6616	5.3766
CFMW-DUP11-GW	CFMW-057	03/29/2017	127000	8.21	3.85	1.82	20.2	21.8	0.716	0.127	160	47.67	1.0878	1.6623	0.1675	0.0466	2.9641	160	0.0202	0.0026	2.6224	2.6452	5.6845
CFMW-057a-GW	CFMW-057a	03/22/2017	680000	12.24	26.6	12.3	0.0318	154	6.88	13.8	509	192.9318	7.6846	0.0026	1.1571	0.3146	9.1590	529.68	0.1941	0.2873	8.3425	8.8239	1.8631
CFMW-059-GW	CFMW-059	03/23/2017	314000	7.24	18.6	1.01	13.9	68.3	91	7.4	241	101.81	3.4082	1.1438	0.8091	0.0258	5.3869	339.4	2.5671	0.1541	3.9500	6.6712	-10.6504
CFMW-059a-GW	CFMW-059a	03/29/2017	129000	9.32	3.8	1.56	9.86	32.4	0.624	8.57	114	47.62	1.6168	0.8114	0.1653	0.0399	2.6333	123.194	0.0176	0.1784	1.8685	2.0645	12.1089
CFMW-061-GW	CFMW-061	03/23/2017	221000	7.54	5.89	0.667	15.3	46.3	0.977	5.64	217	68.157	2.3104	1.2590	0.2562	0.0171	3.8427	223.617	0.0276	0.1174	3.5566	3.7016	1.8699
CFMW-064-GW	CFMW-064	03/23/2017	214000	7.54	7.41	0.794	17.4	45	2.11	6.5	218	70.604	2.2455	1.4318	0.3223	0.0203	4.0200	226.61	0.0595	0.1353	3.5730	3.7679	3.2373

Conversion Factor

Calcium (Ca)	0.0499
Magnesium (Mg)	0.08229
Sodium (Na)	0.0435
Potassium (K)	0.02558
Chloride (Cl)	0.02821
Sulfate (SO4)	0.02082
Bicarbonate (HCO3)	0.01639

Appendix Q - General Chemistry Ion Balance - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample ID	Station ID	Sample Date	Conductivity (uS/cm)	pH	Total Dissolved Solids (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Cl (mg/l)	SO4 (mg/l)	HCO3 (mg/l)	Cation Totals (mg/l)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Sum Cations (meq/L)	Anion Totals (mg/l)	Cl (meq/L)	SO4 (meq/L)	HCO3 (meq/L)	Sum Anions (meq/L)	Ion Balance (%)
CFSWP-001-SW	CFSWP-001	06/14/2017	13300	7.43	--	0.815	0.557	5.77	20.8	0.397	2.59	71.4	27.942	1.0379	0.4748	0.0355	0.0142	1.5624	74.387	0.0112	0.0539	1.1702	1.2354	11.6901
CFSWP-002-SW	CFSWP-002	06/14/2017	12900	8.18	--	0.712	0.257	5.04	18.9	0.255	2.85	70	24.909	0.9431	0.4147	0.0310	0.0066	1.3954	73.105	0.0072	0.0593	1.1473	1.2138	6.9587
CFSWP-003-SW	CFSWP-003	06/14/2017	14500	8.22	--	2.05	0.551	6.08	21.9	0.383	3.29	77.5	30.581	1.0928	0.5003	0.0892	0.0141	1.6964	81.173	0.0108	0.0685	1.2702	1.3495	11.3882
CFSWP-004-SW	CFSWP-004	06/14/2017	14500	8.23	--	2.06	0.495	5.88	21	0.312	3.15	76	29.435	1.0479	0.4839	0.0896	0.0127	1.6340	79.462	0.0088	0.0656	1.2456	1.3200	10.6299
CFSWP-005-SW	CFSWP-005	06/14/2017	30400	7.87	--	18.2	0.762	10.8	37	0.855	8.61	155	66.762	1.8463	0.8887	0.7917	0.0195	3.5462	164.465	0.0241	0.1793	2.5405	2.7438	12.7566
CFSWP-006-SW	CFSWP-006	06/14/2017	12700	8.2	--	0.71	0.605	5.62	19.7	0.241	2.62	69.1	26.635	0.9830	0.4625	0.0309	0.0155	1.4919	71.961	0.0068	0.0545	1.1325	1.1939	11.0943
CFSWP-008-SW	CFSWP-007	06/14/2017	12900	7.92	--	0.677	0.547	5.5	19.3	0.243	2.62	69	26.024	0.9631	0.4526	0.0294	0.0140	1.4591	71.863	0.0069	0.0545	1.1309	1.1923	10.0623
CFSWP-008-SW	CFSWP-008	06/14/2017	12900	7.92	--	0.666	0.242	4.67	17.6	0.269	2.6	69.2	23.178	0.8782	0.3843	0.0290	0.0062	1.2977	72.069	0.0076	0.0541	1.1342	1.1959	4.0819
CFSWP-009-SW	CFSWP-009	06/12/2017	33300	7.86	--	2.38	0.551	13.2	53	1.38	3.41	191	69.131	2.6447	1.0862	0.1035	0.0141	3.8486	195.79	0.0389	0.0710	3.1305	3.2404	8.5786
CFSWP-010-SW	CFSWP-010	06/12/2017	32300	8.36	--	2.22	0.473	12.1	50.7	1.64	1.88	179	65.493	2.5299	0.9957	0.0966	0.0121	3.6343	182.52	0.0463	0.0391	2.9338	3.0192	9.2446
CFSWP-011-SW	CFSWP-011	06/12/2017	32700	8.3	--	2.21	0.472	12.1	50.6	1.65	1.91	180	65.382	2.5249	0.9957	0.0961	0.0121	3.6289	183.56	0.0465	0.0398	2.9502	3.0365	8.8869
CFSWP-012-SW	CFSWP-012	06/12/2017	28700	8.39	--	2.19	0.474	12	50	1.66	1.9	180	64.664	2.4950	0.9875	0.0953	0.0121	3.5899	183.56	0.0468	0.0396	2.9502	3.0366	8.3496
CFSWP-013-SW	CFSWP-013	06/12/2017	32000	8.28	--	2.25	0.48	12.3	50.4	1.66	1.91	181	65.43	2.5150	1.0122	0.0979	0.0123	3.6373	184.57	0.0468	0.0398	2.9666	3.0532	8.7303
CFSWP-014-SW	CFSWP-014	06/13/2017	32200	8.22	--	2.24	0.467	12.4	50.9	1.77	2.02	182	66.007	2.5399	1.0204	0.0974	0.0119	3.6697	185.79	0.0499	0.0421	2.9830	3.0750	8.8177
CFSWP-015-SW	CFSWP-015	06/13/2017	32800	7.85	--	2.25	0.469	12.6	51.6	1.64	1.96	186	66.919	2.5748	1.0369	0.0979	0.0120	3.7216	189.6	0.0463	0.0408	3.0485	3.1356	8.5451
CFSWP-DUP7-SW	CFSWP-015	06/13/2017	32800	7.85	--	2.27	0.466	12.7	51.7	1.62	1.89	186	67.136	2.5798	1.0451	0.0987	0.0119	3.7356	189.51	0.0457	0.0393	3.0485	3.1336	8.7636
CFSWP-016-SW	CFSWP-016	06/12/2017	33700	8.27	--	2.2	0.477	12.2	50.5	1.62	1.99	185	65.377	2.5200	1.0039	0.0957	0.0122	3.6318	188.61	0.0457	0.0414	3.0322	3.1193	7.5915
CFSWP-DUP6-SW	CFSWP-016	06/12/2017	33700	8.27	--	2.2	0.479	12.4	51	1.6	1.98	185	66.079	2.5449	1.0204	0.0957	0.0123	3.6732	188.58	0.0451	0.0412	3.0322	3.1185	8.1678
CFSWP-017-SW	CFSWP-017	06/14/2017	12900	8.17	--	0.692	0.247	4.78	17.7	0.227	2.61	69	23.419	0.8832	0.3933	0.0301	0.0063	1.3130	71.837	0.0064	0.0543	1.1309	1.1917	4.8447
CFSWP-018-SW	CFSWP-018	06/15/2017	45600	8.06	--	25.8	1.06	16.3	62.4	2.3	12.2	233	105.56	3.1138	1.3413	1.1223	0.0271	5.6045	247.5	0.0649	0.2540	3.8189	4.1378	15.0555
CFSWP-019-SW	CFSWP-019	06/15/2017	30300	8.27	--	4.33	0.769	13.3	38	1.47	3.14	167	56.399	1.8962	1.0945	0.1884	0.0197	3.1987	171.61	0.0415	0.0654	2.7371	2.8440	5.8701
CFSWP-020-SW	CFSWP-020	06/15/2017	31500	8.03	--	4.57	0.652	14	41.1	1.32	3.24	175	60.322	2.0509	1.1521	0.1988	0.0167	3.4184	179.56	0.0372	0.0675	2.8683	2.9729	6.9700
CFSWP-021-SW	CFSWP-021	06/15/2017	39800	7.64	--	10.7	0.443	12.7	54.6	1.62	20.3	200	78.443	2.7245	1.0451	0.4655	0.0113	4.2464	221.92	0.0457	0.4226	3.2780	3.7463	6.2564
CFSWP-024-SW	CFSWP-024	06/15/2017	11900	5.37	--	6.73	0.814	0.804	7.86	1.39	4.39	13.9	16.208	0.3922	0.0662	0.2928	0.0208	0.7720	19.68	0.0392	0.0914	0.2278	0.3584	36.5822
CFSWP-025-SW	CFSWP-025	06/13/2017	32300	8.28	--	2.25	0.456	12.4	51.1	1.66	1.96	185	66.206	2.5499	1.0204	0.0979	0.0117	3.6798	188.62	0.0468	0.0408	3.0322	3.1198	8.2363
CFMW-001-GW	CFMW-001	06/19/2017	4110	8.04	208	4.81	0.826	16.6	59.4	0.338	5.66	214	81.636	2.9641	1.3660	0.2092	0.0211	4.5604	219.998	0.0095	0.1178	3.5075	3.6348	11.2943
CFMW-002-GW	CFMW-002	06/27/2017	3770	7.94	408	97.3	0.793	10.7	27.8	1.75	6.73	283	136.593	1.3872	0.8805	4.2326	0.0203	6.5206	291.48	0.0494	0.1401	4.6384	4.8279	14.9158
CFMW-003-GW	CFMW-003	06/27/2017	25400	6.83	2000	372	2.21	56.5	201	36.5	905	674	631.71	10.0299	4.6494	16.1820	0.0565	30.9178	1615.5	1.0297	18.8421	11.0469	30.9186	-0.0013
CFMW-003a-GW	CFMW-003a	06/19/2017	2900	8.92	143	14.2	2.32	8.51	36.9	6.24	13.9	130	61.93	1.8413	0.7003	0.6177	0.0593	3.2186	150.14	0.1760	0.2894	2.1307	2.5961	10.7058
CFMW-007-GW	CFMW-007	06/19/2017	3940	8.41	178	4.56	0.661	15.7	52.5	1.3	12.2	194	73.421	2.6198	1.2920	0.1984	0.0169	4.1270	207.5	0.0367	0.2540	3.1797	3.4703	8.6430
CFMW-008-GW	CFMW-008	06/20/2017	7270	5.91	399	113	2.56	17.6	31.6	1.23	3.15	382	164.76	1.5768	1.4483	4.9155	0.0655	8.0061	386.38	0.0347	0.0656	6.2610	6.3613	11.4486
CFMW-008a-GW	CFMW-008a	06/28/2017	56100	12.59	1300	63.5	19.1	0.0656	407	5.09	8.73	1280	489.6656	20.3093	0.0054	2.7623	0.4886	23.5655	1293.82	0.1436	0.1818	20.9792	21.3045	5.0389
CFMW-010-GW	CFMW-010	06/27/2017	6580	8.29	457	122	0.929	12.3	28.8	1.71	7.13	323	164.029	1.4371	1.0122	5.3070	0.0238	7.7801	331.84	0.0482	0.1484	5.2940	5.4907	17.2515
CFMW-011-GW	CFMW-011	06/28/2017	3870	7.55	214	18.1	0.733	14.1	46.5	1.75	4.59	213	79.433	2.3204	1.1603	0.7874	0.0188	4.2867	219.34	0.0494	0.0956	3.4911	3.6360	8.2135
CFMW-DUP15-GW	CFMW-011	06/28/2017	3870	7.55	228	18.2	0.737	14.1	46.3	1.78	4.41	208	79.337	2.3104	1.1603	0.7917	0.0189	4.2812	214.19	0.0502	0.0918	3.4091	3.5512	9.3211
CFMW-011a-GW	CFMW-011a	06/29/2017	3830	7.46	237	9.74	1.85	17	43.7	0.808	5.81	197	72.29	2.1806	1.3989	0.4237	0.0473	4.0506	203.618	0.0228	0.1210	3.2288	3.3726	9.1334
CFMW-012-GW	CFMW-012	06/23/2017	38600	9.56	2440	834	3.41	7.71	7.48	0.577	78.7	1480	852.6	0.3733	0.6345	36.2790	0.0872	37.3739	1559.277	0.0163	1.6385	24.2572	25.9120	18.1113
CFMW-012a-GW	CFMW-012a	06/20/2017	3950	7.57	217	6.62	0.802	14.5	51.6	0.385	4.67	206	73.522	2.5748	1.1932	0.2880	0.0205	4.0765	211.055	0.0109	0.0972	3.3763	3.4844	7.8310
CFMW-014-GW	CFMW-014	06/27/2017	4560	7.91	374	79.1	0.805	10.2	26.5	1.56	6.87	254	116.605	1.3224	0.8394	3.4409	0.0206	5.6231	262.43	0.0440	0.1430	4.1631	4.3501	12.7646
CFMW-015-GW	CFMW-015	06/27/2017	32500	9.63	2420	703	2.76	6.4	3.73	1.81	103	1570	715.89	0.1861	0.5267	30.5805	0.0706	31.3639	1674.81	0.0511	2.1445	25.7323	27.9278	5.7952
CFMW-016-GW	CFMW-016	06/29/2017	3440	7.81	190	3.58	0.584	12.3	48.4	1.49	2.69	183	64.864	2.4152	1.0122	0.1557	0.0149	3.5980	187.18	0.0420	0.0560	2.9994	3.0974	7.4766
CFMW-016a-GW	CFMW-016a	06/26/2017	3180	11.53	97	29.2	1.08	8.92	62.8	1.82	3.2	65.5	102	3.1337	0.7340	1.2702	0.0276	5.1656	70.52	0.0513	0.0666	1.0735	1.1915	62.5139
CFMW-017-GW	CFMW-017	06/26/2017	3570	8.12	206	8.96	0.476	10.6	46.9	0.984	2.42	191	66.936	2.3403	0.8723	0.3898	0.0122	3.6145	194.404	0.0278	0.0504	3.1305	3.2086	5.9487
CFMW-018-GW	CFMW-018	06/20/2017	4480	7.47	258	5.13	0.692	17.5	61.5	0.412	4.4	237	84.822	3.0689	1.4401	0.2232	0.0177	4.7498	241.812	0.0116	0.0916	3.8844	3.9877	8.7225
CFMW-019-GW	CFMW-019	06/29/2017	10500	7.42	658	145	1.72	19.9	59.2	5.62	130	383	225.82	2.9541	1.6376	6.3075	0.0440	10.9431	518.62	0.1585	2.7066	6.2774	9.1425	8.9648
CFMW-019a-GW	CFMW-019a	06/26/2017	3460	7.96	218	19.1	3.17	12.4	34	0.917	5.15	181	68.67	1.6966	1.0204	0.8309	0.0811	3.6289	187.067	0.0259	0.1072	2.9666	3.0997	7.8657
CFMW-020-GW	CFMW-020	06/26/2017	3650	7.81	220	3.51	0.594	11.4	50.5	1.46	2.48	196	66.004	2.5200	0.9381	0.1527	0.0152	3.6259	199.94	0.0412	0.0516	3.2124	3.3053	4.6266
CFMW-021-GW	CFMW-021	06/26/2017	0.000	7.64	341	47.2	0.883	12	38.3	2.47	25.9	237	98.383	1.9112	0.9875	2.0532	0.0226	4.9744	265.37	0.0697	0.5392	3.8844	4.4933	5.0813
CFMW-022-GW	CFMW-022	06/26/2017	3380	7.56	206	5.18	0.554	11.7	48.9	1.33	2.58	189	66.334	2.4401	0.9628	0.2253	0.0142	3.6424	192.91	0.0375	0.0537	3.0977	3.1889	6.6379
CFMW-023-GW	CFMW-023	06/27/2017	3960	7.31	226	3.56	0.514	15.9	56	0.372	3.94	212	75.974	2.7944	1.3084	0.1549	0.0131	4.2708	216.312	0.0105	0.0820	3.4747	3.5672	8.9769
CFMW-025a-GW	CFMW-025a	06/22/2017	3930	7.62	227	7.37	3.11	26.2	48.2	1.81	12.4	205	84.88	2.4052	2.1560	0.3206	0.0796	4.9613	219.21	0.0511	0.2582	3.3600	3.6692	14.9719
CFMW-025b-GW	CFMW-025b	06/22/2017	4010	7.95	194	6.46	0.981	20.1	44.4	1.84	9.31	210	71.941	2.2156	1.6540	0.2810	0.0251	4.1757	221.15	0.0519	0.1938	3.4419	3.6876	6.2067
CFMW-026-GW	CFMW-026	06/22/2017	4330	7.43	246	7.61	0.63	15	60.7	1.68	12.8	222	83.94	3.0289	1.2344	0.3310	0.0161	4.6104	236.48	0.0474	0.2665	3.6386	3.9525	7.6839
CFMW-027-GW	CFMW-027	06/26/2017	5620	7.64	424	76.7	0.998	11.6	38.3	2.15	29.4	283	127.598	1.9112	0.9546	3.3365	0.0255	6.2277	314.55	0.0607	0.6121	4.6384	5.3111	7.9435

Appendix Q - General Chemistry Ion Balance - Round 4
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Sample ID	Station ID	Sample Date	Conductivity (uS/cm)	pH	Total Dissolved Solids (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Cl (mg/l)	SO4 (mg/l)	HCO3 (mg/l)	Cation Totals (mg/l)	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	K (meq/L)	Sum Cations (meq/L)	Anion Totals (mg/l)	Cl (meq/L)	SO4 (meq/L)	HCO3 (meq/L)	Sum Anions (meq/L)	Ion Balance (%)
CFMW-028-GW	CFMW-028	06/26/2017	4500	7.56	314	29.3	1.23	16.1	51.4	1.58	7.42	247	98.03	2.5649	1.3249	1.2746	0.0315	5.1957	256	0.0446	0.1545	4.0483	4.2474	10.0428
CFMW-028a-GW	CFMW-028a	06/27/2017	2480	10.07	154	7.04	1.71	6.56	35.9	7.51	33	55.3	51.21	1.7914	0.5398	0.3062	0.0437	2.6812	95.81	0.2119	0.6871	0.9064	1.8053	19.5237
CFMW-029-GW	CFMW-029	06/26/2017	3830	7.71	284	38.9	0.692	11.5	34.5	1.25	3.36	214	85.592	1.7216	0.9463	1.6922	0.0177	4.3777	218.61	0.0353	0.0700	3.5075	3.6127	9.5747
CFMW-031-GW	CFMW-031	06/21/2017	3900	7.07	219	35	0.712	12.1	40.5	1.47	6.53	220	88.312	2.0210	0.9957	1.5225	0.0182	4.5574	228	0.0415	0.1360	3.6058	3.7832	9.2817
CFMW-DUP13-GW	CFMW-031	06/21/2017	3900	7.07	232	34.4	0.697	11.9	39.6	1.71	6.57	220	86.597	1.9760	0.9793	1.4964	0.0178	4.4695	228.28	0.0482	0.1368	3.6058	3.7908	8.2163
CFMW-032-GW	CFMW-032	06/20/2017	10800	6.74	660	198	2.3	11.9	42.9	1.95	13.6	555	255.1	2.1407	0.9793	8.6130	0.0588	11.7918	570.55	0.0550	0.2832	9.0965	9.4346	11.1050
CFMW-DUP12-GW	CFMW-032	06/20/2017	10800	6.74	746	200	2.35	12	42.8	1.92	13.4	547	257.15	2.1357	0.9875	8.7000	0.0601	11.8833	562.32	0.0542	0.2790	8.9653	9.2985	12.2031
CFMW-032a-GW	CFMW-032a	06/27/2017	51500	12.63	1340	17.7	16.2	0.259	390	1.4	4.09	1170	424.159	19.4610	0.0213	0.7700	0.4144	20.6667	1175.49	0.0395	0.0852	19.1763	19.3009	3.4170
CFMW-033-GW	CFMW-033	06/19/2017	4730	7.43	237	44.9	0.806	12.8	40.6	1.68	9.45	232	99.106	2.0259	1.0533	1.9532	0.0206	5.0530	243.13	0.0474	0.1967	3.8025	4.0466	11.0598
CFMW-034-GW	CFMW-034	06/19/2017	4980	7.27	275	53.1	0.902	13.1	45.1	1.57	5.33	249	112.202	2.2505	1.0780	2.3099	0.0231	5.6614	255.9	0.0443	0.1110	4.0811	4.2364	14.3976
CFMW-035-GW	CFMW-035	06/20/2017	7570	6.8	452	33.6	2.91	41	121	4.52	15.1	426	198.51	6.0379	3.3739	1.4616	0.0744	10.9478	445.62	0.1275	0.3144	6.9821	7.4240	19.1804
CFMW-037-GW	CFMW-037	06/20/2017	4310	7.83	236	16.2	0.869	15.6	48	2.21	9	210	80.669	2.3952	1.2837	0.7047	0.0222	4.4059	221.21	0.0623	0.1874	3.4419	3.6916	8.8204
CFMW-038-GW	CFMW-038	06/27/2017	5760	7.63	347	40.8	1.04	18.3	63.1	3.18	13.9	289	123.24	3.1487	1.5059	1.7748	0.0266	6.4560	306.08	0.0897	0.2894	4.7367	5.1158	11.5815
CFMW-040-GW	CFMW-040	06/20/2017	5740	7.22	363	47.2	1.15	18.8	58.3	2.67	25.2	281	125.45	2.9092	1.5471	2.0532	0.0294	6.5388	308.87	0.0753	0.5247	4.6056	5.2056	11.3523
CFMW-042-GW	CFMW-042	06/20/2017	5870	7.09	395	59.6	1.03	16.5	50.4	2.47	29.9	281	127.53	2.5150	1.3578	2.5926	0.0263	6.4917	313.37	0.0697	0.6225	4.6056	5.2978	10.1269
CFMW-043-GW	CFMW-043	06/21/2017	6190	7.02	350	44.9	1.03	20.3	63	2.44	32.5	296	129.23	3.1437	1.6705	1.9532	0.0263	6.7937	330.94	0.0688	0.6767	4.8514	5.5969	9.6586
CFMW-044-GW	CFMW-044	06/21/2017	7390	7.57	309	50.6	3.21	19.7	45.1	2.77	22.8	349	118.61	2.2505	1.6211	2.2011	0.0821	6.1548	374.57	0.0781	0.4747	5.7201	6.2729	-0.9506
CFMW-044a-GW	CFMW-044a	06/23/2017	4280	8.5	284	44.7	0.987	12.1	27	3.96	41.9	164	84.787	1.3473	0.9957	1.9445	0.0252	4.3127	209.86	0.1117	0.8724	2.6880	3.6720	8.0238
CFMW-044b-GW	CFMW-044b	06/23/2017	4060	8.56	218	4.84	1	22.5	41.1	1.87	5.24	213	69.44	2.0509	1.8515	0.2105	0.0256	4.1385	220.11	0.0528	0.1091	3.4911	3.6529	6.2327
CFMW-045-GW	CFMW-045	06/28/2017	5690	7.36	355	54.2	1.09	17.1	55.5	2.43	28.2	280	127.89	2.7695	1.4072	2.3577	0.0279	6.5622	310.63	0.0686	0.5871	4.5892	5.2449	11.1570
CFMW-045a-GW	CFMW-045a	06/23/2017	5430	8.1	336	32.6	1.24	16.1	57	2.75	25.3	266	106.94	2.8443	1.3249	1.4181	0.0317	5.6190	294.05	0.0776	0.5267	4.3597	4.9641	6.1884
CFMW-047-GW	CFMW-047	06/21/2017	4840	7.91	245	19.1	0.909	15.7	51.3	1.9	5.32	232	87.009	2.5599	1.2920	0.8309	0.0233	4.7059	239.22	0.0536	0.1108	3.8025	3.9668	8.5219
CFMW-049-GW	CFMW-049	06/21/2017	4410	8.05	208	12.2	0.806	16.4	46.4	1.66	4.03	219	75.806	2.3154	1.3496	0.5307	0.0206	4.2162	224.69	0.0468	0.0839	3.5894	3.7201	6.2508
CFMW-049a-GW	CFMW-049a	06/21/2017	10500	12.08	163	13.7	3.75	13.3	86.3	1.66	3.17	312	117.05	4.3064	1.0945	0.5960	0.0959	6.0927	316.83	0.0468	0.0660	5.1137	5.2265	7.6524
CFMW-050-GW	CFMW-050	06/21/2017	4590	8.07	218	13	0.84	17.5	49.4	1.71	4.67	228	80.74	2.4651	1.4401	0.5655	0.0215	4.4921	234.38	0.0482	0.0972	3.7369	3.8824	7.2808
CFMW-053-GW	CFMW-053	06/28/2017	5160	7.49	325	28.6	0.92	17.8	57.6	1.96	19	264	104.92	2.8742	1.4648	1.2441	0.0235	5.6066	284.96	0.0553	0.3956	4.3270	4.7778	7.9812
CFMW-053a-GW	CFMW-053a	06/28/2017	71500	10.53	1850	31.2	10.8	0.0318	602	5.72	1.99	1840	644.0318	30.0398	0.0026	1.3572	0.2763	31.6759	1847.71	0.1614	0.0414	30.1576	30.3604	2.1205
CFMW-054-GW	CFMW-054	06/21/2017	5210	7.46	291	36.4	1.02	17.4	57.8	1.95	19.6	269	112.62	2.8842	1.4318	1.5834	0.0261	5.9256	290.55	0.0550	0.4081	4.4089	4.8720	9.7575
CFMW-056-GW	CFMW-056	06/22/2017	3990	8.3	227	4.25	1.57	19.5	48.8	0.287	4.31	217	74.12	2.4351	1.6047	0.1849	0.0402	4.2648	221.597	0.0081	0.0897	3.5566	3.6545	7.7072
CFMW-056a-GW	CFMW-056a	06/22/2017	3150	9.68	239	17.8	7.65	14.1	29.1	2.78	3.54	161	68.65	1.4521	1.1603	0.7743	0.1957	3.5824	167.32	0.0784	0.0737	2.6388	2.7909	12.4182
CFMW-056b-GW	CFMW-056b	06/22/2017	5210	7.32	337	9.81	0.806	18.5	69.9	3.05	29.7	255	99.016	3.4880	1.5224	0.4267	0.0206	5.4577	287.75	0.0860	0.6184	4.1795	4.8838	5.5493
CFMW-057-GW	CFMW-057	06/28/2017	3940	7.97	211	5.88	2.36	23.8	39.5	0.314	4.15	219	71.54	1.9711	1.9585	0.2558	0.0604	4.2457	223.464	0.0089	0.0864	3.5894	3.6847	7.0744
CFMW-057a-GW	CFMW-057a	06/28/2017	15200	12.57	396	21.6	11.5	0.226	112	5.66	25.9	313	145.326	5.5888	0.0186	0.9396	0.2942	6.8412	344.56	0.1597	0.5392	5.1301	5.8290	7.9888
CFMW-059-GW	CFMW-059	06/21/2017	5340	7.31	315	21.6	1.23	15.2	68.7	30.7	5.3	236	106.73	3.4281	1.2508	0.9396	0.0315	5.6500	272	0.8660	0.1103	3.8680	4.8444	7.6761
CFMW-059a-GW	CFMW-059a	06/28/2017	2520	9.38	138	4.05	1.94	10.9	39.7	0.469	6.61	135	56.59	1.9810	0.8970	0.1762	0.0496	3.1038	142.079	0.0132	0.1376	2.2127	2.3635	13.5404
CFMW-061-GW	CFMW-061	06/23/2017	4130	7.39	213	6.01	0.692	17.7	51.1	1.48	3.31	226	75.502	2.5499	1.4565	0.2614	0.0177	4.2856	230.79	0.0418	0.0689	3.7041	3.8148	5.8115
CFMW-064-GW	CFMW-064	06/23/2017	4310	7.5	257	11.2	0.924	20	47.8	2.06	5.14	238	79.924	2.3852	1.6458	0.4872	0.0236	4.5419	245.2	0.0581	0.1070	3.9008	4.0659	5.5288
CFMW-DUP14-GW	CFMW-064	06/23/2017	4310	7.5	250	11.1	0.945	19.9	47.5	1.88	5.13	230	79.445	2.3703	1.6376	0.4829	0.0242	4.5148	237.01	0.0530	0.1068	3.7697	3.9295	6.9313
CFMW-DUP14-GW	CFMW-064	06/23/2017	4310	7.5	250	11.1	0.945	19.9	47.5	1.88	5.13	230	79.445	2.3703	1.6376	0.4829	0.0242	4.5148	237.01	0.0530	0.1068	3.7697	3.9295	6.9313

Conversion Factor

Calcium (Ca)	0.0499
Magnesium (Mg)	0.08229
Sodium (Na)	0.0435
Potassium (K)	0.02558
Chloride (Cl)	0.02821
Sulfate (SO4)	0.02082
Bicarbonate (HCO3)	0.01639

APPENDIX R

Geochemical Modeling Evaluation

1.0 Appendix R – Geochemical Modeling Evaluation

As noted in Section 6.2 of the GW/SW Data Summary Report, a subset of monitoring wells was observed to have elevated pH values in groundwater (i.e., above pH 10). Elevated concentrations of calcium in these wells suggest reactions involving cement grout used in well construction is a possible cause of the elevated pH (embedded Figure 1). To further evaluate the groundwater chemistry, geochemical modeling was performed utilizing USGS's pH Redox Equilibrium (in C language) (PHREEQC) geochemical model (Parkhurst and Appelo, 1999). These results were used to evaluate concentrations and mobility of cyanide and fluoride in groundwater and surface water.

The following sections describe geochemical modeling that was used to evaluate the potential impacts of the elevated pH in these wells on the concentrations of fluoride and cyanide measured during groundwater sampling.

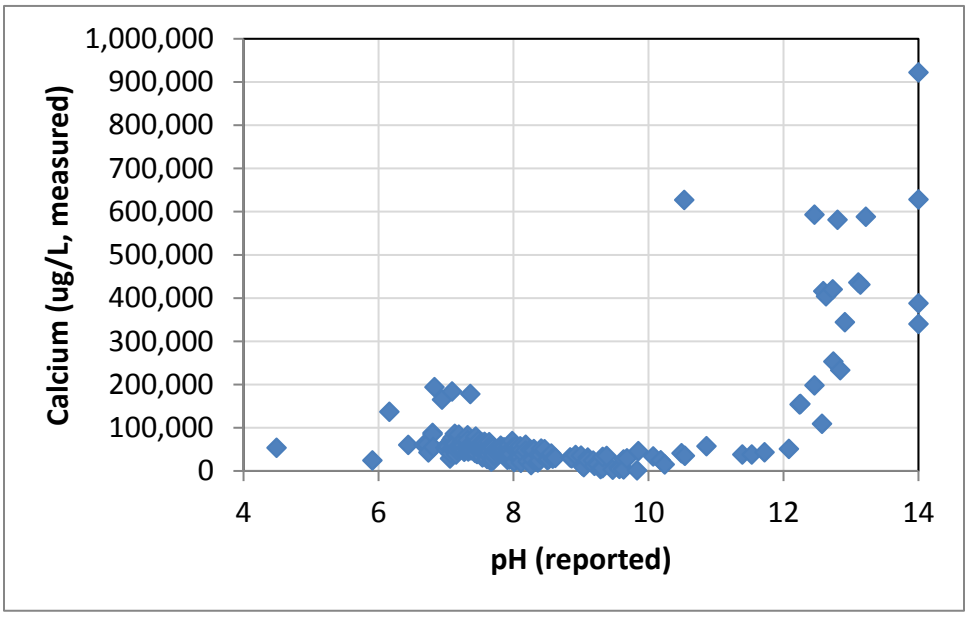


Figure 1. Calcium concentrations versus reported pH

2.0 Geochemical Modeling Approach

Groundwater sampling results from the four sampling rounds were utilized in the geochemical modeling. Data input to the model included analytical results for alkalinity, aluminum, ammonium, antimony, arsenic, barium, beryllium, cadmium, calcium, chloride, chromium, cobalt, copper, cyanide, fluoride, iron, lead, magnesium, manganese, mercury, nickel, nitrate, pH,

potassium, selenium, silver, sodium, sulfate, thallium, vanadium, and zinc. This included results from 235 samples. Concentrations reported as non-detections were treated as being equal to the respective detection limit value.

Each water sample was "speciated" with the U.S. Geological Survey's PHREEQC geochemical model (Parkhurst and Appelo, 1999). Speciation modeling entails calculating the equilibrium state of a water chemistry sample. To accomplish this, PHREEQC uses databases of aqueous complexation and mineralogical equilibrium constants to quantify the distribution of various components, or chemical elements, among free ions and aqueous complexes as a function of water chemistry, including pH, the oxidation-reduction setting, and the abundances of different components. The resulting equilibrated water composition can then be evaluated to identify changes in complexation as a function of particular parameter, such as pH, that could potentially impact mobility of individual components (e.g., fluoride and cyanide, in the case of the CFAC Site). To inform this, the thermodynamic saturation state of the modeled equilibrium water composition with various mineral phases can also be quantified (i.e., the thermodynamic driving force favoring mineral phase precipitation or dissolution, with respect to the water chemical composition).

For all geochemical model calculations discussed below, PHREEQC's llnl.dat thermodynamic database, generally the most comprehensive among those provided with the code, was selected for equilibrium constants as well as thermodynamic activity correction. The aqueous complexation constant database was augmented, however, with additional cyanide complexation constants from the minteqv4.dat database, which is also supplied with PHREEQC.

3.0 Geochemical Model Evaluation of Elevated pH

PHREEQC was initially used to assess the integrity of the groundwater sample set in terms of charge balance and consistency of calculated mineral saturation indices. As a first step, PHREEQC was used to speciate all sample compositions below pH 11, representing a subtotal of 212 samples. The median implied charge imbalance across this group was less than 5 percent. However, many of these samples at the higher end of the pH range are significantly supersaturated with respect to calcite, $CaCO_3$ (embedded Figure 2). Log saturation indices (e.g., greater than 1) generally are not observed unless equilibration with the particular mineral phase is kinetically slow, which is

unlikely for calcite. A plausible explanation for this result is off-gassing of CO_2 during sample collection and/or analysis. No correction was made to the data for this effect.

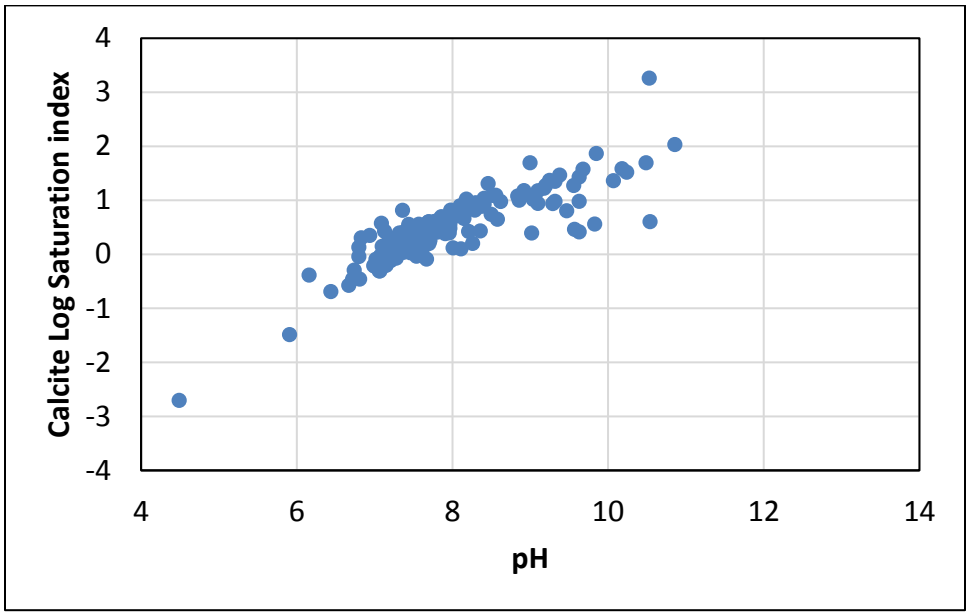


Figure 2. Saturation index values for calcite, $CaCO_3$, versus pH across the groundwater sample set in those samples below pH 11.

As a second step, speciation was then attempted on the remaining groundwater samples. PHREEQC encountered numerical convergence problems with those samples above pH 11. This issue appeared to stem from an inconsistency between the reported pH values and the corresponding reported total alkalinity values (embedded Figure 3) which in most cases implied a large charge imbalance in the reported analytical data. To address this problem, the subset of 23 samples with pH values above 11 were re-speciated by computing the appropriate pH value to achieve charge balance, and then calculating the resulting alkalinity. The computed alkalinity values in this subgroup of samples follow the trend in the reported values (embedded Figure 4) but are slightly diminished at the high end of the range.

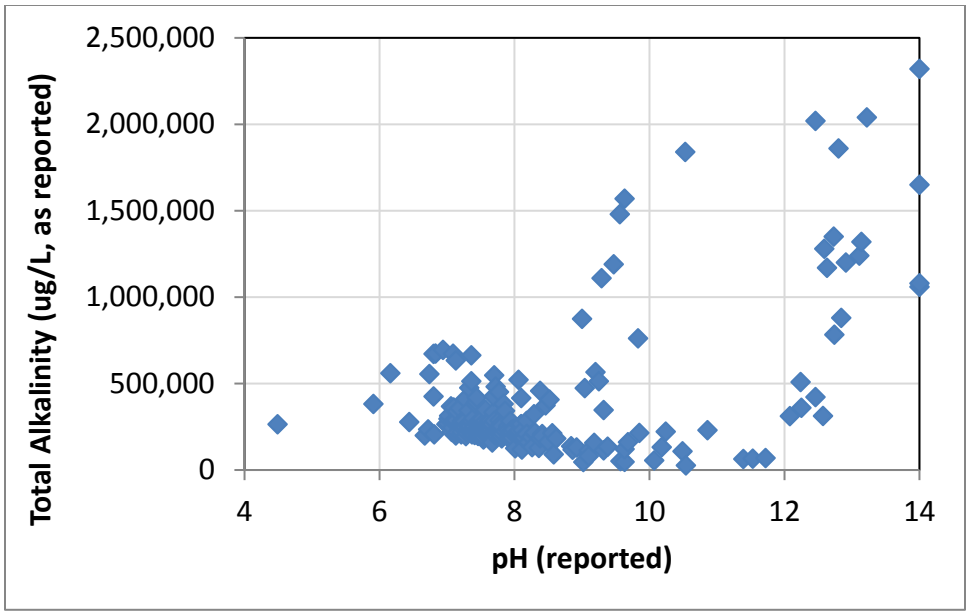


Figure 3. Measured total alkalinity versus measured pH.

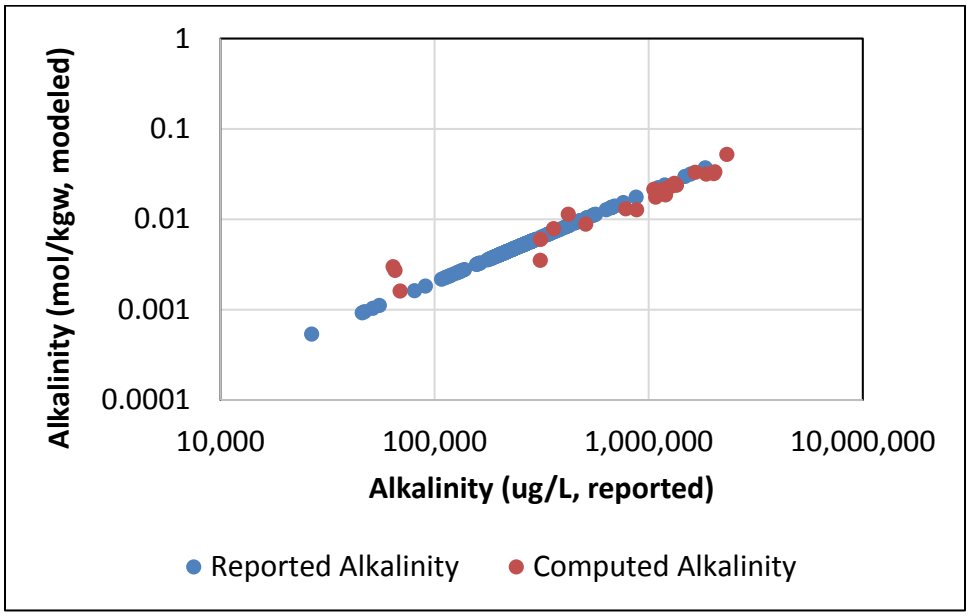


Figure 4. Modeled versus measured total alkalinity; modeled values for the computed set are based on pH and charge balance constraints.

The relationship between the model-adjusted total alkalinity and model-adjusted pH relationship is shown on embedded Figure 5. As expected, this relationship approximates the same patterns exhibited in the uncorrected field data. However, the PHREEQC-calculated contributions of bicarbonate and carbonate alkalinity to the total alkalinity as a function of pH (embedded Figure 6) indicates that these values are only important up to approximately pH 10. At more elevated pH values, such as those associated with the suspected grout issues, total alkalinity is dominated by

the hydroxide ion, OH^-, as implied by the imposed charge balance constraint. It should also be noted that computed bicarbonate and carbonate concentrations in the subset of 23 samples with reported pH values above pH 11 are based on assumed equilibrium with calcite. Under these elevated calcium concentrations and pH conditions, bicarbonate and carbonate concentrations in equilibrium with calcite are negligible.

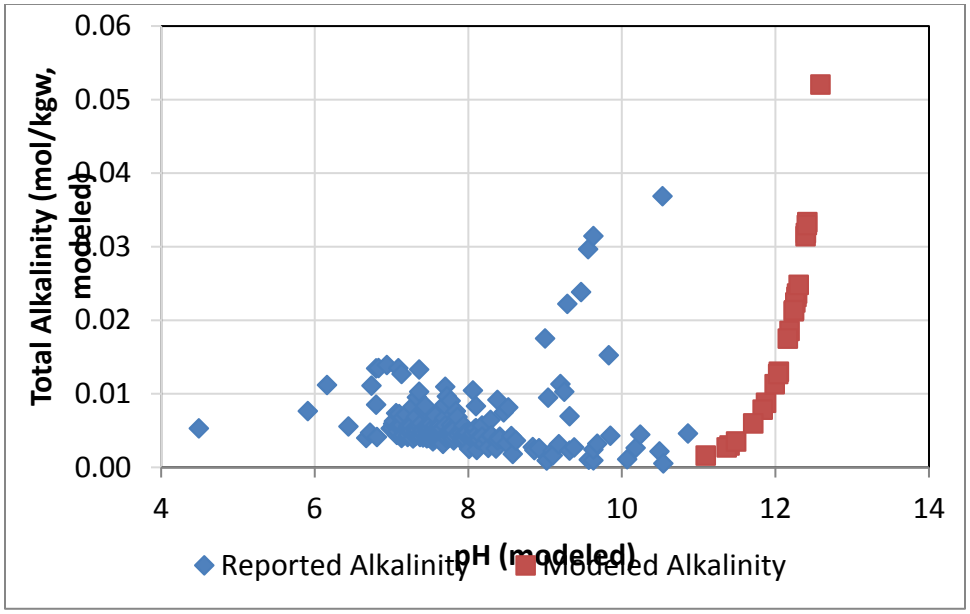


Figure 5. Computed alkalinity versus computed pH; modeled values for the Computed set are based on pH and charge balance constraints.

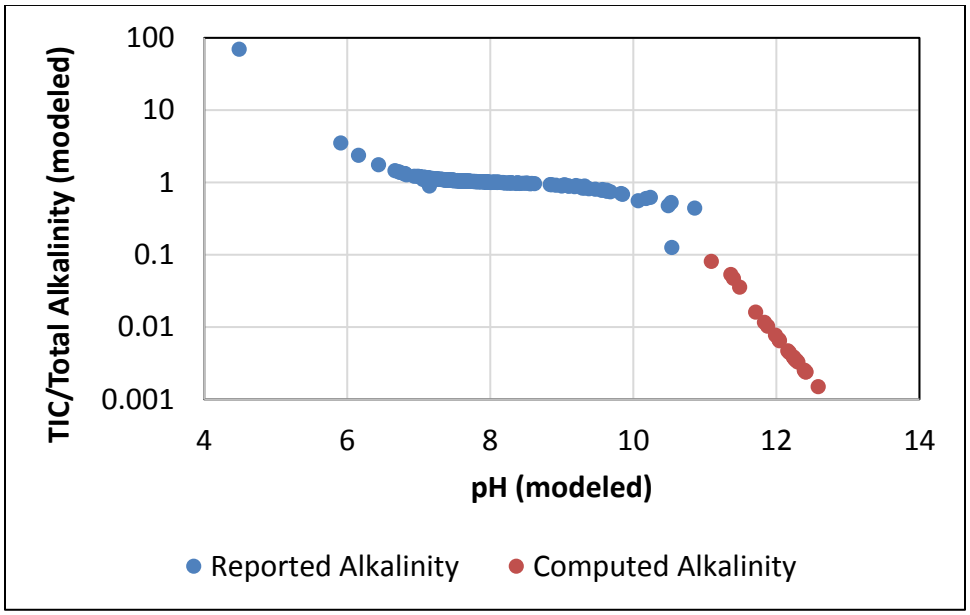


Figure 6. Contribution of total inorganic carbon (as bicarbonate alkalinity and carbonate alkalinity) to total alkalinity as a function pH.

The elevated calcium concentrations at high pH values can be explained by reactions involving cement used in well construction. For example, an equilibration reaction for tobermorite, a proxy mineral phase in the PHREEQC llnl.dat thermodynamic database for the calcium silicate hydrate that is generated by the hydration of Portland cement, both raises pH and the concentration of calcium ion:

$$Ca_5Si_6H_{11}O_{22.5} + 10H^+ \rightarrow 5Ca^{+2} + 6SiO_2 + 10.5H_2O$$

(Equation-1)

Such reactions can also lead to the equilibration of the resulting solution with portlandite, $Ca(OH)_2$:

$$Ca^{+2} + 2H_2O \rightarrow Ca(OH)_2 + 2H^+$$

(Equation-2)

Groundwater samples characterized by the highest model-adjusted pH values are close to thermodynamic equilibrium with portlandite (embedded Figure 7), indicating that the cement used in well construction may be involved.

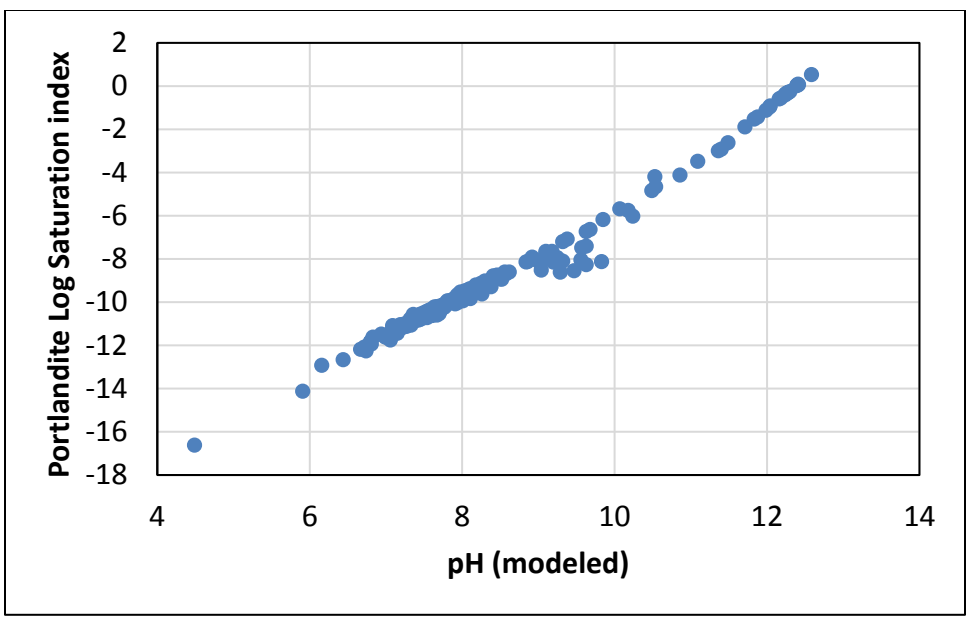


Figure 7. Saturation index values for portlandite, $Ca(OH)_2$, versus model-adjusted pH across groundwater sample set.

The geochemical modeling indicates that minor discrepancies exist in the data sets, mainly regarding pH, alkalinity, and charge balances. However, adjustments to the data implemented via PHREEQC to address these issues have resulted in relatively minor change in water chemistry (i.e., very alkaline wells appear to be characterized by elevated pH, but with somewhat lower

values than had been reported). Therefore, the data appear to be valid for subsequent consideration regarding fluoride and cyanide speciation.

3.1 Geochemical Modeling Evaluation of Fluoride and Cyanide Speciation

Speciation modeling was completed using the adjusted pH and alkalinity model to evaluate if the elevated pH conditions could potentially influence the fluoride and cyanide concentration results.

PHREEQC modeling indicates that F^- ion is the dominant form of fluoride in solution across all of the pH values encountered in the groundwater sample set; HF and MgF^+ complexes, predicted to be the next most-abundant species, are nonetheless characterized by largely negligible concentrations (embedded Figure 8). While fluoride is known to form complexes with aluminum (e.g., Gong et al., 2012), and some elevated concentrations are observed in samples with higher pH values (embedded Figure 9), speciation modeling indicates that Al-F complexation in these water compositions is very minimal. Major fluoride-bearing mineral phases such as fluorite, CaF_2, are undersaturated except in a small number of samples at near-neutral pH (embedded Figure X). However, the saturation states of other mineral phases with fluoride as a possible minor constituent (e.g., fluoro-apatite) could not be determined because the concentrations of some components, such as phosphate, were below detection limits.

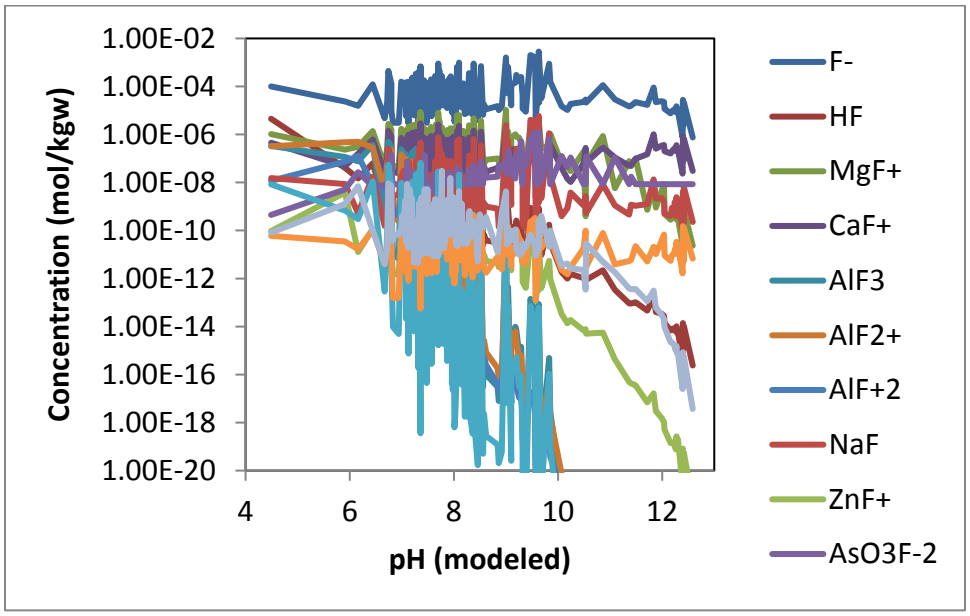


Figure 8. Simulated aqueous speciation of fluoride versus model-corrected pH across groundwater sample set.

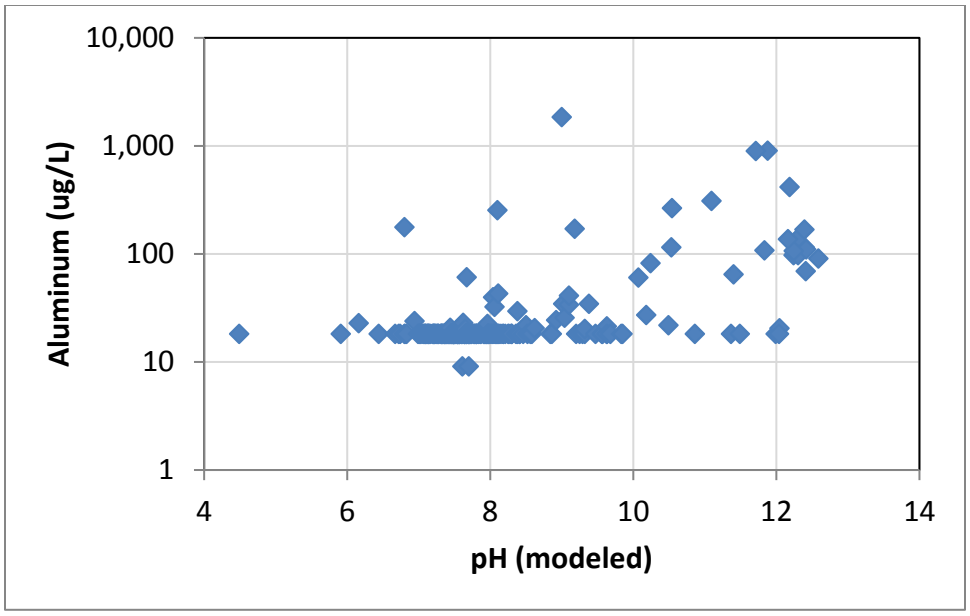


Figure 9. Aluminum concentrations versus modeled pH.

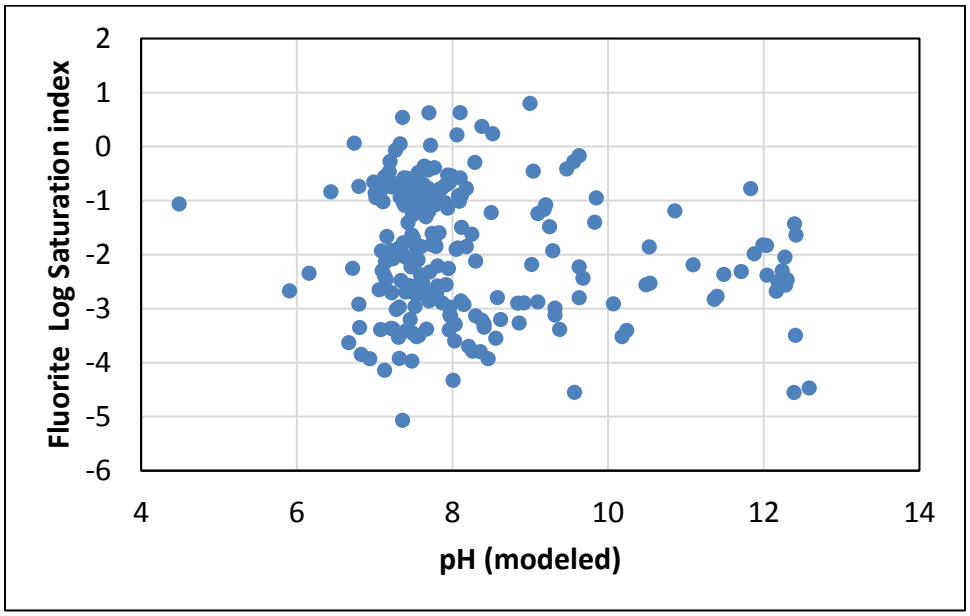


Figure 10. Saturation index values for fluorite, CaF_2, versus model-corrected pH across groundwater sample set.

Speciation of cyanide principally entails a transformation from HCN to CN^- ion at pH 8.5 to pH 9, with various ferrocyanide complexes also present under near-neutral conditions (embedded Figure 10). At high pH values, the negatively charged CN^- ion would be unlikely to adsorb onto iron or aluminum oxide mineral phases which would likely also be characterized by negative charges. Modeled complexation of cyanide with non-ferrous trace metals in the groundwater samples indicates that this is largely negligible.

A separate analysis entailed generation of a correlation matrix of log-transformed concentrations of selected analytes across all 235 samples, including adjusted pH and total alkalinity value (Embedded Table 1). The log-transformed concentrations of fluoride and cyanide are comparatively well correlated, and both exhibit some degree of correlation with nitrate and sodium, suggesting some possible relationship with Site landfill materials.

	pH	Alkalinity	Ba	Ca	Cyanide	F	Mg	Mn	K	Na	NO3	Cl	SO4
pH	1.00												
Alkalinity	0.32	1.00											
Ba	0.18	0.54	1.00										
Ca	0.31	0.47	0.60	1.00									
Cyanide	-0.27	0.24	-0.01	-0.29	1.00								
F	-0.20	0.14	-0.04	-0.40	0.82	1.00							
Mg	-0.86	-0.49	-0.34	-0.51	0.28	0.21	1.00						
Mn	-0.21	-0.14	-0.17	-0.09	-0.32	-0.29	0.31	1.00					
K	0.74	0.46	0.27	0.42	-0.29	-0.26	-0.74	0.12	1.00				
Na	0.07	0.58	0.01	-0.08	0.64	0.57	-0.09	-0.08	0.26	1.00			
NO3	-0.30	0.34	-0.05	-0.20	0.83	0.67	0.28	-0.26	-0.28	0.69	1.00		
Cl	0.17	0.16	-0.07	0.22	-0.01	-0.06	-0.19	0.11	0.33	0.42	0.15	1.00	
SO4	-0.18	0.13	-0.32	-0.09	0.43	0.39	0.21	0.10	-0.05	0.58	0.51	0.46	1.00

Table 1. Correlation matrix for selected log-transformed concentrations across all 235 samples.

4.0 Geochemical Model Conclusions

Wells yielding samples that are characterized by elevated pH (i.e., above 11) reflect chemical reactions involving the cement used in well construction. Overall, the speciation modeling values reveal no evidence indicating phenomena that could reduce the mobility, and hence concentration, of either fluoride or cyanide under the elevated pH conditions encountered in some monitoring wells.

5.0 References

Gong, Wen-Xin, Jiu-Hui Qu, Rui-Ping Liu, and Hua-Chun Lan, 2012. Effect of aluminum fluoride complexation on fluoride removal by coagulation, Colloids and Surfaces A: Physicochemical and Engineering Aspects, 395, 88-93.

Parkhurst, D.L., Appelo, C.A.J., 1999. User's Guide to PHREEQC (Version 2) – A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and Inverse Geochemical Calculations. U.S. Geological Survey Water-Resources Investigations Report 99-4259, 312 pp.

APPENDIX S

Data Validation Reports

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

November 8, 2016

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on October 6, 2016. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #37228:

SDG #	Fraction
460-120143-1, 460-120223-1 460-120318-1, 460-120379-1 460-120477-1, 460-120581-1 460-120664-1, 460-120751-1	Volatiles, Semivolatiles, Metals, Dissolved Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

EDD

LDC #37228 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		F (300.0)		CN- (335.4/ 9012B)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		TDS (2540C)		TSS (2540D)									
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-120143-1	10/06/16	10/27/16	10	0	9	0	-	-	12	0	12	0	12	0	12	0	-	-	12	0	12	0	12	0	11	0	11	0								
B	460-120223-1	10/06/16	10/27/16	10	0	9	0	-	-	10	0	10	0	10	0	10	0	-	-	10	0	10	0	10	0	9	0	9	0								
C	460-120318-1	10/06/16	10/27/16	9	0	8	0	-	-	12	0	12	0	12	0	12	0	-	-	12	0	12	0	12	0	11	0	11	0								
D	460-120379-1	10/06/16	10/27/16	-	-	-	-	6	0	-	-	6	0	6	0	6	0	-	-	6	0	6	0	6	0	5	0	5	0								
E	460-120382-1	10/06/16	10/27/16	2	0	1	0	-	-	3	0	4	0	4	0	4	0	-	-	4	0	4	0	4	0	3	0	3	0								
F	460-120477-1	10/06/16	10/27/16	3	0	2	0	-	-	9	0	9	0	9	0	9	0	-	-	9	0	9	0	9	0	9	0	9	0								
G	460-120581-1	10/06/16	10/27/16	2	0	1	0	-	-	10	0	10	0	10	0	10	0	-	-	10	0	10	0	10	0	9	0	9	0								
H	460-120664-1	10/06/16	10/27/16	4	0	3	0	-	-	6	0	6	0	6	0	6	0	-	-	6	0	6	0	6	0	5	0	5	0								
I	460-120751-1	10/06/16	10/27/16	2	0	1	0	1	0	-	-	1	0	-	-	-	-	1	0	1	0	1	0	-	-	-	-	-	-								
Total	T/CR			42	0	34	0	7	0	62	0	70	0	69	0	69	0	1	0	70	0	70	0	69	0	62	0	62	0	0	0	0	0	0	0	0	687

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

The attached zipped file contains ten files:

File	Format	Description	
1) Readme_ColumbiaFalls_110716.doc	MS Word 2003	A "Readme" file (this document).	
2)	MS Excel 2007	A spreadsheet for the following SDG(s):	
460-120143-1_TestResultsQC_v1.xlsx		460-120143-1	37228A
460-120223-1_TestResultsQC_v1.xlsx		460-120223-1	37228B
460-120318-1_TestResultsQC_v1.xlsx		460-120318-1	37228C
460-120379-1_TestResultsQC_v1.xlsx		460-120379-1	37228D
460-120382-1_TestResultsQC_v1.xlsx		460-120382-1	37228E
460-120477-1_TestResultsQC_v1.xlsx		460-120477-1	37228F
460-120581-1_TestResultsQC_v1.xlsx		460-120581-1	37228G
460-120664-1_TestResultsQC_v1.xlsx		460-120664-1	37228H
460-120751-1_TestResultsQC_v1.xlsx		460-120751-1	37228I

No discrepancies were observed between the hardcopy data packages and the electronic data deliverables during EDD population of validation qualifiers. A 100% verification of the EDD was not performed.

Please contact Christina Rink at (760) 827-1100 if you have any questions regarding this electronic data submittal.

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120143-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-025b-GW	460-120143-2	Water	09/13/16
CFMW-026-GW	460-120143-4	Water	09/13/16
CFMW-043-GW	460-120143-6	Water	09/13/16
Trip Blank	460-120143-7	Water	09/13/16
CFMW-029-GW	460-120143-8	Water	09/13/16
CFMW-DUP1-GW	460-120143-9	Water	09/13/16
CFMW-028-GW	460-120143-10	Water	09/13/16
CFMW-027-GW	460-120143-11	Water	09/13/16
CFMW-022-GW	460-120143-12	Water	09/13/16
CFMW-011-GW	460-120143-13	Water	09/13/16
CFMW-026-GWMS	460-120143-4MS	Water	09/13/16
CFMW-026-GWMSD	460-120143-4MSD	Water	09/13/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/08/16	Dichlorodifluoromethane	21.1	All samples in SDG 160-120143-1	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/17/16	Dichlorodifluoromethane Bromomethane	44.3 26.8	All samples in SDG 160-120143-1	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples CFMW-029-GW and CFMW-DUP1-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D, data were qualified as estimated in ten samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120143-1

Sample	Compound	Flag	A or P	Reason
CFMW-025b-GW CFMW-026-GW CFMW-043-GW Trip Blank CFMW-029-GW CFMW-DUP1-GW CFMW-028-GW CFMW-027-GW CFMW-022-GW CFMW-011-GW	Dichlorodifluoromethane	UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-025b-GW CFMW-026-GW CFMW-043-GW Trip Blank CFMW-029-GW CFMW-DUP1-GW CFMW-028-GW CFMW-027-GW CFMW-022-GW CFMW-011-GW	Dichlorodifluoromethane Bromomethane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120143-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120143-1

No Sample Data Qualified in this SDG

LDC #: 37228A1
SDG #: 460-120143-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 10/22/16
Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A, A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A SW	% RSD ≤ 15/30, r^2 ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 4
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCD
X.	Field duplicates	ND	D = 5, 6
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-025b-GW	460-120143-2	Water	09/13/16
2	CFMW-026-GW	460-120143-4	Water	09/13/16
3	CFMW-043-GW	460-120143-6	Water	09/13/16
4	Trip Blank	460-120143-7	Water	09/13/16
5	CFMW-029-GW D	460-120143-8	Water	09/13/16
6	CFMW-DUP1-GW D	460-120143-9	Water	09/13/16
7	CFMW-028-GW	460-120143-10	Water	09/13/16
8	CFMW-027-GW	460-120143-11	Water	09/13/16
9	CFMW-022-GW	460-120143-12	Water	09/13/16
10	CFMW-011-GW	460-120143-13	Water	09/13/16
11	CFMW-026-GWMS	460-120143-4MS	Water	09/13/16
12	CFMW-026-GWMSD	460-120143-4MSD	Water	09/13/16
13	MB- 460-391120			

LDC #: 37228A 1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: C

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?			✓	
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37228A1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37228A 1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
-	9/8/16 0908	ICV - 13	~~21.1~~ JJ	21.1	all	J-/UJ/A ND

ICVvoa.wpd

LDC #: 37228A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	9/17/16	CCV-13	JJ	44.3		All	J/UJ/A (ND)
-			B	26.8		↓	↓

CONCAL.wpd

LDC #: 37228A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/200std)	Recalculated (RRF 20/100/200std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/8/2016	M	0.2753	0.2753	0.2981	0.2981	9.3	9.3
	GCMS13		C	0.5783	0.5783	0.6188	0.6188	7.7	7.7
			CC	1.6519	1.6519	1.7379	1.7379	6.6	6.6
			JJJ	1.3950	1.3950	1.4540	1.4540	2.5	2.5

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV-13 12:10	9/17/16	M (IS1)	0.2981	0.2476	0.2476	16.9	16.9
			C (IS2)	0.6188	0.5557	0.5557	10.2	10.2
			CC (IS3)	1.7379	1.598	1.598	8.1	8.1
			JJJ (IS4)	1.4540	1.395	1.395	4.1	4.1
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37228A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 10

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	50.3	101	101	0
1,2-Dichloroethane-d4		48.2	96	96	
Toluene-d8		45.5	91	91	
Bromofluorobenzene		51.7	103	103	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37228A1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 11 & 12

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	---	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	ND	19.5	18.3	97	97	92	92	6	6
Trichloroethene	↓	↓	↓	24.1	21.7	120	120	108	108	10	10
Benzene	↓	↓	↓	20.3	18.2	102	102	91	91	11	11
Toluene	↓	↓	↓	20.2	18.3	101	101	91	91	10	10
Chlorobenzene	↓	↓	↓	21.5	19.2	107	107	96	96	11	11

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228A /

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 400-391120

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	18.4	NA	92	92				
Trichloroethene			22.0		110	110				
Benzene			18.4		92	92				
Toluene			19.1		95	95				
Chlorobenzene			19.7		99	99	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228A)

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: CV

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-391120 CC

Conc. = $\frac{(301729)(50)}{(455539)(1.7379)}$

= 19.1

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120143-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-025b-GW	460-120143-2	Water	09/13/16
CFMW-026-GW	460-120143-4	Water	09/13/16
CFMW-043-GW	460-120143-6	Water	09/13/16
CFMW-029-GW	460-120143-8	Water	09/13/16
CFMW-DUP1-GW	460-120143-9	Water	09/13/16
CFMW-028-GW	460-120143-10	Water	09/13/16
CFMW-027-GW	460-120143-11	Water	09/13/16
CFMW-022-GW	460-120143-12	Water	09/13/16
CFMW-011-GW	460-120143-13	Water	09/13/16
CFMW-026-GWMS	460-120143-4MS	Water	09/13/16
CFMW-026-GWMSD	460-120143-4MSD	Water	09/13/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/17/16	Hexachlorocyclopentadiene 2,6-Dinitrotoluene 2,4-Dinitrotoluene	22.3 21.5 20.2	All samples in SDG 460-120143-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
LCS 460-390998	2,4-Dinitrophenol	40 (45-125)	All samples in SDG 460-120143-1	UJ (all non-detects)	P
LCS 460-390998	Acenaphthene Acenaphthylene Naphthalene	111 (58-107) 110 (61-106) 105 (51-98)	All samples in SDG 460-120143-1	NA	-
LCS 460-390998	Pentachlorophenol	9 (54-120)	All samples in SDG 460-120143-1	R (all non-detects)	P

X. Field Duplicates

Samples CFMW-029-GW and CFMW-DUP1-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method.

Due to LCS %R, data were rejected in nine samples.

Due to LCS %R, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be rejected (R) are unusable for all purposes. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120143-1

Sample	Compound	Flag	A or P	Reason
CFMW-025b-GW CFMW-026-GW CFMW-043-GW CFMW-029-GW CFMW-DUP1-GW CFMW-028-GW CFMW-027-GW CFMW-022-GW CFMW-011-GW	2,4-Dinitrophenol	UJ (all non-detects)	P	Laboratory control samples (%R)
CFMW-025b-GW CFMW-026-GW CFMW-043-GW CFMW-029-GW CFMW-DUP1-GW CFMW-028-GW CFMW-027-GW CFMW-022-GW CFMW-011-GW	Pentachlorophenol	R (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120143-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120143-1

No Sample Data Qualified in this SDG

LDC #: 37228A2a

SDG #: 460-120143-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

Page: 6 of 7

Reviewer: m

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	ND	D = 4, 5
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-025b-GW	460-120143-2	Water	09/13/16
2	CFMW-026-GW	460-120143-4	Water	09/13/16
3	CFMW-043-GW	460-120143-6	Water	09/13/16
4	CFMW-029-GW D	460-120143-8	Water	09/13/16
5	CFMW-DUP1-GW D	460-120143-9	Water	09/13/16
6	CFMW-028-GW	460-120143-10	Water	09/13/16
7	CFMW-027-GW	460-120143-11	Water	09/13/16
8	CFMW-022-GW	460-120143-12	Water	09/13/16
9	CFMW-011-GW	460-120143-13	Water	09/13/16
10	CFMW-026-GWMS	460-120143-4MS	Water	09/13/16
11	CFMW-026-GWMSD	460-120143-4MSD	Water	09/13/16
12				
13	MB 460-390998			

LDC #: 37228A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37228A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	T. 4-Chloroaniline	MM. 4-Chlorophenyl-phenyl ether	FFF. Di-n-octylphthalate	YYY. 2,3,5-Trimethylnaphthalene
B. Bis (2-chloroethyl) ether	U. Hexachlorobutadiene	NN. Fluorene	GGG. Benzo(b)fluoranthene	ZZZ. Perylene
C. 2-Chlorophenol	V. 4-Chloro-3-methylphenol	OO. 4-Nitroaniline	HHH. Benzo(k)fluoranthene	AAAA. Dibenzothiophene
D. 1,3-Dichlorobenzene	W. 2-Methylnaphthalene	PP. 4,6-Dinitro-2-methylphenol	III. Benzo(a)pyrene	BBBB. Benzo(a)fluoranthene
E. 1,4-Dichlorobenzene	X. Hexachlorocyclopentadiene	QQ. N-Nitrosodiphenylamine	JJJ. Indeno(1,2,3-cd)pyrene	CCCC. Benzo(b)fluorene
F. 1,2-Dichlorobenzene	Y. 2,4,6-Trichlorophenol	RR. 4-Bromophenyl-phenylether	KKK. Dibenz(a,h)anthracene	DDDD. cis/trans-Decalin
G. 2-Methylphenol	Z. 2,4,5-Trichlorophenol	SS. Hexachlorobenzene	LLL. Benzo(g,h,i)perylene	EEEE. Biphenyl
H. 2,2'-Oxybis(1-chloropropane)	AA. 2-Chloronaphthalene	TT. Pentachlorophenol	MMM. Bis(2-Chloroisopropyl)ether	FFFF. Retene
I. 4-Methylphenol	BB. 2-Nitroaniline	UU. Phenanthrene	NNN. Aniline	GGGG. C30-Hopane
J. N-Nitroso-di-n-propylamine.	CC. Dimethylphthalate	VV. Anthracene	OOO. N-Nitrosodimethylamine	HHHH. 1-Methylphenanthrene
K. Hexachloroethane	DD. Acenaphthylene	WW. Carbazole	PPP. Benzoic Acid	IIII. 1,4-Dioxane
L. Nitrobenzene	EE. 2,6-Dinitrotoluene	XX. Di-n-butylphthalate	QQQ. Benzyl alcohol	JJJJ. Acetophenone
M. Isophorone	FF. 3-Nitroaniline	YY. Fluoranthene	RRR. Pyridine	KKKK. Atrazine
N. 2-Nitrophenol	GG. Acenaphthene	ZZ. Pyrene	SSS. Benzidine	LLLL. Benzaldehyde
O. 2,4-Dimethylphenol	HH. 2,4-Dinitrophenol	AAA. Butylbenzylphthalate	TTT. 1-Methylnaphthalene	MMMM. Caprolactam
P. Bis(2-chloroethoxy)methane	II. 4-Nitrophenol	BBB. 3,3'-Dichlorobenzidine	UUU.Benzo(b)thiophene	NNNN.
Q. 2,4-Dichlorophenol	JJ. Dibenzofuran	CCC. Benzo(a)anthracene	VVV.Benzonaphthothiophene	OOOO.
R. 1,2,4-Trichlorobenzene	KK. 2,4-Dinitrotoluene	DDD. Chrysene	WWW.Benzo(e)pyrene	PPPP.
S. Naphthalene	LL. Diethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	XXX. 2,6-Dimethylnaphthalene	QQQQ.

LDC #: 37228A2e

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	9/17/16	CCV - 4	X	22.3		All	J+ det /A all
+	0433		~~KK~~ EE	21.5		↓	↓
+			KK	20.2			

CONCAL.wpd

LDC #: 37228A2e

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-390998	HH	40 (45-125)	( )	( )	All	J-/UJ/P and NP
		GG	111 (58-107)	( )	( )	↓	J+/P
		DD	110 (61-106)	( )	( )	↓	↓
		S	105 (51-98)	( )	( )	↓	↓
		TT	9 (54-120)	( )	( )	↓	J-/R/P
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37228A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms4	9/16/2016	A	1.3044	1.3044	1.4076	1.4076	9.6	9.6
			M	0.7088	0.7088	0.8284	0.8284	16.7	16.7
			GG	1.0548	1.0548	1.0136	1.0136	7.0	7.0
			UU	0.9687	0.9687	0.9792	0.9792	18.2	18.2
			EEE	0.8710	0.8710	0.8680	0.8680	13.6	13.6
			III	1.0694	1.0694	1.0483	1.0483	5.4	5.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228 A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	cal-4 0433	9/17/16	A (1st IS)	1.4076	1.605	1.605	14.0	14.0
			M (2nd IS)	0.8284	0.7519	0.7519	9.2	9.2
			GG (3rd IS)	1.0136	1.035	1.035	2.1	2.1
			UU (4th IS)	0.9792	0.9731	0.9731	0.6	0.6
			EEE (5th IS)	0.8680	0.8781	0.8781	1.2	1.2
			III (6th IS)	1.0483	1.043	1.043	0.5	0.5
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: GA

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #9

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.56	86	86	0
2-Fluorobiphenyl		8.67	87	87	
Terphenyl-d14		8.69	87	87	
Phenol-d5		~~4.72~~ 2.65	26	26	
2-Fluorophenol		4.72	47	47	
2,4,6-Tribromophenol		6.67	67	67	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37228A2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration, SA = Spike added, SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 10 + 11

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	83.3	83.3	ND	27.3	30.6	33	33	37	37	12	12
N-Nitroso-di-n-propylamine	83.3	83.3	↓	74.7	80.0	90	90	96	96	7	7
4-Chloro-3-methylphenol	83.3	83.3	ND	60.9	62.3	73	73	75	75	2	2
Acenaphthene	83.3	83.3	ND	86.4	82.5	104	104	99	99	5	5
Pentachlorophenol	167	167	↓	123	138	74	74	83	83	11	11
Pyrene	83.3	83.3	↓	73.9	79.2	89	89	95	95	7	7

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 390998

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	28.0	NA	35	35				
N-Nitroso-di-n-propylamine	↓	↓	83.5	↓	104	104				
4-Chloro-3-methylphenol			60.7		76	76				
Acenaphthene			88.7		111	111				
Pentachlorophenol			14.4		9	9				
Pyrene			81		101	101	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228A2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-390998 TT

Conc. = $\frac{(416523)(8.00)(2)(1000)}{(677128)(1.4076)(250)}$

= 28.0 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 27, 2016

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120143-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-025a-GW	460-120143-1	Water	09/13/16
CFMW-025b-GW	460-120143-2	Water	09/13/16
CFMW-EB2-AQ	460-120143-3	Water	09/13/16
CFMW-026-GW	460-120143-4	Water	09/13/16
CFMW-056b-GW	460-120143-5	Water	09/13/16
CFMW-043-GW	460-120143-6	Water	09/13/16
CFMW-029-GW	460-120143-8	Water	09/13/16
CFMW-DUP1-GW	460-120143-9	Water	09/13/16
CFMW-028-GW	460-120143-10	Water	09/13/16
CFMW-027-GW	460-120143-11	Water	09/13/16
CFMW-022-GW	460-120143-12	Water	09/13/16
CFMW-011-GW	460-120143-13	Water	09/13/16
CFMW-026-GWMS	460-120143-4MS	Water	09/13/16
CFMW-026-GWDUP	460-120143-4DUP	Water	09/13/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB2-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-029-GW and CFMW-DUP1-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-029-GW	CFMW-DUP1-GW			
Barium	233	225	3 (≤30)	-	-
Calcium	52700	51100	3 (≤30)	-	-
Copper	4.5	1.4U	105 (≤30)	J (all detects) UJ (all non-detects)	A
Iron	172	164	5 (≤30)	-	-
Magnesium	18700	17800	5 (≤30)	-	-
Potassium	898	864	4 (≤30)	-	-
Sodium	35400	34200	3 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-120143-1

Sample	Analyte	Flag	A or P	Reason
CFMW-029-GW CFMW-DUP1-GW	Copper	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-120143-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-120143-1

No Sample Data Qualified in this SDG

LDC #: 37228A4a

SDG #: 460-120143-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/24/16

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/13/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB=(3)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(3)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER=(4)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD=(7,8)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-025a-GW	460-120143-1	Water	09/13/16
2	CFMW-025b-GW	460-120143-2	Water	09/13/16
3	CFMW-EB2-AQ	460-120143-3	Water	09/13/16
4	CFMW-026-GW	460-120143-4	Water	09/13/16
5	CFMW-056b-GW	460-120143-5	Water	09/13/16
6	CFMW-043-GW	460-120143-6	Water	09/13/16
7	CFMW-029-GW	460-120143-8	Water	09/13/16
8	CFMW-DUP1-GW	460-120143-9	Water	09/13/16
9	CFMW-028-GW	460-120143-10	Water	09/13/16
10	CFMW-027-GW	460-120143-11	Water	09/13/16
11	CFMW-022-GW	460-120143-12	Water	09/13/16
12	CFMW-011-GW	460-120143-13	Water	09/13/16
13	CFMW-026-GWMS All	460-120143-4MS	Water	09/13/16
14	CFMW-026-GWDUP ↓	460-120143-4DUP	Water	09/13/16
15				

LDC #: 31228A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37228A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: 2D
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 31228A4g

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-12	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
QC-13-14	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,

Comments: Mercury by CVAA if performed

LDC#: 37228A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: ZD
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6010B/7000)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	7	8		
Barium	233	225	3	
Calcium	52700	51100	3	
Copper	4.5	1.4U	105	J/UJ/A (det/nd)
Iron	172	164	5	
Magnesium	18700	17800	5	
Potassium	898	864	4	
Sodium	35400	34200	3	

LDC #: 37228A1a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 00:54	ICP/MS (Initial calibration)	Sb	39.80 ug/L	40 ug/L	100%R	100%R	Y
ICV 14:13	CVAA (Initial calibration)	Hg	5 ug/L	5 ug/L	100%R	100%R	↓
	ICP (Continuing calibration)						
CCV 7:58	ICP/MS (Continuing calibration)	K	4904 ug/L	5000 ug/L	98%R	98%R	Y
CCV 16:40	CVAA (Contining calibration)	Hg	5.220 ug/L	5 ug/L	104%R	104%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

calclc.4sw.wpd

LDC #: 37228A46

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: 9

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICSAB 1:19	ICP interference check	As	98.01 ug/L	100 ug/L	98%R	98%R	Y
LCS 6:13	Laboratory control sample	Be	22.20 ug/L	25 ug/L	89%R	89%R	
MS 17:00	Matrix spike	Hg	(SSR-SR) 1.12 ug/L	1 ug/L	112%R	112%R	
DUP 18:12	Duplicate	Na	11638 ug/L	11590 ug/L	0.4%RPD	0.4%RPD	
SER 18:17	ICP serial dilution	Mg	14976 ug/L	14648 ug/L	2.2%D	2.2%D	

Comments: _____

TOTCLC.4SW

LDC #: 37228A4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: JSD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) As were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 0.464 ug/L × 2 = 0.93 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 0.464 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	As	0.93	0.93	Y
	2	Ba	320	320	
	4	Ca	59900	59900	
	5	Cu	3.7	3.7	
	6	Fe	207	207	
	7	Mg	18100	18700	
	8	K	864	864	
	9	Na	26000	26000	
	10	Mn	1.2	1.2	
	11	Fe	36.1	36.1	
	12	Ba	186	186	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120143-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-025a-GW	460-120143-1	Water	09/13/16
CFMW-025b-GW	460-120143-2	Water	09/13/16
CFMW-EB2-AQ	460-120143-3	Water	09/13/16
CFMW-026-GW	460-120143-4	Water	09/13/16
CFMW-056b-GW	460-120143-5	Water	09/13/16
CFMW-043-GW	460-120143-6	Water	09/13/16
CFMW-029-GW	460-120143-8	Water	09/13/16
CFMW-DUP1-GW	460-120143-9	Water	09/13/16
CFMW-028-GW	460-120143-10	Water	09/13/16
CFMW-027-GW	460-120143-11	Water	09/13/16
CFMW-022-GW	460-120143-12	Water	09/13/16
CFMW-011-GW	460-120143-13	Water	09/13/16
CFMW-026-GWMS	460-120143-4MS	Water	09/13/16
CFMW-026-GWMSD	460-120143-4MSD	Water	09/13/16
CFMW-026-GWDUP	460-120143-4DUP	Water	09/13/16
CFMW-029-GWMS	460-120143-8MS	Water	09/13/16
CFMW-029-GWMSD	460-120143-8MSD	Water	09/13/16
CFMW-029-GWDUP	460-120143-8DUP	Water	09/13/16
CFMW-022-GWMS	460-120143-12MS	Water	09/13/16
CFMW-022-GWMSD	460-120143-12MSD	Water	09/13/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB2-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB2-AQ	09/13/16	Chloride	189 ug/L	CFMW-025b-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-029-GWMS/MSD (CFMW-029-GW CFMW-DUP1-GW CFMW-028-GW)	Fluoride	111 (90-110)	-	J+ (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-026-GWMS/MSD (CFMW-025a-GW CFMW-025b-GW CFMW-026-GW CFMW-056b-GW CFMW-043-GW CFMW-029-GW CFMW-DUP1-GW CFMW-028-GW CFMW-027-GW CFMW-022-GW CFMW-011-GW)	Orthophosphate as P	75 (90-110)	78 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFMW-029-GW and CFMW-DUP1-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-029-GW	CFMW-DUP1-GW			
Sulfate	18300 ug/L	18300 ug/L	0 (≤30)	-	-
Chloride	1000 ug/L	999 ug/L	0 (≤30)	-	-
Fluoride	3370 ug/L	3370 ug/L	0 (≤30)	-	-
Total cyanide	366 ug/L	357 ug/L	2 (≤30)	-	-
Ammonia	113 ug/L	72.1 ug/L	44 (≤30)	J (all detects)	A

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-029-GW	CFMW-DUP1-GW			
Nitrate/Nitrite as N	1850 ug/L	1830 ug/L	1 (≤30)	-	-
Hardness	214000 ug/L	214000 ug/L	0 (≤30)	-	-
Alkalinity	226000 ug/L	238000 ug/L	5 (≤30)	-	-
Total dissolved solids	319 mg/L	312 mg/L	2 (≤30)	-	-
Total suspended solids	6.1 mg/L	5.3 mg/L	14 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and field duplicate RPD, data were qualified as estimated in eleven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120143-1

Sample	Analyte	Flag	A or P	Reason
CFMW-029-GW CFMW-DUP1-GW CFMW-028-GW	Fluoride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-025a-GW CFMW-025b-GW CFMW-026-GW CFMW-056b-GW CFMW-043-GW CFMW-029-GW CFMW-DUP1-GW CFMW-028-GW CFMW-027-GW CFMW-022-GW CFMW-011-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-029-GW CFMW-DUP1-GW	Ammonia	J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120143-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120143-1

No Sample Data Qualified in this SDG

LDC #: 37228A6

SDG #: 460-120143-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/24/16

Page: 1 of 2

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ JD (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D) OPO_4-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/13/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB= (3)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D= See List Below
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	SW	FD= (7,8)
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-025a-GW	460-120143-1	Water	09/13/16
2	CFMW-025b-GW	460-120143-2	Water	09/13/16
3	CFMW-EB2-AQ No TDS & TSS	460-120143-3	Water	09/13/16
4	CFMW-026-GW	460-120143-4	Water	09/13/16
5	CFMW-056b-GW	460-120143-5	Water	09/13/16
6	CFMW-043-GW	460-120143-6	Water	09/13/16
7	CFMW-029-GW	460-120143-8	Water	09/13/16
8	CFMW-DUP1-GW	460-120143-9	Water	09/13/16
9	CFMW-028-GW	460-120143-10	Water	09/13/16
10	CFMW-027-GW	460-120143-11	Water	09/13/16
11	CFMW-022-GW	460-120143-12	Water	09/13/16
12	CFMW-011-GW	460-120143-13	Water	09/13/16
13	CFMW-026-GWMS 9056A 300.0 353.2 NH_3 CN	460-120143-4MS	Water	09/13/16
14	CFMW-026-GWMSD ↓ ↓ ↓ ↓ ↓	460-120143-4MSD	Water	09/13/16
15	CFMW-026-GWDUP Alk, Hard, TDS, TSS	460-120143-4DUP	Water	09/13/16
16	CFMW-029-GWMS 300.0	460-120143-8MS	Water	09/13/16

LDC #: 37228A6

SDG #: 460-120143-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/24/16

Reviewer: 3D

2nd Reviewer: a

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

	Client ID		Lab ID	Matrix	Date
17	CFMW-029-GWMSD	300.0	460-120143-8MSD	Water	09/13/16
18	CFMW-029-GWDUP	↓	460-120143-8DUP	Water	09/13/16
19	CFMW-022-GWMS	CN	460-120143-12MS	Water	09/13/16
20	CFMW-022-GWMSD	↓	460-120143-12MSD	Water	09/13/16
21					
22					
23					
24					
25					

Notes:

DC #: 372284Y

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: a

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37228B6

VALIDATION FINDINGS CHECKLIST

Reviewer: 2D
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 31228A4

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: ✓

All circled methods are applicable to each sample.

Sample ID	Parameter
1-2, 4-12	pH TDS Cl F NO_3 | NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
3	pH TDS Cl F NO_3 | NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:13-14	pH TDS Cl F NO_3 | NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:15	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:16-18	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:19-20	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37228A6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/13/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	3		No Qual.							
Chloride	189	1890								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37228A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: [signature]
2nd Reviewer: [signature]

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	16/17	W	F	111 (90-110)			7-9	J+det/A (det)
	13/14	W	OPO4-P	75 (90-110)	78 (90-110)		1-2, 4-12*	J-/UJ/A (nd)

Comments: *EB not associated (different matrix)

LDC#: 37228A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: JSD
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	7	8		
Sulfate	18300 (ug/L)	18300 (ug/L)	0	
Chloride	1000 (ug/L)	999 (ug/L)	0	
Fluoride	3370 (ug/L)	3370 (ug/L)	0	
Total Cyanide	366 (ug/L)	357 (ug/L)	2	
Ammonia	113 (ug/L)	72.1 (ug/L)	44	Jdet/A (det)
Nitrate/Nitrite-N	1850 (ug/L)	1830 (ug/L)	1	
Hardness	214000 (ug/L)	214000 (ug/L)	0	
Alkalinity	226000 (ug/L)	238000 (ug/L)	5	
TDS	319 (mg/L)	312 (mg/L)	2	
TSS	6.1 (mg/L)	5.3 (mg/L)	14	

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LDC #: 37228A6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of CN was recalculated. Calibration date: 9/18/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	CN	s1	0	0.0225	0.99979	0.99986	Y*
		s2	0.01	0.655			
		s3	0.025	1.2			
		s4	0.05	2.37			
		s5	0.1	4.73			
		s6	0.2	9.41			
		s7	0.4	18.3			
ICV 9:45 Calibration verification	CN	Found 0.212mg/L	True 0.2mg/L		106%R	106%R	Y
ICV 13:18 Calibration verification	NH_3	1.92mg/L	2mg/L		96%R	96%R	↓
ICV 13:43 Calibration verification	NO_3/NO_2N	0.9526mg/L	1mg/L		95%R	95%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37228A0

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 18:33	Laboratory control sample	TDS	308 mg/L	339 mg/L	90.9 %R	90.9 %R	Y
MS 22:02	Matrix spike sample	F	(SSR-SR) 2229 ug/L	2000 ug/L	111 %R	111 %R	
DUP 6:30	Duplicate sample	Alkalinity	217.9 mg/L	217.9 mg/L	0 %RPD	0 %RPD	

Comments:

TOTCLC.6

LDC #: 37288A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (1) Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

Recalculation: $\frac{(10\,mg/L)(50000)(0.02N)}{50ml} \times \frac{1000ug}{1mg} = 200000\ ug/L$

T = 10 mg/L
N = 0.02N
V = 50ml

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Hardness	200000	200000	Y
	2	NO_3/NO_2-N	145	145	
	3	Cl	189	189	
	4	CN	3.9	3.8	Y*
	5	Alkalinity	236000	236000	Y
	6	TDS	354 mg/L	354 mg/L	
	7	NH_3	113	113	
	8	TSS	5.3 mg/L	5.3 mg/L	
	9	CN	104	104	
	10	NH_3	77.5	77.5	
	11	NO_3/NO_2-N	702	702	
	12	Alkalinity	196000	196000	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 31, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120223-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-034-GW	460-120223-1	Water	09/14/16
CFMW-035-GW	460-120223-2	Water	09/14/16
CFMW-042-GW	460-120223-3	Water	09/14/16
CFMW-053-GW	460-120223-5	Water	09/14/16
CFMW-054-GW	460-120223-6	Water	09/14/16
CFMW-047-GW	460-120223-7	Water	09/14/16
Trip Blank	460-120223-8	Water	09/14/16
CFMW-003-GW	460-120223-9	Water	09/14/16
CFMW-038-GW	460-120223-10	Water	09/14/16
CFMW-040-GW	460-120223-11	Water	09/14/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/16/16	1,1,2-Trichloro-1,2,2-trifluoroethane Cyclohexane Methyl cychlohexane	31.6 25.3 26.0	All samples in SDG 160-120223-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

LDC #: 37228B1

SDG #: 460-120223-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A SW	% RSD ≤ 15/30, r^2 ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 7
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-034-GW	460-120223-1	Water	09/14/16
2	CFMW-035-GW	460-120223-2	Water	09/14/16
3	CFMW-042-GE	460-120223-3	Water	09/14/16
4	CFMW-053-GW	460-120223-5	Water	09/14/16
5	CFMW-054-GW	460-120223-6	Water	09/14/16
6	CFMW-047-GW	460-120223-7	Water	09/14/16
7	Trip Blank	460-120223-8	Water	09/14/16
8	CFMW-003-GW	460-120223-9	Water	09/14/16
9	CFMW-038-GW	460-120223-10	Water	09/14/16
10	CFMW-040-GW	460-120223-11	Water	09/14/16
11				
12	MB 460-391646			
13				

LDC #: 37228B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: ✓

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?			✓	
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37228B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37228B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
+	9/16/16	ICV-8	TTT	31.6	all	Jt det /Δ (ND)
+			SSSS	25.3	↓	↓
+			TTTT	26.0		

ICVvoa.wpd

LDC #: 37228B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100std)	Recalculated (RRF 20/100std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/16/2016	M	0.2701	0.2701	0.2727	0.2727	10.8	10.8
	GCMS8		C	0.3415	0.3415	0.3549	0.3549	14.6	14.6
			CC	1.4599	1.4599	1.4405	1.4405	9.1	9.1
			JJJ	1.2868	1.2868	1.2803	1.2803	9.8	9.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228B7

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: 9

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV -8 0906	9/20/16	M (IS1)	0.2727	0.2556	0.2556	6.3	6.3
			C (IS2)	0.3549	0.3254	0.3254	8.3	8.3
			CC (IS3)	1.4405	1.409	1.409	2.2	2.2
			JJJ (IS4)	1.2803	1.295	1.295	1.2	1.2
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37228 B 1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #6

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	49.4	99	99	0
1,2-Dichloroethane-d4		48.9	98	98	
Toluene-d8		47.0	94	94	
Bromofluorobenzene		50.6	101	101	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37228 B 1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/D 460 - 391646

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	19.6	19.2	98	98	96	96	2	2
Trichloroethene	↓	↓	19.9	19.6	100	100	98	98	1	1
Benzene			19.4	19.0	97	97	95	95	2	2
Toluene			19.6	19.3	98	98	96	96	2	2
Chlorobenzene			19.5	19.2	98	98	96	96	2	2

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228B

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #6, G:

Conc. = $\frac{28848 \quad (50.0)}{594658 \quad (0.8219)}$

= 3.0 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 31, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120223-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-034-GW	460-120223-1	Water	09/14/16
CFMW-035-GW	460-120223-2	Water	09/14/16
CFMW-042-GW	460-120223-3	Water	09/14/16
CFMW-053-GW	460-120223-5	Water	09/14/16
CFMW-054-GW	460-120223-6	Water	09/14/16
CFMW-047-GW	460-120223-7	Water	09/14/16
CFMW-003-GW	460-120223-9	Water	09/14/16
CFMW-038-GW	460-120223-10	Water	09/14/16
CFMW-040-GW	460-120223-11	Water	09/14/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/20/16	N-Nitroso-di-n-propylamine 3&4-Methylphenol 2-Nitroaniline	20.5 30.4 22.3	All samples in SDG 460-120223-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
LCS 460-390998	2,4-Dinitrophenol	40 (45-125)	All samples in SDG 460-120223-1	UJ (all non-detects)	P
LCS 460-390998	Acenaphthene Acenaphthylene Naphthalene	111 (58-107) 110 (61-106) 105 (51-98)	All samples in SDG 460-120223-1	NA	-
LCS 460-390998	Pentachlorophenol	9 (54-120)	All samples in SDG 460-120223-1	R (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method.

Due to LCS %R, data were rejected in nine samples.

Due to continuing calibration %D and LCS %R, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be rejected (R) are unusable for all purposes. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120223-1

Sample	Compound	Flag	A or P	Reason
CFMW-034-GW CFMW-035-GW CFMW-042-GW CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-003-GW CFMW-038-GW CFMW-040-GW	N-Nitroso-di-n-propylamine 3&4-Methylphenol 2-Nitroaniline	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-034-GW CFMW-035-GW CFMW-042-GW CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-003-GW CFMW-038-GW CFMW-040-GW	2,4-Dinitrophenol	UJ (all non-detects)	P	Laboratory control samples (%R)
CFMW-034-GW CFMW-035-GW CFMW-042-GW CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-003-GW CFMW-038-GW CFMW-040-GW	Pentachlorophenol	R (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

LDC #: 37228B2a

SDG #: 460-120223-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	460-120143-4 MS/D
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-034-GW	460-120223-1	Water	09/14/16
2	CFMW-035-GW	460-120223-2	Water	09/14/16
3	CFMW-042-GW	460-120223-3	Water	09/14/16
4	CFMW-053-GW	460-120223-5	Water	09/14/16
5	CFMW-054-GW	460-120223-6	Water	09/14/16
6	CFMW-047-GW	460-120223-7	Water	09/14/16
7	CFMW-003-GW	460-120223-9	Water	09/14/16
8	CFMW-038-GW	460-120223-10	Water	09/14/16
9	CFMW-040-GW	460-120223-11	Water	09/14/16
10				
11	MB 460-390998			
12				
13				

LDC #: 37228 B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37228 B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?		✓		
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV.	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37228B2c

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	9/17/16	ccv-4	X	22.3		MB 460-390998	J+det/A ND
+	0433		EE	21.5		↓	↓
+			KK	20.2			
-	9/20/16	ccv-6	J	20.5		All - MB	J-/UJ/A ND
-	0341		QQQQ	30.4		↓	↓
-			BB	22.3			

LDC #: 37228B2e

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-390998	HH	40 (45-125)	( )	( )	All	J-/UJ/P and ND
		GG	111 (58-107)	( )	( )		J+/P
		DD	110 (61-106)	( )	( )		
		S	105 (51-98)	( )	( )		
		TT	9 (54-120)	( )	( )		J-/R/P
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37228B2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms4	9/16/2016	A	1.3044	1.3044	1.4076	1.4076	9.6	9.6
			M	0.7088	0.7088	0.8284	0.8284	16.7	16.7
			GG	1.0548	1.0548	1.0136	1.0136	7.0	7.0
			UU	0.9687	0.9687	0.9792	0.9792	18.2	18.2
			EEE	0.8710	0.8710	0.8680	0.8680	13.6	13.6
			III	1.0694	1.0694	1.0483	1.0483	5.4	5.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228B2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms4	9/16/2016	A	1.3044	1.3044	1.4076	1.4076	9.6	9.6
			M	0.7088	0.7088	0.8284	0.8284	16.7	16.7
			GG	1.0548	1.0548	1.0136	1.0136	7.0	7.0
			UU	0.9687	0.9687	0.9792	0.9792	18.2	18.2
			EEE	0.8710	0.8710	0.8680	0.8680	13.6	13.6
			III	1.0694	1.0694	1.0483	1.0483	5.4	5.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228 B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV-4 0433	9/17/16	A	(1st IS)	1.4076	1.605	1.605	14.0	14.0
			M	(2nd IS)	0.8284	0.7519	0.7519	9.2	9.2
			GG	(3rd IS)	1.0136	1.035	1.035	2.1	2.1
			UU	(4th IS)	0.9792	0.9731	0.9731	0.6	0.6
			EEE	(5th IS)	0.8680	0.8781	0.8781	1.2	1.2
			III	(6th IS)	1.0483	1.043	1.043	0.5	0.5
2	CCV-6 0341	9/20/16	A	(1st IS)	1.4955	1.499	1.499	0.2	0.2
			S	(2nd IS)	0.8960	0.9019	0.9019	0.7	0.7
			DD	(3rd IS)	1.5002	1.600	1.600	6.7	6.7
			UU	(4th IS)	0.9021	0.8870	0.8870	1.7	1.7
			EEE	(5th IS)	0.6453	0.6405	0.6405	0.7	0.7
			III	(6th IS)	1.0144	0.9769	0.9769	3.7	3.7
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228B2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #8

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.55	85	85	0
2-Fluorobiphenyl		9.46	95	95	
Terphenyl-d14		10.4	104	104	
Phenol-d5		2.48	~~85~~ 25	25	
2-Fluorophenol		4.29	43	43	
2,4,6-Tribromophenol		6.84	68	68	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37228B2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: 9

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration, SA = Spike added, SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 10 + 11

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	-----	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	83.3	83.3	ND	27.3	30.6	33	33	37	37	12	12
N-Nitroso-di-n-propylamine	83.3	83.3	↓	74.7	80.0	90	90	96	96	7	7
4-Chloro-3-methylphenol	83.3	83.3	ND	60.9	62.3	73	73	75	75	2	2
Acenaphthene	83.3	83.3	ND	86.4	82.5	104	104	99	99	5	5
Pentachlorophenol	167	167	↓	123	138	74	74	83	83	11	11
Pyrene	83.3	83.3	↓	73.9	79.2	89	89	95	95	7	7

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 390998

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	28.0	NA	35	35				
N-Nitroso-di-n-propylamine			83.5		104	104				
4-Chloro-3-methylphenol			60.7		76	76				
Acenaphthene			88.7		111	111				
Pentachlorophenol			14.4		9	9				
Pyrene			81		101	101	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228 B2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: GW

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-396998 TT

Conc. = $\frac{(416523)(8.00)(2)(1000)}{(677128)(1.4076)(250)}$

= 28.0 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification
	#8 EE				
	(14744)(8.0)(2)(1000)				
	(1349804)(0.6453)(240)				
	= 1.1 ug/L				

RECALC.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 31, 2016

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120223-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-034-GW	460-120223-1	Water	09/14/16
CFMW-035-GW	460-120223-2	Water	09/14/16
CFMW-042-GW	460-120223-3	Water	09/14/16
CFMW-EB3-AQ	460-120223-4	Water	09/14/16
CFMW-053-GW	460-120223-5	Water	09/14/16
CFMW-054-GW	460-120223-6	Water	09/14/16
CFMW-047-GW	460-120223-7	Water	09/14/16
CFMW-003-GW	460-120223-9	Water	09/14/16
CFMW-038-GW	460-120223-10	Water	09/14/16
CFMW-040-GW	460-120223-11	Water	09/14/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB3-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

LDC #: 37228B4a
SDG #: 460-120223-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 10/24/16
Page: 1 of 1
Reviewer: SD
2nd Reviewer: a

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/14/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB=(4)
VII.	Matrix Spike/Matrix Spike Duplicates	N	CS
VIII.	Duplicate sample analysis	N	
IX.	Serial Dilution	N	Not Performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-034-GW	460-120223-1	Water	09/14/16
2	CFMW-035-GW	460-120223-2	Water	09/14/16
3	CFMW-042-GW SD	460-120223-3	Water	09/14/16
4	CFMW-EB3-AQ	460-120223-4	Water	09/14/16
5	CFMW-053-GW	460-120223-5	Water	09/14/16
6	CFMW-054-GW	460-120223-6	Water	09/14/16
7	CFMW-047-GW	460-120223-7	Water	09/14/16
8	CFMW-003-GW	460-120223-9	Water	09/14/16
9	CFMW-038-GW	460-120223-10	Water	09/14/16
10	CFMW-040-GW	460-120223-11	Water	09/14/16
11				
12				
13				
14				

Notes:

LDC #: 37228B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.			✓	
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 31228B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?			✓	
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37228B4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JO
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 35228B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found}}{\text{True}} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 13:48	ICP/MS (Initial calibration)	V	39.58 ug/L	40 ug/L	99%R	99%R	Y
ICV 13:54	CVAA (Initial calibration)	Hg	4.796 ug/L	5 ug/L	96%R	96%R	↓
	ICP (Continuing calibration)						
CCV 15:38	ICP/MS (Continuing calibration)	Zn	48.96 ug/L	50 ug/L	98%R	98%R	Y
CCV 15:21	CVAA (Contining calibration)	Hg	4.792 ug/L	5 ug/L	96%R	96%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37228B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: ESD
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICSAB 14:00	ICP interference check	Co	194.7 ug/L	200 ug/L	97%R	97%R	Y
LCS 15:05	Laboratory control sample	Hg	1.14 ug/L	1 ug/L	114%R	114%R	↓
N	Matrix spike		(SSR-SR)				
N	Duplicate						
N	ICP serial dilution						

Comments: _____

TOTCLC.4SW

LDC #: 35228B1a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: JSD
2nd reviewer: GL

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Ba were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 99.349 ug/L x 2 = 199 ug/L

RD = Raw data concentration — RD = 99.349 ug/L
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor — Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ba	199	199	Y
	2	As	5.8	5.8	
	3	Ca	56000	56000	
	4	Pb	0.56	0.56	
	5	Cu	4.6	4.6	
	6	Fe	156	156	
	7	Mg	15600	15600	
	8	Mn	306	306	
	9	K	1030	1030	
	10	Na	34700	34700	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 31, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120223-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-034-GW	460-120223-1	Water	09/14/16
CFMW-035-GW	460-120223-2	Water	09/14/16
CFMW-042-GW	460-120223-3	Water	09/14/16
CFMW-EB3-AQ	460-120223-4	Water	09/14/16
CFMW-053-GW	460-120223-5	Water	09/14/16
CFMW-054-GW	460-120223-6	Water	09/14/16
CFMW-047-GW	460-120223-7	Water	09/14/16
CFMW-003-GW	460-120223-9	Water	09/14/16
CFMW-038-GW	460-120223-10	Water	09/14/16
CFMW-040-GW	460-120223-11	Water	09/14/16
CFMW-034-GWMS	460-120223-1MS	Water	09/14/16
CFMW-034-GWMSD	460-120223-1MSD	Water	09/14/16
CFMW-053-GWMS	460-120223-5MS	Water	09/14/16
CFMW-053-GWMSD	460-120223-5MSD	Water	09/14/16
CFMW-053-GWDUP	460-120223-5DUP	Water	09/14/16
CFMW-047-GWMS	460-120223-7MS	Water	09/14/16
CFMW-047-GWMSD	460-120223-7MSD	Water	09/14/16
CFMW-040-GWMS	460-120223-11MS	Water	09/14/16
CFMW-040-GWMSD	460-120223-11MSD	Water	09/14/16
CFMW-040-GWDUP	460-120223-11DUP	Water	09/14/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
CFMW-034-GW	Orthophosphate as P	48.25 hours	48 hours	UJ (all non-detects)	P

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB3-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB3-AQ	09/14/16	Chloride	162 ug/L	CFMW-053-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-053-GWMS/MSD (CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-038-GW CFMW-040-GW)	Chloride	125 (90-110)	5 (90-110)	J- (all detects)	A
CFMW-040-GWMS/MSD (CFMW-034-GW CFMW-047-GW CFMW-038-GW CFMW-040-GW)	Sulfate	-	112 (90-110)	J+ (all detects)	A
CFMW-040-GWMS/MSD (CFMW-034-GW CFMW-035-GW CFMW-042-GW CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-003-GW CFMW-038-GW CFMW-040-GW)	Orthophosphate as P	83 (90-110)	83 (90-110)	UJ (all non-detects)	A
CFMW-049a-GWMS/MSD (CFMW-034-GW CFMW-035-GW CFMW-042-GW CFMW-003-GW)	Chloride	86 (90-110)	88 (90-110)	J- (all detects)	A
CFMW-049a-GWMS/MSD (CFMW-034-GW)	Fluoride	84 (90-110)	86 (90-110)	J- (all detects)	A
CFMW-049a-GWMS/MSD (CFMW-035-GW CFMW-042-GW CFMW-003-GW)	Sulfate	87 (90-110)	86 (90-110)	J- (all detects)	A

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-053-GWMS/MSD (CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-038-GW CFMW-040-GW)	Chloride	66 (≤20)	J (all detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to technical holding time and MS/MSD %R and RPD, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120223-1

Sample	Analyte	Flag	A or P	Reason
CFMW-034-GW	Orthophosphate as P	UJ (all non-detects)	P	Technical holding times
CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-038-GW CFMW-040-GW CFMW-034-GW CFMW-035-GW CFMW-042-GW CFMW-003-GW	Chloride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-034-GW CFMW-047-GW CFMW-038-GW CFMW-040-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-034-GW CFMW-035-GW CFMW-042-GW CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-003-GW CFMW-038-GW CFMW-040-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-034-GW	Fluoride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-035-GW CFMW-042-GW CFMW-003-GW	Sulfate	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-053-GW CFMW-054-GW CFMW-047-GW CFMW-038-GW CFMW-040-GW	Chloride	J (all detects)	A	Matrix spike/Matrix spike duplicate (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120223-1

No Sample Data Qualified in this SDG

LDC #: 37228B6

SDG #: 460-120223-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/24/16

Page: 1 of 2

Reviewer: SD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D) ORTHO-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	SW	9/14/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = (4)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = See Below
VII.	Duplicate sample analysis	A	DUP = CFMW-026-GWDUP (SDG: 460-120143-1) CFMW-032-GWDUP (SDG: 460-120318-1)
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFMW-034-GW		460-120223-1	Water	09/14/16
2	CFMW-035-GW		460-120223-2	Water	09/14/16
3	CFMW-042-GE		460-120223-3	Water	09/14/16
4	CFMW-EB3-AQ	No TSS & TDS	460-120223-4	Water	09/14/16
5	CFMW-053-GW		460-120223-5	Water	09/14/16
6	CFMW-054-GW		460-120223-6	Water	09/14/16
7	CFMW-047-GW		460-120223-7	Water	09/14/16
8	CFMW-003-GW		460-120223-9	Water	09/14/16
9	CFMW-038-GW		460-120223-10	Water	09/14/16
10	CFMW-040-GW		460-120223-11	Water	09/14/16
11	CFMW-034-GWMS	NH_3	460-120223-1MS	Water	09/14/16
12	CFMW-034-GWMSD	↓	460-120223-1MSD	Water	09/14/16
13	CFMW-053-GWMS	Cl, SO_4	460-120223-5MS	Water	09/14/16
14	CFMW-053-GWMSD	↓	460-120223-5MSD	Water	09/14/16
15	CFMW-053-GWDUP	↓	460-120223-5DUP	Water	09/14/16
16	CFMW-047-GWMS	CN	460-120223-7MS	Water	09/14/16

* MS/D = CFMW-026-GW MS/D > (SDG: 460-120143-1)
CFMW-022-GW MS/D
CFMW-049a-GW MS/D (SDG: 460-120382-1)

LDC #: 37228B6

SDG #: 460-120223-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/24/16

Page: 2 of 2

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

	Client ID		Lab ID	Matrix	Date
17	CFMW-047-GWMSD	CN	460-120223-7MSD	Water	09/14/16
18	CFMW-040-GWMS	9056 300.0	460-120223-11MS	Water	09/14/16
19	CFMW-040-GWMSD	↓ ↓	460-120223-11MSD	Water	09/14/16
20	CFMW-040-GWDUP		460-120223-11DUP	Water	09/14/16
21					
22					
23					
24					
25					

Notes:

LDC #: 37228B6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.		✓		
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37728806

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37228B60

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: [signature]

All circled methods are applicable to each sample.

Sample ID	Parameter
1-3,5-10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
4	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:11-12	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:13-15	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:16-17	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:18-20	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37228B6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: SD
2nd reviewer: [illegible]

All circled dates have exceeded the technical holding time.
Y N N/A Were all samples preserved as applicable to each method ?
Y N N/A Were all cooler temperatures within validation criteria?

Method:		**9056A**					
Parameters:		**OPO4-P**					
Technical holding time:		**48 Hrs**					
Sample ID	**Sampling date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Qualifier**
1	09/14/16 8:20	9/16/16 8:35	48.25 Hrs				J/UJ/P (nd)

LDC #: 37228B6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/14/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 5

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	4		No Qual.							
Chloride	162	1620								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37228B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: JD
2nd Reviewer: a

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	13/14	W	Cl	125 (90-110)	5 (90-110)		5-7, 9-10	J-/R/A (det)
	18/19	W	SO4		112 (90-110)		1, 7, 9-10*	J+det/A (det)
			OPO4-P	83 (90-110)	83 (90-110)		1-3, 5-10*	J-/UJ/A (nd)
	CFMW-049a-GWMS/D (SDG: 460-120382-1)	W	Cl	86 (90-110)	88 (90-110)		1-3, 8	J-/UJ/A (det)
			F	84 (90-110)	86 (90-110)		1	J-/UJ/A (det)
			SO4	87 (90-110)	86 (90-110)		2-3, 8	J-/UJ/A (det)
	13/14	W	Cl			66 (≤20)	5-7, 9-10	J/UJ/A (det)

Comments: *EB not associated (different matrix)

LDC #: 37228B6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of ORO4-P was recalculated.Calibration date: 8/17/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Abs	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	ORO4-P	s1	0.2	11296	0.9975	0.9980	Y*
		s2	0.5	45719			
		s3	2.5	193148			
		s4	5	403999			
		s5	7.5	646712			
ICV 15:39 Calibration verification	ORO4-P	Found 2.36mg/L	True 2.5mg/L		94.4%R	94.3%R	Y*
ICV 15:39 Calibration verification	SO4	6.93mg/L	7.5mg/L		92.4%R	92.5%R	Y*
ICV 9:45 Calibration verification	CN	0.212mg/L	0.2mg/L		96%R	96%R	Y

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37228860

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: CL

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 13:47	Laboratory control sample	NO_3/NO_2-N	1100 ug/L	1090 ug/L	100.9 %R	100.9 %R	Y
MS 15:30	Matrix spike sample	NH_3	(SSR-SR) 956 ug/L	1000 ug/L	96 %R	96 %R	↓
DUP 7:00	Duplicate sample	Hardness	220 mg/L	220 mg/L	0 % RPD	0 % RPD	↓

Comments:

TOTCLC.6

LDC #: 37228B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: GW

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (4) Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A-(-11607.612)}{96427.2888}$

Recalculation: $\frac{3971-(-11607.612)}{96427.2888} = 0.162\ mg/L$

A= 3971

$0.162\ mg/L \times \frac{1000\ ug}{1\ mg} = 162\ ug/L$

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	NH_3	142	142	Y
	2	CN	57.1	57.1	
	3	NO_3/NO_2-N	2910	2910	
	4	Cl	162	162	
	5	Hardness	212000	212000	
	6	TDS	302 mg/L	302 mg/L	
	7	Alkalinity	230000	230000	
	8	TSS	39.4 mg/L	39.4 mg/L	
	9	CN	260	260	
	10	NO_3/NO_2-N	290	290	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120318-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-032-GW	460-120318-1	Water	09/15/16
CFMW-031-GW	460-120318-2	Water	09/15/16
CFMW-033-GW	460-120318-3	Water	09/15/16
CFMW-044-GW	460-120318-4	Water	09/15/16
CFMW-045-GW	460-120318-5	Water	09/15/16
Trip Blank	460-120318-6	Water	09/15/16
CFMW-061-GW	460-120318-10	Water	09/15/16
CFMW-064-GW	460-120318-11	Water	09/15/16
CFMW-008a-GW	460-120318-13	Water	09/15/16
CFMW-032-GWMS	460-120318-1MS	Water	09/15/16
CFMW-032-GWMSD	460-120318-1MSD	Water	09/15/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/16/16	1,1,2-Trichloro-1,2,2-trifluoroethane Cyclohexane Methyl cychlohexane	21.5 23.1 22.4	All samples in SDG 160-120318-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/21/16	1,2-Dibromo-3-chloropropane 1,2,3-Trichlorobenzene	20.9 24.9	CFMW-032-GW CFMW-031-GW CFMW-033-GW CFMW-044-GW CFMW-045-GW CFMW-061-GW CFMW-064-GW CFMW-008a-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

LDC #: 37228C1 **VALIDATION COMPLETENESS WORKSHEET** Date: 10/22/16
SDG #: 460-120318-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer:
2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A, SW	% RSD ≤ 15/30, r² IA ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 6
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCS/LD
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-032-GW	460-120318-1	Water	09/15/16
2 1	CFMW-031-GW	460-120318-2	Water	09/15/16
3 1	CFMW-033-GW	460-120318-3	Water	09/15/16
4 1	CFMW-044-GW	460-120318-4	Water	09/15/16
5 1	CFMW-045-GW	460-120318-5	Water	09/15/16
6 2	Trip Blank	460-120318-6	Water	09/15/16
7 1	CFMW-061-GW	460-120318-10	Water	09/15/16
8 1	CFMW-064-GW	460-120318-11	Water	09/15/16
9 1	CFMW-008a-GW	460-120318-13	Water	09/15/16
10 1	CFMW-032-GWMS	460-120318-1MS	Water	09/15/16
11 1	CFMW-032-GWMSD	460-120318-1MSD	Water	09/15/16
12 1	MB 460-391965			
13 1	MB 460-392060			

LDC #: 37228C1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37228C1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37228C1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 7
Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
+	~~0237~~	ICV - 2	TTT	21.5	All	J+ dil /A (ND)
+	9/16/16		SSS	23.1	↓	↓
+	0237		TTT	22.4		

ICVvoa.wpd

LDC #: 37228C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 7
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	9/21/16	CCV-2	MM	20.9		1→5, 7→11,	J+ all /A ND
+	0941		NNN	24.9		MB 460-391965	↓

CONCAL.wpd

LDC #: 37228C1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100std)	Recalculated (RRF 20/100std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/16/2016	M	0.2511	0.2511	0.2869	0.2869	13.8	13.8
	GCMS2		C	0.4573	0.4573	0.4196	0.4196	5.4	5.4
			CC	1.5632	1.5632	1.5578	1.5578	6.1	6.1
			JJJ	1.3324	1.3324	1.2619	1.2619	3.3	3.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0941	9/21/16	M (IS1)	0.2869	0.2554	0.2554	11.0	11.0
			C (IS2)	0.4169	0.38336	0.3836	8.6	8.6
			CC (IS3)	1.5578	1.494	1.494	4.1	4.1
			JJJ (IS4)	1.2619	1.282	1.282	1.6	1.6
			(IS5)					
2	CCV 2157	9/21/16	M (IS1)	0.2869	0.2834	0.2834	1.2	1.2
			C (IS2)	0.4169	0.4042	0.4042	3.7	3.7
			CC (IS3)	1.5578	1.576	1.576	1.2	1.2
			JJJ (IS4)	1.2619	1.296	1.296	2.7	2.7
			(IS5)					
3								
4								

LDC #: 37228C1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	50.1	100	100	0
1,2-Dichloroethane-d4	↓	50.2	100	100	↓
Toluene-d8	↓	48.7	97	97	↓
Bromofluorobenzene	↓	55.1	110	110	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37228C1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = | MSC - MSC | * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 10 + 11

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	----	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	ND	17.9	19.4	89	89	97	97	8	8
Trichloroethene	↓	↓	↓	18.2	19.4	91	91	97	97	6	6
Benzene	↓	↓	↓	18.9	19.9	95	95	100	100	5	5
Toluene	↓	↓	↓	18.9	19.9	94	94	100	100	6	6
Chlorobenzene	↓	↓	ND	20.1	21.2	101	101	106	106	5	5

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228C1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-391965

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	18.8	NA	94	94				
Trichloroethene			~~19.5~~ 18.7		93	93				
Benzene			19.4		97	97				
Toluene			19.5		97	97				
Chlorobenzene			20.0		100	100	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228C)

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [signature]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #3, AA:

Conc. = 322 (50)
309169 (0.3180)
=
0.16 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120318-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-032-GW	460-120318-1	Water	09/15/16
CFMW-031-GW	460-120318-2	Water	09/15/16
CFMW-033-GW	460-120318-3	Water	09/15/16
CFMW-044-GW	460-120318-4	Water	09/15/16
CFMW-045-GW	460-120318-5	Water	09/15/16
CFMW-061-GW	460-120318-10	Water	09/15/16
CFMW-064-GW	460-120318-11	Water	09/15/16
CFMW-008a-GW	460-120318-13	Water	09/15/16
CFMW-032-GWMS	460-120318-1MS	Water	09/15/16
CFMW-032-GWMSD	460-120318-1MSD	Water	09/15/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/18/16	3&4-Methylphenol 4-Nitrophenol	28.1 21.2	CFMW-032-GW CFMW-031-GW CFMW-044-GW	UJ (all non-detects) UJ (all non-detects)	A
09/20/16	N-Nitroso-di-n-propylamine 3&4-Methylphenol 2-Nitroaniline	20.5 30.4 22.3	CFMW-033-GW CFMW-045-GW CFMW-061-GW CFMW-064-GW CFMW-008a-GW	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-032-GWMS/MSD (CFMW-032-GW)	1,1'-Biphenyl 2,4-Dichlorophenol 2,4-Dimethylphenol	112 (54-108) 103 (62-102) 96 (61-95)	- - -	NA	-

Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120318-1

Sample	Compound	Flag	A or P	Reason
CFMW-032-GW CFMW-031-GW CFMW-044-GW	3&4-Methylphenol 4-Nitrophenol	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-033-GW CFMW-045-GW CFMW-061-GW CFMW-064-GW CFMW-008a-GW	N-Nitroso-di-n-propylamine 3&4-Methylphenol 2-Nitroaniline	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

LDC #: 37228C2a

SDG #: 460-120318-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration		CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-032-GW	460-120318-1	Water	09/15/16
2	CFMW-031-GW	460-120318-2	Water	09/15/16
3	CFMW-033-GW	460-120318-3	Water	09/15/16
4	CFMW-044-GW	460-120318-4	Water	09/15/16
5	CFMW-045-GW	460-120318-5	Water	09/15/16
6	CFMW-061-GW	460-120318-10	Water	09/15/16
7	CFMW-064-GW	460-120318-11	Water	09/15/16
8	CFMW-008a-GW	460-120318-13	Water	09/15/16
9	CFMW-032-GWMS	460-120318-1MS	Water	09/15/16
10	CFMW-032-GWMSD	460-120318-1MSD	Water	09/15/16
11				
12	MB 460-391204			
13				

LDC #: 31228C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37228C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓	✓		
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?		✓		
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV.	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37228C2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 7
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
–	9/18/16	CCV-6	QQQQ	28.1		1, 2, 4, 9, 10,	J/UJ/A ND
–	2107		II	21.2		MB 460-391204	↓
–	9/20/16	CCV-6	↓	20.5		3, 5, 6, 7, 8	J-/UJ/A ND
–	0341		QQQQ	30.4		↓	↓
–			BB	22.3			

LDC #: 37228C2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT
2nd Reviewer: Q

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	9 + 10	1,1'-Biphenyl	112 (54-108)	( )	( )	1	J+ all/A (ND)
		Q	103 (62-102)	( )	( )	↓	↓
		Q	96 (61-95)	( )		↓	↓
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		

LDC #: 37228C2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	9/11/2016	A	1.4850	1.4850	1.4955	1.4955	10.4	10.4
			S	0.8404	0.8404	0.8960	0.8960	8.7	8.7
			DD	1.5289	1.5289	1.5002	1.5002	2.9	2.9
			UU	0.9460	0.9460	0.9021	0.9021	7.7	7.7
			EEE	0.6572	0.6572	0.6453	0.6453	7.0	7.0
			III	1.0087	1.0087	1.0144	1.0144	6.9	6.9

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228C2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV-6 21:07	9/18/16	A	(1st IS)	1.4955	1.581	1.581	5.7	5.7
			S	(2nd IS)	0.8960	0.8909	0.8909	0.6	0.6
			DD	(3rd IS)	1.5002	1.463	1.463	2.5	2.5
			UU	(4th IS)	0.9021	0.9111	0.9111	1.0	1.0
			EEE	(5th IS)	0.6453	0.6552	0.6552	1.5	1.5
			III	(6th IS)	1.0144	0.9537	0.9537	6.0	6.0
2	CCV-6 0341	9/20/16	A	(1st IS)	1.4955	1.499	1.499	0.2	0.2
			S	(2nd IS)	0.8960	0.9019	0.9019	0.7	0.7
			DD	(3rd IS)	1.5002	1.600	1.600	6.7	6.7
			UU	(4th IS)	0.9021	0.8870	0.8870	1.7	1.7
			EEE	(5th IS)	0.6453	0.6405	0.6405	0.7	0.7
			III	(6th IS)	1.0144	0.9769	0.9769	3.7	3.7
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228C2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #8

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.15	82	82	0
2-Fluorobiphenyl		8.70	87	87	
Terphenyl-d14		8.94	89	89	
Phenol-d5		2.36	24	24	
2-Fluorophenol		3.83	38	38	
2,4,6-Tribromophenol		8.23	82	82	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37228C2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration, SA = Spike added, SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 9+ 10

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
[redacted]	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	80.0	80.0	ND	30.4	27.2	38	38	34	34	11	11
N-Nitroso-di-n-propylamine	↓	↓	↓	70.7	66.5	88	88	83	83	6	6
4-Chloro-3-methylphenol				73.7	70.3	92	92	88	88	5	5
Acenaphthene				76.9	72.4	96	96	90	90	6	6
Pentachlorophenol	160	160		145	148	90	90	92	92	2	2
Pyrene	80	80		79.8	80.7	100	100	101	101	1	1

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228C2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 391204

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	25.4	NA	32	32				
N-Nitroso-di-n-propylamine			64.4		81	81				
4-Chloro-3-methylphenol			63.6		79	79				
Acenaphthene			72.8		91	91				
Pentachlorophenol	160		148		92	92				
Pyrene	80		79.2		99	99	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228C2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: ✓

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #8, EET

Conc. = $\frac{14439\ (8.0)\ (2)\ (1000)}{1331215\ (0.6453)\ (250)}$

= 1.1 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 27, 2016

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120318-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-032-GW	460-120318-1	Water	09/15/16
CFMW-031-GW	460-120318-2	Water	09/15/16
CFMW-033-GW	460-120318-3	Water	09/15/16
CFMW-044-GW	460-120318-4	Water	09/15/16
CFMW-045-GW	460-120318-5	Water	09/15/16
CFMW-012a-GW	460-120318-7	Water	09/15/16
CFMW-059-GW	460-120318-8	Water	09/15/16
CFMW-EB4-AQ	460-120318-9	Water	09/15/16
CFMW-061-GW	460-120318-10	Water	09/15/16
CFMW-064-GW	460-120318-11	Water	09/15/16
CFMW-DUP2-GW	460-120318-12	Water	09/15/16
CFMW-008a-GW	460-120318-13	Water	09/15/16
CFMW-032-GWMS	460-120318-1MS	Water	09/15/16
CFMW-032-GWDUP	460-120318-1DUP	Water	09/15/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB4-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-032-GWMS, no data were qualified for Calcium, Magnesium, and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-012a-GW and CFMW-DUP2-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-012a-GW	CFMW-DUP2-GW			
Barium	78.2	77.7	1 (≤30)	-	-
Calcium	51300	50800	1(≤30)	-	-
Copper	1.4U	3.3	81 (≤30)	J (all detects) UJ (all non-detects)	A
Magnesium	13000	13000	0 (≤30)	-	-
Manganese	21.6	21.3	1 (≤30)	-	-
Potassium	721	726	1 (≤30)	-	-
Sodium	6380	6190	3 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-120318-1

Sample	Analyte	Flag	A or P	Reason
CFMW-012a-GW CFMW-DUP2-GW	Copper	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

LDC #: 37228C4a

SDG #: 460-120318-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 11/7/16

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/15/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB= (8)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS= (13)= Ca, Mg, Na > 4X
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER=(1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD=(6,11)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-032-GW	460-120318-1	Water	09/15/16
2	CFMW-031-GW	460-120318-2	Water	09/15/16
3	CFMW-033-GW	460-120318-3	Water	09/15/16
4	CFMW-044-GW	460-120318-4	Water	09/15/16
5	CFMW-045-GW	460-120318-5	Water	09/15/16
6	CFMW-012a-GW	460-120318-7	Water	09/15/16
7	CFMW-059-GW	460-120318-8	Water	09/15/16
8	CFMW-EB4-AQ	460-120318-9	Water	09/15/16
9	CFMW-061-GW	460-120318-10	Water	09/15/16
10	CFMW-064-GW	460-120318-11	Water	09/15/16
11	CFMW-DUP2-GW	460-120318-12	Water	09/15/16
12	CFMW-008a-GW	460-120318-13	Water	09/15/16
13	CFMW-032-GWMS	460-120318-1MS	Water	09/15/16
14	CFMW-032-GWDUP	460-120318-1DUP	Water	09/15/16
15				

LDC #: 37228C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: C

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37228C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37228C4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JO
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-12	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC: 13-14	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC#: 37228C4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6010B/7000)

Y/N NA Were field duplicate pairs identified in this SDG?
Y/N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	6	11		
Barium	78.2	77.7	1	
Calcium	51300	50800	1	
Copper	1.4U	3.3	81	J/UJ/A (det/nd)
Magnesium	13000	13000	0	
Manganese	21.6	21.3	1	
Potassium	721	726	1	
Sodium	6380	6190	3	

LDC #: 37228C4c

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: DD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 00:33	ICP/MS (Initial calibration)	Ag	41.27 ug/L	40 ug/L	103%R	103%R	Y
ICV 13:34	CVAA (Initial calibration)	Hg	5.08 ug/L	5 ug/L	102%R	102%R	↓
	ICP (Continuing calibration)						
CCV 02:24	ICP/MS (Continuing calibration)	As	51.64 ug/L	50 ug/L	103%R	103%R	Y
CCV 15:42	CVAA (Contining calibration)	Hg	4.994 ug/L	5 ug/L	100%R	100%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37228C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 00:57	ICP interference check	Co	195.3 ug/L	200 ug/L	98%R	98%R	Y
LCS 15:50	Laboratory control sample	Hg	0.936 ug/L	1 ug/L	94%R	94%R	↓
MS 12:57	Matrix spike	Cr	(SSR-SR) 21.97 ug/L	20 ug/L	110%R	110%R	↓
DUP 13:00	Duplicate	Fe	194.6 ug/L	197.5 ug/L	1%RPD	2%RPD	Y*
SER 13:05	ICP serial dilution	Ca	37939 ug/L	38801 ug/L	2.2%D	2.2%D	Y

Comments: *Rounding

TOTCLC.4SW

LDC #: 37228C4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 3D
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (2) Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 23858.34 x 2 = 47700 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 23858.34
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ba	147	147	Y
	2	Ca	47700	47700	
	3	Cu	4.1	4.1	
	4	Fe	370	370	
	5	Mg	15600	15600	
	6	Mn	21.6	21.6	
	7	K	150	150	
	8	Na	87.6	87.6	
	9	Ba	220	220	
	10	Ca	47100	47100	
	11	Cu	3.3	3.3	
	12	Na	49600	49600	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120318-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-032-GW	460-120318-1	Water	09/15/16
CFMW-031-GW	460-120318-2	Water	09/15/16
CFMW-033-GW	460-120318-3	Water	09/15/16
CFMW-044-GW	460-120318-4	Water	09/15/16
CFMW-045-GW	460-120318-5	Water	09/15/16
CFMW-012a-GW	460-120318-7	Water	09/15/16
CFMW-059-GW	460-120318-8	Water	09/15/16
CFMW-EB4-AQ	460-120318-9	Water	09/15/16
CFMW-061-GW	460-120318-10	Water	09/15/16
CFMW-064-GW	460-120318-11	Water	09/15/16
CFMW-DUP2-GW	460-120318-12	Water	09/15/16
CFMW-008a-GW	460-120318-13	Water	09/15/16
CFMW-032-GWMS	460-120318-1MS	Water	09/15/16
CFMW-032-GWMSD	460-120318-1MSD	Water	09/15/16
CFMW-032-GWDUP	460-120318-1DUP	Water	09/15/16
CFMW-DUP2-GWMS	460-120318-12MS	Water	09/15/16
CFMW-DUP2-GWMSD	460-120318-12MSD	Water	09/15/16
CFMW-008a-GWDUP	460-120318-13DUP	Water	09/15/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB4-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB4-AQ	09/15/16	Chloride	190 ug/L	CFMW-061-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-032-GWMS/MSD (CFMW-032-GW)	Total cyanide	-	65 (75-125)	J- (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-032-GWMS/MSD (CFMW-032-GW CFMW-031-GW CFMW-033-GW CFMW-044-GW CFMW-045-GW CFMW-012a-GW CFMW-059-GW CFMW-061-GW CFMW-064-GW CFMW-DUP2-GW CFMW-008a-GW)	Orthophosphate as P	68 (90-110)	72 (90-110)	UJ (all non-detects)	A
CFMW-008-GWMS/MSD (CFMW-031-GW CFMW-033-GW CFMW-044-GW CFMW-045-GW CFMW-012a-GW CFMW-059-GW CFMW-061-GW CFMW-064-GW CFMW-DUP2-GW CFMW-008a-GW)	Chloride	85 (90-110)	85 (90-110)	J- (all detects)	A
CFMW-008-GWMS/MSD (CFMW-032-GW)	Fluoride	62 (90-110)	64 (90-110)	J- (all detects)	A
CFMW-008-GWMS/MSD (CFMW-033-GW CFMW-044-GW CFMW-045-GW)	Sulfate	34 (90-110)	33 (90-110)	J- (all detects)	A

For CFMW-032-GWMS/MSD, no data were qualified for Fluoride percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFMW-012a-GW and CFMW-DUP2-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-012a-GW	CFMW-DUP2-GW			
Sulfate	5260 ug/L	5740 ug/L	9 (≤30)	-	-
Chloride	571 ug/L	570 ug/L	0 (≤30)	-	-
Fluoride	54.6 ug/L	55.8 ug/L	2 (≤30)	-	-
Hardness	194000 ug/L	196000 ug/L	1 (≤30)	-	-
Alkalinity	200000 ug/L	204000 ug/L	2 (≤30)	-	-
Total dissolved solids	210 mg/L	214 mg/L	2 (≤30)	-	-
Total suspended solids	40.8 mg/L	41.2 mg/L	1 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in eleven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120318-1

Sample	Analyte	Flag	A or P	Reason
CFMW-032-GW	Total cyanide Fluoride	J- (all detects) J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-032-GW CFMW-031-GW CFMW-033-GW CFMW-044-GW CFMW-045-GW CFMW-012a-GW CFMW-059-GW CFMW-061-GW CFMW-064-GW CFMW-DUP2-GW CFMW-008a-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-031-GW CFMW-033-GW CFMW-044-GW CFMW-045-GW CFMW-012a-GW CFMW-059-GW CFMW-061-GW CFMW-064-GW CFMW-DUP2-GW CFMW-008a-GW	Chloride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-033-GW CFMW-044-GW CFMW-045-GW	Sulfate	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120318-1

No Sample Data Qualified in this SDG

LDC #: 37228C6

SDG #: 460-120318-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/25/16

Page: 1 of 2

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), ORPO4-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/15/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=(8)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D= (13,14) (16,17) *See Below
VII.	Duplicate sample analysis	A	DUP=CFMW-008-GWDUP (SDG:460-120666 4-6)
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	SW	FD= (6,11)
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-032-GW	460-120318-1	Water	09/15/16
2	CFMW-031-GW	460-120318-2	Water	09/15/16
3	CFMW-033-GW	460-120318-3	Water	09/15/16
4	CFMW-044-GW	460-120318-4	Water	09/15/16
5	CFMW-045-GW	460-120318-5	Water	09/15/16
6	CFMW-012a-GW	460-120318-7	Water	09/15/16
7	CFMW-059-GW	460-120318-8	Water	09/15/16
8	CFMW-EB4-AQ No TSS & TDS	460-120318-9	Water	09/15/16
9	CFMW-061-GW	460-120318-10	Water	09/15/16
10	CFMW-064-GW	460-120318-11	Water	09/15/16
11	CFMW-DUP2-GW	460-120318-12	Water	09/15/16
12	CFMW-008a-GW	460-120318-13	Water	09/15/16
13	CFMW-032-GWMS 9056A 300.0 353.2 NH3 CN	460-120318-1MS	Water	09/15/16
14	CFMW-032-GWMSD ↓ ↓ ↓ ↓ ↓	460-120318-1MSD	Water	09/15/16
15	CFMW-032-GWDUP Alk, Hardn, TDS, TSS	460-120318-1DUP	Water	09/15/16
16	CFMW-DUP2-GWMS CN	460-120318-12MS	Water	09/15/16

* MS/D = CFMW-008-GW MS/D (SDG: 460-120664-1)

LDC #: 37228C6

SDG #: 460-120318-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/25/16

Page: 2 of 2

Reviewer: JSR

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

	Client ID		Lab ID	Matrix	Date
17	CFMW-DUP2-GWMSD	CN	460-120318-12MSD	Water	09/15/16
18	CFMW-008a-GWDUP	TDS	460-120318-13DUP	Water	09/15/16
19					
20					
21					
22					
23					

Notes:

DC #: 3122850

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: GA

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37228C6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 35728C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: a

All circled methods are applicable to each sample.

Sample ID	Parameter
1-7, 9-12	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
8	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:13-14	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:15	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:16-17	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:18	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37228C6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer: a

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/15/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 9

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	8		No Qual.							
Chloride	190	1900								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37228C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: SD
2nd Reviewer: a

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	13/14	W	Total CN		65 (75-125)		1*	J-/UJ/A (det)
			OPO4-P	68 (90-110)	72 (90-110)		1-7, 9-12	J-/UJ/A (nd)
	CFMW-008-GWMS/D (SDG: 460-120664-1)	W	Cl	85 (90-110)	85 (90-110)		2-7, 9-12	J-/UJ/A (det)
			F	62 (90-110)	64 (90-110)		1	J-/UJ/A (det)
			SO4	34 (90-110)	33 (90-110)		3-5	J-/UJ/A (det)

Comments: *Parent Only...other MSD in batch ok
13/14: F > 4X
EB not associated (different matrix)

LDC#: 37228C6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JSD
2nd Reviewer: W

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	6	11		
Sulfate mg/L	5260	5740	9	
Chloride	571	570	0	
Fluoride	54.6	55.8	2	
Hardness	194000	196000	1	
Alkalinity	200000	204000	2	
TDS mg/L	210	214	2	
TSS	40.8	41.2	1	

\\LDCFILESERVER\Validation\FIELD DUPLICATES\FD_inorganic\37228C6.wpd

LDC #: 37228C6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Reviewer: SD
2nd Reviewer: a

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NO3/NO2-N was recalculated. Calibration date: 9/22/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NO3/NO2-N	s1	0.0	61875	0.9999	0.9999	Y
		s2	0.1	718336			
		s3	0.5	3660416			
		s4	1	7408128			
		s5	1.5	11155456			
		s6	2	14560563			
ICV 15:33 Calibration verification	NO3/NO2-N	Found 0.955 mg/L	True 1 mg/L		95%R	95%R	
ICV 15:58 Calibration verification	SO4	6.82 mg/L	7.5 mg/L		90.9%R	90.9%R	
ICV 13:08 Calibration verification	NH3	2.114 mg/L	2 mg/L		106%R	106%R	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37728C4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 18:35	Laboratory control sample	TSS	64 mg/L	68.7 mg/L	93.2%R	93.2%R	Y
MS 14:55	Matrix spike sample	CN	(SSR-SR) 162 ug/L	200 ug/L	81%R	81%R	↓
DUP 19:30	Duplicate sample	TDS	482 mg/L	500 mg/L	4%RPD	5%RPD	Y*

Comments: *Rounding

TOTCLC.6

LDC #: 37228C6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for Cl CN reported with a positive detect were recalculated and verified using the following equation:

Concentration = 0.0198 x A - 9.76e-4 Recalculation: (0.0198 x 10.4 - 9.76e-4) x 2 x 1000 ug/1 mg = 410 ug/L

A = 10.4
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	CN	412	410	Y
	2	NO3/NO2-N	1280	1280	
	3	Hardness	208000	208000	
	4	NH3	110	110	
	5	Alkalinity	254000	254000	
	6	TDS	210 mg/L	210 mg/L	
	7	NO3/NO2-N	3180	3180	
	8	Cl	190	190	
	9	CN	7.7	7.6	
	10	TDS	223 mg/L	223 mg/L	
	11	TSS	41.2 mg/L	41.2 mg/L	
	12	Alkalinity	1060000	1060000	

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120379-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-001-SW	460-120379-1	Water	09/16/16
CFSWP-002-SW	460-120379-2	Water	09/16/16
CFSWP-007-SW	460-120379-3	Water	09/16/16
CFSWP-008-SW	460-120379-4	Water	09/16/16
CFSWP-017-SW	460-120379-5	Water	09/16/16
CFSWP-FB1-AQ	460-120379-6	Water	09/16/16
CFSWP-008-SWMS	460-120379-4MS	Water	09/16/16
CFSWP-008-SWDUP	460-120379-4DUP	Water	09/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFSWP-FB1-AQ was identified as a field blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field blanks were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-120379-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-120379-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-120379-1

No Sample Data Qualified in this SDG

LDC #: 37228D4a

SDG #: 460-120379-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/25/16

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/16/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	FB=(6)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(1)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	N	Not Performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-001-SW	460-120379-1	Water	09/16/16
2	CFSWP-002-SW	460-120379-2	Water	09/16/16
3	CFSWP-007-SW	460-120379-3	Water	09/16/16
4	CFSWP-008-SW	460-120379-4	Water	09/16/16
5	CFSWP-017-SW	460-120379-5	Water	09/16/16
6	CFSWP-FB1-AQ	460-120379-6	Water	09/16/16
7	CFSWP-008-SWMS Hg	460-120379-4MS	Water	09/16/16
8	CFSWP-008-SWDUP	460-120379-4DUP	Water	09/16/16
9				
10				
11				
12				

Notes:

LDC #: 31228D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37288D4b

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?			✓	
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37228D4q

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: a

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-6	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC7-8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37228Aa

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 14:31	ICP/MS (Initial calibration)	Ag	41.49ug/L	40ug/L	104%R	104%R	Y
ICV 13:34	CVAA (Initial calibration)	Hg	5.081ug/L	5ug/L	102%R	102%R	↓
	ICP (Continuing calibration)						
CCV 14:51	ICP/MS (Continuing calibration)	As	50.46ug/L	50ug/L	101%R	101%R	Y
CCV 15:13	CVAA (Contining calibration)	Hg	4.933ug/L	5ug/L	99%R	99%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

LDC #: 37228D4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 14:44	ICP interference check	Mn	194.24 ug/L	200 ug/L	97 %R	97 %R	Y
LCS 15:02	Laboratory control sample	Be	26.26 ug/L	25 ug/L	105 %R	105 %R	↓
MS 15:03	Matrix spike	Hg	(SSR-SR) 0.928 ug/L	1 ug/L	93 %R	93 %R	↓
DUP = NC	Duplicate	N					
	ICP serial dilution						

Comments:

TOTCLC.4SW

LDC #: 37228D4q

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 11.862 ug/L x 2 = 23.7 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 11.862 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	23.7	23.7	Y
	2	Ba	102	102	
	3	Ca	23100	23100	
	4	Mg	6050	6050	
	5	Mn	21.8	21.8	
	6	Na	82.1	82.1	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120379-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-001-SW	460-120379-1	Water	09/16/16
CFSWP-002-SW	460-120379-2	Water	09/16/16
CFSWP-007-SW	460-120379-3	Water	09/16/16
CFSWP-008-SW	460-120379-4	Water	09/16/16
CFSWP-017-SW	460-120379-5	Water	09/16/16
CFSWP-FB1-AQ	460-120379-6	Water	09/16/16
CFSWP-001-SWDUP	460-120379-1DUP	Water	09/16/16
CFSWP-002-SWMS	460-120379-2MS	Water	09/16/16
CFSWP-002-SWMSD	460-120379-2MSD	Water	09/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFSWP-FB1-AQ was identified as a field blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFSWP-FB1-AQ	09/15/16	Chloride	138 ug/L	CFSWP-001-SW CFSWP-002-SW CFSWP-007-SW CFSWP-008-SW CFSWP-017-SW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFSWP-001-SW	Chloride	379 ug/L	379J+ ug/L
CFSWP-002-SW	Chloride	342 ug/L	342J+ ug/L
CFSWP-007-SW	Chloride	348 ug/L	348J+ ug/L
CFSWP-008-SW	Chloride	335 ug/L	335J+ ug/L

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFSWP-017-SW	Chloride	864 ug/L	864J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-049a-GWMS/MSD (CFSWP-001-SW CFSWP-002-SW CFSWP-007-SW CFSWP-008-SW CFSWP-017-SW)	Chloride Fluoride Sulfate	86 (90-110) 84 (90-110) 87 (90-110)	88 (90-110) 86 (90-110) 86 (90-110)	J- (all detects) J- (all detects) J- (all detects)	A
CFMW-049a-GWMS/MSD (CFSWP-001-SW CFSWP-002-SW CFSWP-007-SW CFSWP-008-SW CFSWP-017-SW)	Orthophosphate as P	0 (90-110)	0 (90-110)	R (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods.

Due to MS/MSD %R, data were rejected in five samples.

Due to MS/MSD %R, data were qualified as estimated in five samples.

Due to field blank contamination, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be rejected (R) are unusable for all purposes. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120379-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-001-SW CFSWP-002-SW CFSWP-007-SW CFSWP-008-SW CFSWP-017-SW	Chloride Fluoride Sulfate	J- (all detects) J- (all detects) J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-001-SW CFSWP-002-SW CFSWP-007-SW CFSWP-008-SW CFSWP-017-SW	Orthophosphate as P	R (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120379-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120379-1

Sample	Analyte	Modified Final Concentration	A or P
CFSWP-001-SW	Chloride	379J+ ug/L	A
CFSWP-002-SW	Chloride	342J+ ug/L	A
CFSWP-007-SW	Chloride	348J+ ug/L	A
CFSWP-008-SW	Chloride	335J+ ug/L	A
CFSWP-017-SW	Chloride	864J+ ug/L	A

LDC #: 37228D6

SDG #: 460-120379-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/25/16

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), OPO_4-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/16/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	FB = (6)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = CFMW-049a-GWMS/D (SDG: 460-120382-1) *See Below
VII.	Duplicate sample analysis	A	DUP = CFMW-049a-GWDUP (SDG: 460-120382-1) *See Below
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-001-SW	460-120379-1	Water	09/16/16
2	CFSWP-002-SW	460-120379-2	Water	09/16/16
3	CFSWP-007-SW	460-120379-3	Water	09/16/16
4	CFSWP-008-SW	460-120379-4	Water	09/16/16
5	CFSWP-017-SW	460-120379-5	Water	09/16/16
6	CFSWP-FB1-AQ	460-120379-6	Water	09/16/16
7	CFSWP-001-SWDUP Alk	460-120379-1DUP	Water	09/16/16
8	CFSWP-002-SWMS NO_3/NO_2	460-120379-2MS	Water	09/16/16
9	CFSWP-002-SWMSD ↓	460-120379-2MSD	Water	09/16/16
10				
11				
12				
13				
14				

Notes:

*MS/D = CFMW-DUP2-GW MS/D (SDG: 460-120382-1)
DUP = CFMW-032-GWDUP

LDC #: 37228D6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 51228D6

VALIDATION FINDINGS CHECKLIST

Reviewer: CSD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37228D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1-5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC-7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC-8	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37228D6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/16/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: FB Associated Samples: 1-5 (J+)

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	6		1	2	3	4	5			
Chloride	168	1680	379	342	348	335	864			

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37228D6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JS
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	CFMW-049a-GWMS/D (SDG: 460-120382-1)	W	Cl	86 (90-110)	88 (90-110)		1-5*	J-/UJ/A (det)
			F	84 (90-110)	86 (90-110)			J-/UJ/A (det)
			SO4	87 (90-110)	86 (90-110)			J-/UJ/A (det)
			OPO4-P	0 (90-110)	0 (90-110)			J-/R/A (nd)

Comments: *FB not associated (Different matrix)

LDC #: 37228D6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NH_3 was recalculated. Calibration date: 9/27/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NH_3	s1	0.0	218029	0.9997	0.9997	Y
		s2	0.1	1711507			
		s3	0.5	5292932			
		s4	1	10035917			
		s5	2	18321994			
		s6	4	37469516			
ICV 11:44 Calibration verification	NH_3	Found 2.07 mg/L	True 2 mg/L		104 %R	103 %R	Y*
ICV 13:24 Calibration verification	CN	0.203 mg/L	0.2 mg/L		102 %R	102 %R	Y
ICV 15:39 Calibration verification	Cl	1.41 mg/L	1.5 mg/L		94.0 %R	93.7 %R	Y*

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

* Rounding

LDC #: 31228D0

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: E

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 13:30	Laboratory control sample	Hardness	312000	319000 ug/L	97.8%R	97.8%R	Y
MS 14:25	Matrix spike sample	NO_3/NO_2-N	(SSR-SR) 995 ug/L	1000 ug/L	100%R	99%R	Y*
DUP 9:30	Duplicate sample	Alk	85.94 mg/L	85.94 mg/L	0%RPD	0%RPD	Y

Comments: *Rounding

TOTCLC.6

LDC #: 37228Q0

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: ESD
2nd reviewer: G

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (3) Alkalinity reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

V = 50ml
T = 4.2ml
N = 0.01987N

Recalculation: $\frac{(4.2ml)(0.01987N) \times 50000}{50ml} \times \frac{1000ug}{1mg} \approx 83900$ ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	NO_3/NO_2-N	898	898	Y
	2	Hardness	86000	86000	
	3	Alkalinity	83900	83900	
	4	TDS	95.0 mg/L	95.0 mg/L	
	5	TSS	4.9 mg/L	4.9 mg/L	
	6	Cl	168	168	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120382-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-037-GW	460-120382-1	Water	09/16/16
Trip Blank	460-120382-5	Water	09/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/16/16	1,1,2-Trichloro-1,2,2-trifluoroethane Cyclohexane Methyl cychlohexane	21.5 23.1 22.4	All samples in SDG 160-120382-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

LDC #: 37228E1

SDG #: 460-120382-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/23/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 2
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-037-GW	460-120382-1	Water	09/16/16
2	Trip Blank	460-120382-5	Water	09/16/16
3				
4				
5				
6				
7				
8				
9				

Notes:

	MB 460-~~396~~ 391646						

LDC #: 37228E1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37228E1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37228E1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Associated Samples	Qualifications
+	9/16/16	ICV-2	TTT	21.5	All	J+ all/A (NP)
+	0237		SSSS	23.1	↓	↓
+			TTTT	22.4	↓	↓

ICVvoa.wpd

LDC #: 37228E1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100std)	Recalculated (RRF 20/100std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/16/2016	M	0.2701	0.2701	0.2727	0.2727	10.8	10.8
	GCMS8		C	0.3415	0.3415	0.3549	0.3549	14.6	14.6
			CC	1.4599	1.4599	1.4405	1.4405	9.1	9.1
			JJJ	1.2868	1.2868	1.2803	1.2803	9.8	9.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0906	9/20/16	M (IS1)	0.2727	0.2556	0.2556	6.3	6.3
			C (IS2)	0.3549	0.3254	0.3254	8.3	8.3
			CC (IS3)	1.4405	1.409	1.409	2.2	2.2
			JJ (IS4)	1.2803	1.295	1.295	1.2	1.2
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37228t 1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	49.2	98	98	0
1,2-Dichloroethane-d4	↓	49.0	98	98	↓
Toluene-d8	↓	47.7	95	95	↓
Bromofluorobenzene	↓	51.1	102	102	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37228E1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/D 460-391646

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20	20	19.6	19.2	98	98	96	96	2	2
Trichloroethene			19.9	19.6	100	100	98	98	1	1
Benzene			19.4	19.0	97	97	95	95	2	2
Toluene			19.6	19.3	98	98	96	96	2	2
Chlorobenzene			19.5	19.2	98	98	96	96	2	2

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228E1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-391646

Conc. = $\frac{272811\ (50.0)}{482528\ (1.4405)}$

= 19.6

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120382-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-037-GW	460-120382-1	Water	09/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/20/16	N-Nitroso-di-n-propylamine 3&4-Methylphenol 2-Nitroaniline	20.5 30.4 22.3	All samples in SDG 460-120382-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were not within QC limits. No data were qualified since there were no associated samples in this SDG. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120382-1

Sample	Compound	Flag	A or P	Reason
CFMW-037-GW	N-Nitroso-di-n-propylamine 3&4-Methylphenol 2-Nitroaniline	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

LDC #: 37228E2a

SDG #: 460-120382-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	% RSD ≤ 30, r² |/r| ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	460-120318-1 MS/D (% R No Asso sample)
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-037-GW	460-120382-1	Water	09/16/16
2				
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-391204						

LDC #: 31228E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37128E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓	✓		
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?		✓		
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV.	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37228E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
–	9/18/16	CCV-6	QQQQ	28.1		MB 460-391204	J- / UJ / A NP
–	2107		II	21.2		↓	↓
–	9/20/16	CCV-6	J	20.5		# 1	J- / UJ / A (ND)
–	0341		QQQQ	30.4		↓	↓
–			BB	22.3			

CONCAL.wpd

LDC #: 37228Ed2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	9/11/2016	A	1.4850	1.4850	1.4955	1.4955	10.4	10.4
			S	0.8404	0.8404	0.8960	0.8960	8.7	8.7
			DD	1.5289	1.5289	1.5002	1.5002	2.9	2.9
			UU	0.9460	0.9460	0.9021	0.9021	7.7	7.7
			EEE	0.6572	0.6572	0.6453	0.6453	7.0	7.0
			III	1.0087	1.0087	1.0144	1.0144	6.9	6.9

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV-6 21:07	9/18/16	A	(1st IS)	1.4955	1.581	1.581	5.7	5.7
			S	(2nd IS)	0.8960	0.8909	0.8909	0.6	0.6
			DD	(3rd IS)	1.5002	1.463	1.463	2.5	2.5
			UU	(4th IS)	0.9021	0.9111	0.9111	1.0	1.0
			EEE	(5th IS)	0.6453	0.6552	0.6552	1.5	1.5
			III	(6th IS)	1.0144	0.9537	0.9537	6.0	6.0
2	CCV-6 0341	9/20/16	A	(1st IS)	1.4955	1.499	1.499	0.2	0.2
			S	(2nd IS)	0.8960	0.9019	0.9019	0.7	0.7
			DD	(3rd IS)	1.5002	1.600	1.600	6.7	6.7
			UU	(4th IS)	0.9021	0.8870	0.8870	1.7	1.7
			EEE	(5th IS)	0.6453	0.6405	0.6405	0.7	0.7
			III	(6th IS)	1.0144	0.9769	0.9769	3.7	3.7
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228E2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: ✓

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.45	8.45	85	85
2-Fluorobiphenyl		8.89	8.89	89	89
Terphenyl-d14		9.33	9.33	93	93
Phenol-d5		2.77	2.77	28	28
2-Fluorophenol		4.18	4.18	42	42
2,4,6-Tribromophenol		7.81	7.81	78	78
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37228e2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration, SA = Spike added, SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 9+ 10

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
[redacted]	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	80.0	80.0	ND	30.4	27.2	38	38	34	34	11	11
N-Nitroso-di-n-propylamine	↓	↓	↓	70.7	66.5	88	88	83	83	6	6
4-Chloro-3-methylphenol	↓	↓	↓	73.7	70.3	92	92	88	88	5	5
Acenaphthene	↓	↓	↓	76.9	72.4	96	96	90	90	6	6
Pentachlorophenol	160	160	↓	145	148	90	90	92	92	2	2
Pyrene	80	80	↓	79.8	80.7	100	100	101	101	1	1

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228E2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 391204

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	25.7	NA	32	32				
N-Nitroso-di-n-propylamine			64.4		81	81				
4-Chloro-3-methylphenol			63.6		79	79				
Acenaphthene			72.8		91	91				
Pentachlorophenol	160		148		92	92				
Pyrene	80		79.2		99	99	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228E2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: ✓

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-391204 A

Conc. = $\frac{(185641)(8.0)(2)(1000)}{(312607)(1.4955)(250)}$

= 25.4 ng/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 27, 2016

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120382-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-037-GW	460-120382-1	Water	09/16/16
CFMW-EB5-AQ	460-120382-2	Water	09/16/16
CFMW-032a-GW	460-120382-3	Water	09/16/16
CFMW-049a-GW	460-120382-4	Water	09/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB5-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB5-AQ	09/16/16	Calcium	290 ug/L	CFMW-049a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-032-GWMS, no data were qualified for Calcium, Magnesium, and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field blanks were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

LDC #: 37228E4a

SDG #: 460-120382-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 11/7/16

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/16/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=(1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=CFMW-032-GW MS (SDG:460-120318-1)= Ca, Mg, Na, K
VIII.	Duplicate sample analysis	A	DUP=CFMW-032-GW DUP (SDG:460-120318-1)
IX.	Serial Dilution	A	SER=CFMW-032-GW (SDG:460-120318-1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-037-GW	460-120382-1	Water	09/16/16
2	CFMW-EB5-AQ	460-120382-2	Water	09/16/16
3	CFMW-032a-GW	460-120382-3	Water	09/16/16
4	CFMW-049a-GW	460-120382-4	Water	09/16/16
5				
6				
7				
8				
9				
10				
11				
12				

Notes:

LDC #: 37228E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: JP
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

DC #: 3722854

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37228E4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JSD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-4	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37228E4a

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?
Y N N/A Are all correlation coefficients ≥0.995?
Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
	09/21/16	CRDL (14:15)	Cd	68 (70-130)	2	No Qual. (True and Found CRDL value < MDL)

Comments:

LDC #: 37228E4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JVD
2nd Reviewer: G

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/16/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 4

Analyte	Blank ID	Sample Identification										
[redacted]	1	Action Limit	No Qual.									
Ca	290	2900										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 57223EQa

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 00:33	ICP/MS (Initial calibration)	Cd	41.37 ug/L	40 ug/L	103%R	103%R	Y
ICV 13:34	CVAA (Initial calibration)	Hg	5.08 ug/L	5 ug/L	102%R	102%R	↓
	ICP (Continuing calibration)						
CCV 2:24	ICP/MS (Continuing calibration)	Co	48.9 ug/L	50 ug/L	98%R	98%R	Y
CCV 16:23	CVAA (Contining calibration)	Hg	4.989 ug/L	5 ug/L	100%R	100%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37228E4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 00:57	ICP interference check	As	102.9 ug/L	100 ug/L	103%R	103%R	Y
LCS 1:40	Laboratory control sample	Be	4.75 ug/L	5 ug/L	95%R	95%R	
MS 12:57	Matrix spike	Cu	(SSR-SR) 20.75 ug/L	20 ug/L	104%R	104%R	
DUP 13:00	Duplicate	Mn	527.4 ug/L	536.0 ug/L	2%RPD	2%RPD	
SER 13:05	ICP serial dilution	Na	154245 ug/L	154756 ug/L	0.33%D	0.33%D	

Comments:

TOTCLC.4SW

LDC #: 37228E4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: JD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Mg were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 7080 ug/L x 2 = 14200 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 7080.4 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Mg	14200	14200	Y
	2	Al	19.0	19.0	↓
	3	Na	25400	25400	↓
	4	Ca	4.0	4.0	↓

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120382-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-037-GW	460-120382-1	Water	09/16/16
CFMW-EB5-AQ	460-120382-2	Water	09/16/16
CFMW-032a-GW	460-120382-3	Water	09/16/16
CFMW-049a-GW	460-120382-4	Water	09/16/16
CFMW-037-GWMS	460-120382-1MS	Water	09/16/16
CFMW-037-GWMSD	460-120382-1MSD	Water	09/16/16
CFMW-032a-GWDUP	460-120382-3DUP	Water	09/16/16
CFMW-049a-GWMS	460-120382-4MS	Water	09/16/16
CFMW-049a-GWMSD	460-120382-4MSD	Water	09/16/16
CFMW-049a-GWDUP	460-120382-4DUP	Water	09/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB5-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB5-AQ	09/16/16	Chloride	187 ug/L	CFMW-037-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-049a-GWMS/MSD (CFMW-032a-GW CFMW-049a-GW)	Chloride	86 (90-110)	88 (90-110)	J- (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-049a-GWMS/MSD (CFMW-037-GW CFMW-032a-GW CFMW-049a-GW)	Fluoride Sulfate	84 (90-110) 87 (90-110)	86 (90-110) 86 (90-110)	J- (all detects) J- (all detects)	A
CFMW-049a-GWMS/MSD (CFMW-037-GW CFMW-032a-GW CFMW-049a-GW)	Orthophosphate as P	0 (90-110)	0 (90-110)	R (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods.

Due to MS/MSD %R, data were rejected in three samples.

Due to MS/MSD %R, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be rejected (R) are unusable for all purposes. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120382-1

Sample	Analyte	Flag	A or P	Reason
CFMW-032a-GW CFMW-049a-GW	Chloride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-037-GW CFMW-032a-GW CFMW-049a-GW	Fluoride Sulfate	J- (all detects) J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-037-GW CFMW-032a-GW CFMW-049a-GW	Orthophosphate as P	R (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120382-1

No Sample Data Qualified in this SDG

LDC #: 37228E6

SDG #: 460-120382-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/25/16

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ SD (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), ORPO4-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/16/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=(2)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D=CFSWP-002-SW MS/D (SDG:460-120379-1)
VII.	Duplicate sample analysis	A	DUP=CFSWP-001-SW DUP (SDG:460-120379-1) *See Below
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFMW-037-GW		460-120382-1	Water	09/16/16
2	CFMW-EB5-AQ		460-120382-2	Water	09/16/16
3	CFMW-032a-GW		460-120382-3	Water	09/16/16
4	CFMW-049a-GW		460-120382-4	Water	09/16/16
5	CFMW-037-GWMS	CN	460-120382-1MS	Water	09/16/16
6	CFMW-037-GWMSD	↓	460-120382-1MSD	Water	09/16/16
7	CFMW-032a-GWDUP	TDS	460-120382-3DUP	Water	09/16/16
8	CFMW-049a-GWMS	ORPO4-P 300.0	460-120382-4MS	Water	09/16/16
9	CFMW-049a-GWMSD	↓ ↓	460-120382-4MSD	Water	09/16/16
10	CFMW-049a-GWDUP	↓ ↓	460-120382-4DUP	Water	09/16/16
11					
12					
13					
14					

Notes:

DUP=CFMW-044b-GW DUP (SDG:460-120477-1)

LDC #: 37228E6

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: JD
2nd Reviewer: C

Method: Inorganics (EPA Method See Comments)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37228E6

VALIDATION FINDINGS CHECKLIST

Reviewer: 2nd
2nd Reviewer: 2

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37228E6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: a

All circled methods are applicable to each sample.

Sample ID	Parameter
1-4	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:5-6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:8-10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37228E6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/16/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 1

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	2		No Qual.							
Chloride	187	1870								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37228E6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: SD
2nd Reviewer: a

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	8/9	W	Cl	86 (90-110)	88 (90-110)		3-4	J-/UJ/A (det)
			F	84 (90-110)	86 (90-110)		1, 3-4	J-/UJ/A (det)
			SO4	87 (90-110)	86 (90-110)		1, 3-4	J-/UJ/A (det)
			OPO4-P	0 (90-110)	0 (90-110)		1, 3-4	J-R/A (nd)

Comments: EB not associated (different matrix)

LDC #: 37228E6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JR
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of OPO4-P was recalculated. Calibration date: 8/17/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Abs	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	OPO4-P	s1	0.2	11296	0.9975	0.9980	Y*
		s2	0.5	45719			
		s3	2.5	193148			
		s4	5	403999			
		s5	7.5	646712			
ICV 15:39 Calibration verification	OPO4-P	Found 2.36mg/L	True 2.5mg/L		94.4%R	94.4%R	Y
ICV 15:39 Calibration verification	F	0.913mg/L	1mg/L		91.3%R	91.3%R	↓
ICV 14:10 Calibration verification	NO3/NO2-N	0.99mg/L	1mg/L		99%R	99%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37228E6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 11:48	Laboratory control sample	NH3	963 ug/L	1000 ug/L	96% R	96% R	Y
MS 12:38	Matrix spike sample	CN	(SSR-SR) 196 ug/L	200 ug/L	98% R	98% R	
DUP 18:35	Duplicate sample	TDS	1530 mg/L	1610 mg/L	5% RPD	5 ~~8~~% RPD JD	Y

Comments:

TOTCLC.6

LDC #: 37228E0

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: [illegible]
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y/N N/A Have results been reported and calculated correctly?
Y/N N/A Are results within the calibrated range of the instruments?
Y/N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (2) Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A-(-11607.612)}{96427.288}$

A = 6425

Recalculation: $\frac{6425-(-11607.612)}{96427.288} \times \frac{1000\,ug}{1\,mg} \simeq 187\ ug/L$

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	CN	66.7	66.7	Y
	2	Cl	187	187	
	3	NH_3	95.7	95.7	
	4	Hardness	700000	700000	
	4	Alkalinity	422000	422000	
	4	NO_3/NO_2-N	442	442	
	4	TDS	512	512	
	4	TSS	133	133	

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120477-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-050-GW	460-120477-4	Water	09/19/16
Trip Blank	460-120477-5	Water	09/19/16
CFMW-044b-GW	460-120477-8	Water	09/19/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/23/16 (08:39)	Chloroethane	43.3	All samples in SDG 160-120477-1	UJ (all non-detects)	A
09/23/16 (08:39)	Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane 1,1-Dichloroethane Carbon tetrachloride 1,1,1-Trichloroethane 1,2-Dichloroethane	44.9 23.0 21.8 25.8 23.1 24.2	All samples in SDG 160-120477-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analysis Date	Compound	Concentration	Associated Samples
MB 460-392467	09/23/16	Styrene	0.339 ug/L	All samples in SDG 460-120477-1

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120477-1

Sample	Compound	Flag	A or P	Reason
CFMW-050-GW Trip Blank CFMW-044b-GW	Chloroethane	UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

LDC #: 37228F1

SDG #: 460-120477-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/23/16

Page: 1 of 1

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30 r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	SW	
VI.	Field blanks	ND	TB = 2
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/LD
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
+ 1	CFMW-050-GW	460-120477-4	Water	09/19/16
− 2	Trip Blank	460-120477-5	Water	09/19/16
+ 3	CFMW-044b-GW	460-120477-8	Water	09/19/16
4				
5				
6				
7				
8				
9				

Notes:

	MB 460-392467						

LDC #: 37228F1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37228F1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?		✓		
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓		NN	
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37228F1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	9/23/16	CCV-5	D	43.3		All	J-MJ/A ND
+	0839		KK	44.9			J+ det/A
+			TTT	23.0			
+			I	21.8			
+			O	~~25.8~~ 25.8			
+			N	23.1			
+			L	24.2			

CONCAL.wpd

LDC #: 37228F 1

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a method blank associated with every sample in this SDG?
Y N N/A Was a method blank analyzed at least once every 12 hours for each matrix and concentration?
Y N N/A Was there contamination in the method blanks? If yes, please see the qualifications below.

Blank analysis date: 9/23/16
Conc. units: ug/L
Associated Samples: All (ND)

Compound	Blank ID	Sample Identification								
	MB 460-392467									
FF	0.339									

Blank analysis date:
Conc. units:
Associated Samples:

Compound	Blank ID	Sample Identification								

All results were qualified using the criteria stated below except those circled.

Note: Common contaminants such as Methylene chloride, Acetone, 2-Butanone, Carbon disulfide and TICs that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC #: 37228F1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100std)	Recalculated (RRF 20/100std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/10/2016	M	0.4055	0.4055	0.4321	0.4055	4.1	4.1
	GCMS5		C	0.4288	0.4288	0.4497	0.4288	4.6	4.6
			CC	1.4369	1.4369	1.5059	1.4369	4.8	4.8
			JJJ	1.2251	1.2251	1.2563	1.2251	3.9	3.9

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228F1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	0839 CCV-5	9/23/16	M (IS1)	0.4321	0.4408	0.4408	2.0	2.0
			a (IS2)	0.4497	0.4914	0.4914	9.3	9.3
			cc (IS3)	1.5059	1.567	1.567	4.1	4.1
			NJ (IS4)	1.2563	1.235	1.235	1.7	1.7
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37228 F1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: H1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	61.5	123	123	0
1,2-Dichloroethane-d4	↓	65.0	130	130	↓
Toluene-d8	↓	50.6	101	101	↓
Bromofluorobenzene	↓	43.3	87	87	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37228F1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/D 460-392467

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	21.4	19.9	107	107	99	99	8	8
Trichloroethene	↓	↓	23.2	21.1	116	116	105	105	10	10
Benzene	↓	↓	19.6	18.6	98	98	93	93	5	5
Toluene	↓	↓	19.2	18.2	96	96	91	91	6	6
Chlorobenzene	↓	↓	18.7	18.1	94	94	91	91	3	3

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228F1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #1, AA

Conc. = $\frac{(398)(50)}{(446185)(0.3217)}$

=

0.14 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120477-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-050-GW	460-120477-4	Water	09/19/16
CFMW-044b-GW	460-120477-8	Water	09/19/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/22/16	Hexachlorocyclopentadiene	31.9	CFMW-050-GW CFMW-044b-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

LDC #: 37228F2a

SDG #: 460-120477-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CG
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-050-GW	460-120477-4	Water	09/19/16
2	CFMW-044b-GW	460-120477-8	Water	09/19/16
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-39213						

LDC #: 31228Fda

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: C

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37228F2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: C

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.				

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV.	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 57228F2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	9/22/16	CCV-4	X	27.4		MB 460-392013	J+ det/A ND
+	0119		II	29.1		↓	↓
+			KK	30.5		↓	↓
			PP	21.6		↓	↓
+	9/22/16 1552	CCV-4	X	31.9		1, 2	J+ det/A ND

CONCAL.wpd

LDC #: 37228f2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms4	9/16/2016	A	1.3044	1.3044	1.4076	1.4076	9.6	9.6
			M	0.7088	0.7088	0.8284	0.8284	16.7	16.7
			GG	1.0548	1.0548	1.0136	1.0136	7.0	7.0
			UU	0.9687	0.9687	0.9792	0.9792	18.2	18.2
			EEE	0.8710	0.8710	0.8680	0.8680	13.6	13.6
			III	1.0694	1.0694	1.0483	1.0483	5.4	5.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228 F2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 001:19	9/22/16	Δ	(1st IS)	1.4076	1.490	1.490	5.8	5.8
			M	(2nd IS)	0.8284	0.7865	0.7865	5.1	5.1
			GG	(3rd IS)	1.0136	1.037	1.037	2.3	2.3
			UU	(4th IS)	0.9792	0.8724	0.8724	10.9	10.9
			EEE	(5th IS)	0.8680	0.8541	0.8541	1.6	1.6
			III	(6th IS)	1.0483	1.043	1.043	0.5	0.5
2	CCV 1552	9/22/16	Δ	(1st IS)	1.4076	1.429	1.429	1.5	1.5
			M	(2nd IS)	0.8284	0.7239	0.7239	12.6	12.6
			GG	(3rd IS)	1.0136	1.067	1.067	5.3	5.3
			UU	(4th IS)	0.9792	0.9035	0.9035	7.7	7.7
			EEE	(5th IS)	0.8680	0.8607	0.8607	0.8	0.8
			III	(6th IS)	1.0483	1.051	1.051	0.2	0.2
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228F02

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.30	93	93	0
2-Fluorobiphenyl	↓	7.72	77	77	↓
Terphenyl-d14	↓	9.00	90	90	↓
Phenol-d5	↓	3.11	31	31	↓
2-Fluorophenol	↓	4.79	48	48	↓
2,4,6-Tribromophenol	↓	5.73	57	57	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37228f2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460 - 392013

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	26.8	30.6	33	33	38	38	13	13
N-Nitroso-di-n-propylamine	80.0	80.0	74.3	86.7	93	93	108	108	15	15
4-Chloro-3-methylphenol	80.0	80.0	70.9	72.4	89	89	91	91	2	2
Acenaphthene	80.0	80.0	64.0	61.0	80	80	76	76	5	5
Pentachlorophenol	160	160	165	164	103	103	102	102	1	1
Pyrene	80.0	80.0	75.6	83.6	95	95	105	105	10	10

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228F2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-39.2013 A

Conc. = $\frac{(188595)(8)(2)(1000)}{(310704)(\cancel{1.4076}\ 1.450)(250)}$

= 26.8 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 31, 2016

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120477-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-053a-GW	460-120477-1	Water	09/19/16
CFMW-045a-GW	460-120477-2	Water	09/19/16
CFMW-EB6-AQ	460-120477-3	Water	09/19/16
CFMW-050-GW	460-120477-4	Water	09/19/16
CFMW-059a-GW	460-120477-6	Water	09/19/16
CFMW-044a-GW	460-120477-7	Water	09/19/16
CFMW-044b-GW	460-120477-8	Water	09/19/16
CFMW-057-GW	460-120477-9	Water	09/19/16
CFMW-057a-GW	460-120477-10	Water	09/19/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB6-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field blanks were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

LDC #: 37228F4a
SDG #: 460-120477-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 10/25/16
Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/28/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB=(3)
VII.	Matrix Spike/Matrix Spike Duplicates	N	CS
VIII.	Duplicate sample analysis	N	
IX.	Serial Dilution	N	Not Performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-053a-GW	460-120477-1	Water	09/19/16
2	CFMW-045a-GW	460-120477-2	Water	09/19/16
3	CFMW-EB6-AQ	460-120477-3	Water	09/19/16
4	CFMW-050-GW	460-120477-4	Water	09/19/16
5	CFMW-059a-GW	460-120477-6	Water	09/19/16
6	CFMW-044a-GW	460-120477-7	Water	09/19/16
7	CFMW-044b-GW	460-120477-8	Water	09/19/16
8	CFMW-057-GW	460-120477-9	Water	09/19/16
9	CFMW-057a-GW	460-120477-10	Water	09/19/16
10				
11				
12				

Notes:

LDC #: 37228A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-a	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

DC #: 37228F4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.			✓	
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

DC #: 37228F1

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?			✓	
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 35228A4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 17:20	ICP/MS (Initial calibration)	Ni	40.67ug/L	40ug/L	102%R	102%R	Y
ICV 13:54	CVAA (Initial calibration)	Hg	4.8Rug/L	5ug/L	96%R	96%R	↓
	ICP (Continuing calibration)						
CCV 18:22	ICP/MS (Continuing calibration)	Pb	50.03ug/L	50ug/L	100%R	100%R	Y
CCV 15:00	CVAA (Contining calibration)	Hg	4.747ug/L	5ug/L	95%R	95%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

LDC #: 37228F4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICSAB 17:33	ICP interference check	Cu	199.5 ug/L	200 ug/L	100%R	100%R	Y
LCS 15:04	Laboratory control sample	Hg	1.004 ug/L	1 ug/L	100%R	100%R	Y
N	Matrix spike		(SSR-SR)				
N	Duplicate						
N	ICP serial dilution						

Comments: _____

TOTCLC.4SW

LDC #: 35728F4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 45.32 ug/L x 2 = 90.6 ug/L

RD = Raw data concentration RD = 45.32 ug/L
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor Dil = 2x

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	90.6	90.6	Y
	2	Ba	88.5	88.5	
	3	Na	147	147	
	4	Ca	46800	46800	
	5	Cr	1.3	1.3	
	6	Cu	1.9	1.9	
	7	Fe	732	732	
	8	Mg	15600	15600	
	9	K	18100	18100	

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120477-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-053a-GW	460-120477-1	Water	09/19/16
CFMW-045a-GW	460-120477-2	Water	09/19/16
CFMW-EB6-AQ	460-120477-3	Water	09/19/16
CFMW-050-GW	460-120477-4	Water	09/19/16
CFMW-059a-GW	460-120477-6	Water	09/19/16
CFMW-044a-GW	460-120477-7	Water	09/19/16
CFMW-044b-GW	460-120477-8	Water	09/19/16
CFMW-057-GW	460-120477-9	Water	09/19/16
CFMW-057a-GW	460-120477-10	Water	09/19/16
CFMW-053a-GWMS	460-120477-1MS	Water	09/19/16
CFMW-053a-GWMSD	460-120477-1MSD	Water	09/19/16
CFMW-053a-GWDUP	460-120477-1DUP	Water	09/19/16
CFMW-045a-GWMS	460-120477-2MS	Water	09/19/16
CFMW-045a-GWMSD	460-120477-2MSD	Water	09/19/16
CFMW-059a-GWMS	460-120477-6MS	Water	09/19/16
CFMW-059a-GWMSD	460-120477-6MSD	Water	09/19/16
CFMW-044b-GWMS	460-120477-8MS	Water	09/19/16
CFMW-044b-GWMSD	460-120477-8MSD	Water	09/19/16
CFMW-044b-GWDUP	460-120477-8DUP	Water	09/19/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB6-AQ was identified as an equipment blank. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-059a-GWMS/MSD (CFMW-053a-GW CFMW-045a-GW CFMW-050-GW CFMW-059a-GW CFMW-044a-GW CFMW-044b-GW CFMW-057-GW CFMW-057a-GW)	Orthophosphate as P	0 (90-110)	0 (90-110)	R (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods.

Due to MS/MSD %R, data were rejected in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be rejected (R) are unusable for all purposes. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120477-1

Sample	Analyte	Flag	A or P	Reason
CFMW-053a-GW CFMW-045a-GW CFMW-050-GW CFMW-059a-GW CFMW-044a-GW CFMW-044b-GW CFMW-057-GW CFMW-057a-GW	Orthophosphate as P	R (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120477-1

No Sample Data Qualified in this SDG

LDC #: 37228F6

SDG #: 460-120477-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/25/16

Page: 1 of 2

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), ORPO4-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/19/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	ND	EB=(3)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D= See List
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFMW-053a-GW		460-120477-1	Water	09/19/16
2	CFMW-045a-GW		460-120477-2	Water	09/19/16
3	CFMW-EB6-AQ		460-120477-3	Water	09/19/16
4	CFMW-050-GW		460-120477-4	Water	09/19/16
5	CFMW-059a-GW		460-120477-6	Water	09/19/16
6	CFMW-044a-GW		460-120477-7	Water	09/19/16
7	CFMW-044b-GW		460-120477-8	Water	09/19/16
8	CFMW-057-GW		460-120477-9	Water	09/19/16
9	CFMW-057a-GW		460-120477-10	Water	09/19/16
10	CFMW-053a-GWMS	353.2	460-120477-1MS	Water	09/19/16
11	CFMW-053a-GWMSD	↓	460-120477-1MSD	Water	09/19/16
12	CFMW-053a-GWDUP	TDS	460-120477-1DUP	Water	09/19/16
13	CFMW-045a-GWMS	NH_3	460-120477-2MS	Water	09/19/16
14	CFMW-045a-GWMSD	↓	460-120477-2MSD	Water	09/19/16
15	CFMW-059a-GWMS	$ORPO_4$	460-120477-6MS	Water	09/19/16
16	CFMW-059a-GWMSD	↓	460-120477-6MSD	Water	09/19/16

LDC #: 37228F6

SDG #: 460-120477-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/25/10

Reviewer: ZD

2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

	Client ID	Lab ID	Matrix	Date
17	CFMW-044b-GWMS CN	460-120477-8MS	Water	09/19/16
18	CFMW-044b-GWMSD ↓	460-120477-8MSD	Water	09/19/16
19	CFMW-044b-GWDUP Hard	460-120477-8DUP	Water	09/19/16
20				
21				
22				
23				
24				

Notes:

LDC #: 37228F6

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: a

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37228F6

VALIDATION FINDINGS CHECKLIST

Reviewer: ZSD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37228

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer:

All circled methods are applicable to each sample.

Sample ID	Parameter
1-9	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37228F6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	15/16	W	OPO4-P	0 (90-110)	0 (90-110)		1-2, 4-9	J-R\A (nd)

Comments: EB not associated (different matrix)

LDC #: 37228F6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer: a

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of CN was recalculated.Calibration date: 9/27/10

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	CN	s1	0	-0.0296	0.99937	0.99990	Y*
		s2	0.01	0.518			
		s3	0.025	1.24			
		s4	0.05	2.45			
		s5	0.1	4.87			
		s6	0.2	9.65			
		s7	0.4	18.4			
ICV 12:30 Calibration verification	CN	Found 0.206 mg/L	True 0.2 mg/L		103%R	103%R	Y
ICV 11:35 Calibration verification	NO_3/NO_2-N	0.978 mg/L	1 mg/L		98%R	98%R	↓
ICV 13:08 Calibration verification	NH_3	2.11 mg/L	2 mg/L		106%R	106%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37228F0

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 11:00	Laboratory control sample	Hardness	312000 ug/L	319000 ug/L	97.8%R	97.8%R	Y
MS 11:40	Matrix spike sample	NO_3/NO_2-N	(SSR-SR) 1102 ug/L	1000 ug/L	110%R	110%R	
DUP 19:34	Duplicate sample	TDS	2340 mg/L	2280 mg/L	3%RPD	3%RPD	

Comments:

TOTCLC.6

LDC #: 37228F0

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (1) SO4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A - (-45921.992)}{75404.8611}$

Recalculation: $\frac{72340 - (-45921.992)}{75404.8611} \times \frac{1000 ug}{1 mg} = 1570$ ug/L

A = 72340

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	SO4	1570	1570	Y
	2	CN	56.0	56.1	Y*
	4	NO3/NO2-N	307	307	Y
	5	NH3	211	211	
	6	Hardness	408000	408000	
	7	Alkalinity	132000	132000	
	8	TSS	11.9 mg/L	11.9 mg/L	
	9	TDS	1780 mg/L	1780 mg/L	
	3	CN	2.8	2.8	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120581-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-020-GW	460-120581-10	Water	09/20/16
Trip Blank	460-120581-11	Water	09/20/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/21/16 (ICV-13)	Bromomethane	27.8	All samples in SDG 160-120581-1	UJ (all non-detects)	A
09/21/16 (ICV-13)	1,1,2-Trichloro-1,2,2-trifluoroethane Acetone Cyclohexane Methyl cychlohexane	31.1 33.4 32.3 22.7	All samples in SDG 160-120581-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/26/16 (11:05)	Dichlorodifluoromethane Bromomethane Chloroethane	23.2 38.6 23.2	Trip Blank	UJ (all non-detects)	A
09/26/16 (22:32)	Bromomethane	27.4	CFMW-020-GW	UJ (all non-detects)	A
09/26/16 (22:32)	Cyclohexane Methyl cychlohexane	20.5 20.3	CFMW-020-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120581-1

Sample	Compound	Flag	A or P	Reason
CFMW-020-GW Trip Blank	Bromomethane	UJ (all non-detects)	A	Initial calibration verification (%D)
Trip Blank	Dichlorodifluoromethane Bromomethane Chloroethane	UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-020-GW	Bromomethane	UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

LDC #: 37228G1 **VALIDATION COMPLETENESS WORKSHEET** Date: 10/23/16
SDG #: 460-120581-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer: EJ
2nd Reviewer: O

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 2
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS 10
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 2	CFMW-020-GW	460-120581-10	Water	09/20/16
2 1	Trip Blank	460-120581-11	Water	09/20/16
3				
4				
5				
6				
7				
8				
9				

Notes:

1	MB 460-392978						
2	MB 460-393053						

LDC #: 3722861

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: C

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?			✓	
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37228G1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37228G1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
-	9/21/16	ICV-13	B	27.8	All	J-/UJ/A all ND
+			TTT	31.1	↓	J+ all/A
+			F	33.4	↓	↓
+			SSS	32.3	↓	↓
+			TTTT	22.7	↓	↓

ICVvoa.wpd

LDC #: 37228G1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	9/26/16	CCV-13	JJ	23.2		~~All~~ #2,	J-/UJ/A (ND)
-	11:05		B	38.6		MB 460-392978	
-			D	23.2			
-	9/26/16	CCV-13	B	27.4		#1,	J-/UJ/A (ND)
+	22:32		SSSS	20.5		MB 460-393053	J+ det/A
+			TTTT	20.3			

CONCAL.wpd

LDC #: 37228G1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: C

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100std)	Recalculated (RRF 20/100std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/21/2016	M	0.2669	0.2669	0.2822	0.2822	11.6	11.6
	GCMS13		C	0.4765	0.4765	0.5021	0.5021	5.7	5.7
			CC	1.6295	1.6295	1.6457	1.6457	9.8	9.8
			JJJ	1.4544	1.4544	1.4200	1.4200	6.4	6.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228G1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 11:05	9/26/16	M (IS1)	0.2822	0.2679	0.2679	5.1	5.1
			C (IS2)	0.5021	0.5243	0.5243	4.4	4.4
			CC (IS3)	1.6457	1.632	1.632	0.8	0.8
			JJJ (IS4)	1.4200	1.431	1.431	0.8	0.8
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37228G1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	48.1	96	96	0
1,2-Dichloroethane-d4		51.3	103	103	
Toluene-d8		48.1	96	96	
Bromofluorobenzene		51.0	102	102	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37228G1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-392978

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	18.7	17.8	94	94	89	89	5	5
Trichloroethene	↓	↓	20.1	20.1	100	100	101	101	0	0
Benzene	↓	↓	19.8	20.5	99	99	102	102	4	4
Toluene	↓	↓	19.6	20.5	98	98	103	103	5	5
Chlorobenzene	↓	↓	20.0	20.8	100	100	104	104	4	4

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228G1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: GW

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-392978 — Toluene

Conc. = $\frac{239945\ (50)}{372168\ (1.6457)}$

= 19.6 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120581-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-020-GW	460-120581-10	Water	09/20/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/23/16	Hexachlorocyclopentadiene 4-Nitrophenol	22.9 34.0	All samples in SDG 460-120581-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

LDC #: 37228G2a

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

SDG #: 460-120581-1

Page: 1 of 1

Laboratory: Test America, Inc.

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	% RSD ≤ 20, r² KV ≤ 30
IV.	Continuing calibration	SW	CV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-020-GW	460-120581-10	Water	09/20/16
2				
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-392154						

LDC #: 37228G2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?		✓		
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37228G2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?		✓		
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	T. 4-Chloroaniline	MM. 4-Chlorophenyl-phenyl ether	FFF. Di-n-octylphthalate	YYY. 2,3,5-Trimethylnaphthalene
B. Bis (2-chloroethyl) ether	U. Hexachlorobutadiene	NN. Fluorene	GGG. Benzo(b)fluoranthene	ZZZ. Perylene
C. 2-Chlorophenol	V. 4-Chloro-3-methylphenol	OO. 4-Nitroaniline	HHH. Benzo(k)fluoranthene	AAAA. Dibenzothiophene
D. 1,3-Dichlorobenzene	W. 2-Methylnaphthalene	PP. 4,6-Dinitro-2-methylphenol	III. Benzo(a)pyrene	BBBB. Benzo(a)fluoranthene
E. 1,4-Dichlorobenzene	X. Hexachlorocyclopentadiene	QQ. N-Nitrosodiphenylamine	JJJ. Indeno(1,2,3-cd)pyrene	CCCC. Benzo(b)fluorene
F. 1,2-Dichlorobenzene	Y. 2,4,6-Trichlorophenol	RR. 4-Bromophenyl-phenylether	KKK. Dibenz(a,h)anthracene	DDDD. cis/trans-Decalin
G. 2-Methylphenol	Z. 2,4,5-Trichlorophenol	SS. Hexachlorobenzene	LLL. Benzo(g,h,i)perylene	EEEE. Biphenyl
H. 2,2'-Oxybis(1-chloropropane)	AA. 2-Chloronaphthalene	TT. Pentachlorophenol	MMM. Bis(2-Chloroisopropyl)ether	FFFF. Retene
I. 4-Methylphenol	BB. 2-Nitroaniline	UU. Phenanthrene	NNN. Aniline	GGGG. C30-Hopane
J. N-Nitroso-di-n-propylamine.	CC. Dimethylphthalate	VV. Anthracene	OOO. N-Nitrosodimethylamine	HHHH. 1-Methylphenanthrene
K. Hexachloroethane	DD. Acenaphthylene	WW. Carbazole	PPP. Benzoic Acid	IIII. 1,4-Dioxane
L. Nitrobenzene	EE. 2,6-Dinitrotoluene	XX. Di-n-butylphthalate	QQQ. Benzyl alcohol	JJJJ. Acetophenone
M. Isophorone	FF. 3-Nitroaniline	YY. Fluoranthene	RRR. Pyridine	KKKK. Atrazine
N. 2-Nitrophenol	GG. Acenaphthene	ZZ. Pyrene	SSS. Benzidine	LLLL. Benzaldehyde
O. 2,4-Dimethylphenol	HH. 2,4-Dinitrophenol	AAA. Butylbenzylphthalate	TTT. 1-Methylnaphthalene	MMMM. Caprolactam
P. Bis(2-chloroethoxy)methane	II. 4-Nitrophenol	BBB. 3,3'-Dichlorobenzidine	UUU.Benzo(b)thiophene	NNNN.
Q. 2,4-Dichlorophenol	JJ. Dibenzofuran	CCC. Benzo(a)anthracene	VVV.Benzonaphthothiophene	OOOO.
R. 1,2,4-Trichlorobenzene	KK. 2,4-Dinitrotoluene	DDD. Chrysene	WWW.Benzo(e)pyrene	PPPP.
S. Naphthalene	LL. Diethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	XXX. 2,6-Dimethylnaphthalene	QQQQ.

LDC #: 37228G2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	9/23/16	CCV-4	X	22.9		All	J+ all/A (ND)
+	0509		II	34.0		↓	↓

CONCAL.wpd

LDC #: 37228 G2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms4	9/16/2016	A	1.3044	1.3044	1.4076	1.4076	9.6	9.6
			M	0.7088	0.7088	0.8284	0.8284	16.7	16.7
			GG	1.0548	1.0548	1.0136	1.0136	7.0	7.0
			UU	0.9687	0.9687	0.9792	0.9792	18.2	18.2
			EEE	0.8710	0.8710	0.8680	0.8680	13.6	13.6
			III	1.0694	1.0694	1.0483	1.0483	5.4	5.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228G2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CON-4 0509	9/23/16	Δ (1st IS)	1.4076	1.364	1.364	3.1	3.1
			M (2nd IS)	0.8284	0.7371	0.7371	11.0	11.0
			GG (3rd IS)	1.0136	1.018	1.018	0.4	0.4
			UU (4th IS)	0.9792	0.9929	0.9929	1.4	1.4
			EEE (5th IS)	0.8680	0.8606	0.8606	0.9	0.9
			III (6th IS)	1.0483	1.018	1.018	2.9	2.9
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 31228G2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.31	83	83	0
2-Fluorobiphenyl		8.20	82	82	
Terphenyl-d14		9.73	97	97	
Phenol-d5		3.45	34	34	
2-Fluorophenol		5.16	52	52	
2,4,6-Tribromophenol		8.41	84	84	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37228 G 2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: lcs/D 460-392154

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	180	28.5	27.3	36	36	34	34	4	4
N-Nitroso-di-n-propylamine			73.8	71.6	92	92	89	89	3	3
4-Chloro-3-methylphenol			62.1	64.5	78	78	81	81	4	4
Acenaphthene			73.1	71.1	91	91	89	89	3	3
Pentachlorophenol	160	160	152	149	95	95	93	93	2	2
Pyrene	80	80	73.4	72.9	92	92	91	91	1	1

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228G2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-392154

Conc. = $\frac{186083\ (8)\ (2)\ (1000)}{(288203)\ (1.4902)\ (250)}$

= 28.5 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 27, 2016

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120581-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-003a-GW	460-120581-1	Water	09/20/16
CFMW-011a-GW	460-120581-2	Water	09/20/16
CFMW-019a-GW	460-120581-3	Water	09/20/16
CFMW-056a-GW	460-120581-4	Water	09/20/16
CFMW-EB7-AQ	460-120581-5	Water	09/20/16
CFMW-056-GW	460-120581-6	Water	09/20/16
CFMW-DUP3-GW	460-120581-7	Water	09/20/16
CFMW-028a-GW	460-120581-8	Water	09/20/16
CFMW-001-GW	460-120581-9	Water	09/20/16
CFMW-020-GW	460-120581-10	Water	09/20/16
CFMW-011a-GWMS	460-120581-2MS	Water	09/20/16
CFMW-011a-GWDUP	460-120581-2DUP	Water	09/20/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB7-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-011a-GWMS, no data were qualified for Calcium, Magnesium, and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-056-GW and CFMW-DUP3-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-056-GW	CFMW-DUP3-GW			
Barium	144	142	1 (≤30)	-	-
Calcium	48700	49700	2 (≤30)	-	-
Iron	516	514	0 (≤30)	-	-
Magnesium	18700	19000	2 (≤30)	-	-
Nitrogen	36.7	37.4	2 (≤30)	-	-
Potassium	1570	1590	1 (≤30)	-	-
Sodium	4100	4280	4 (≤30)	-	-
Zinc	7.0U	7.1	1 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

LDC #: 37228G4a
SDG #: 460-120581-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 10/25/16
Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/20/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB=(5)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(11) = Ca, Mg, Na >4x
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER=(2)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD=(6,7)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-003a-GW	460-120581-1	Water	09/20/16
2	CFMW-011a-GW	460-120581-2	Water	09/20/16
3	CFMW-019a-GW	460-120581-3	Water	09/20/16
4	CFMW-056a-GW	460-120581-4	Water	09/20/16
5	CFMW-EB7-AQ	460-120581-5	Water	09/20/16
6	CFMW-056-GW	460-120581-6	Water	09/20/16
7	CFMW-DUP3-GW	460-120581-7	Water	09/20/16
8	CFMW-028a-GW	460-120581-8	Water	09/20/16
9	CFMW-001-GW	460-120581-9	Water	09/20/16
10	CFMW-020-GW	460-120581-10	Water	09/20/16
11	CFMW-011a-GWMS All	460-120581-2MS	Water	09/20/16
12	CFMW-011a-GWDUP ↓	460-120581-2DUP	Water	09/20/16
13				
14				

Notes:

DC #: 3722864

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

DC #: 3722864a

VALIDATION FINDINGS CHECKLIST

Reviewer: DO
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37228G4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: 3D
2nd reviewer: a

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC-11-12	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC#: 37228G4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6010B/7000)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	6	7		
Barium	144	142	1	
Calcium	48700	49700	2	
Iron	516	514	0	
Magnesium	18700	19000	2	
Manganese	36.7	37.4	2	
Potassium	1570	1590	1	
Sodium	4100	4280	4	
Zinc	7.0U	7.1	1	

LDC #: 37228864a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 3:07	ICP/MS (Initial calibration)	Sb	39.86ug/L	40ug/L	100%R	100%R	Y
ICV 13:15	CVAA (Initial calibration)	Hg	4.868ug/L	5 ug/L	97%R	97%R	Y
	ICP (Continuing calibration)						
CCV 4:01	ICP/MS (Continuing calibration)	As	53.05 ug/L	50 ug/L	106%R	106%R	Y
CCV 15:08	CVAA (Contining calibration)	Hg	5.12ug/L	5 ug/L	102%R	102%R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37228640

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JSD
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 3:32	ICP interference check	V	201.8ug/L	200 ug/L	101%R	101%R	Y
LCS 14:29	Laboratory control sample	Hg	1.176ug/L	1ug/L	118%R	118%R	
MS 4:25	Matrix spike	Pb	(SSR-SR) 10.29 ug/L	10ug/L	103%R	103%R	
DUP 4:30	Duplicate	Mn	14.11ug/L	13.73ug/L	3%RPD	3%RPD	
SER 4:41	ICP serial dilution	Ca	25102ug/L	24553ug/L	2.2%D	2.2%D	

Comments:

TOTCLC.4SW

LDC #: 37728C4q

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 16.89 x 2 = 33.8 ug/L

RD = Raw data concentration — RD = 16.89 ug/L
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G) — Dil = 2
Dil = Dilution factor

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	33.8	33.8	Y
	2	As	3.3	3.3	
	3	Ba	56.9	56.9	
	4	Ca	18600	186000	
	5	Cr	1.6	1.6	
	6	Fe	516	516	
	7	Mg	19000	19000	
	8	K	3260	3260	
	9	Na	8360	8360	
	10	Mn	37.5	37.5	

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120581-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-003a-GW	460-120581-1	Water	09/20/16
CFMW-011a-GW	460-120581-2	Water	09/20/16
CFMW-019a-GW	460-120581-3	Water	09/20/16
CFMW-056a-GW	460-120581-4	Water	09/20/16
CFMW-EB7-AQ	460-120581-5	Water	09/20/16
CFMW-056-GW	460-120581-6	Water	09/20/16
CFMW-DUP3-GW	460-120581-7	Water	09/20/16
CFMW-028a-GW	460-120581-8	Water	09/20/16
CFMW-001-GW	460-120581-9	Water	09/20/16
CFMW-020-GW	460-120581-10	Water	09/20/16
CFMW-003a-GWMS	460-120581-1MS	Water	09/20/16
CFMW-003a-GWMSD	460-120581-1MSD	Water	09/20/16
CFMW-003a-GWDUP	460-120581-1DUP	Water	09/20/16
CFMW-011a-GWMS	460-120581-2MS	Water	09/20/16
CFMW-011a-GWMSD	460-120581-2MSD	Water	09/20/16
CFMW-011a-GWDUP	460-120581-2DUP	Water	09/20/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB7-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB7-AQ	09/20/16	Chloride	152 ug/L	CFMW-056-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-056-GW	Chloride	459 ug/L	459J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-011a-GWDUP (CFMW-003a-GW CFMW-011a-GW CFMW-019a-GW CFMW-056a-GW CFMW-056-GW CFMW-DUP3-GW CFMW-028a-GW CFMW-001-GW CFMW-020-GW)	Total suspended solids	7 (≤5)	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFMW-056-GW and CFMW-DUP3-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-056-GW	CFMW-DUP3-GW			
Sulfate	4530 ug/L	4430 ug/L	2 (≤30)	-	-
Chloride	459 ug/L	386 ug/L	17 (≤30)	-	-
Fluoride	138 ug/L	131 ug/L	5 (≤30)	-	-
Hardness	202000 ug/L	202000 ug/L	0 (≤30)	-	-
Alkalinity	206000 ug/L	206000 ug/L	0 (≤30)	-	-
Total dissolved solids	222 mg/L	202 mg/L	9 (≤30)	-	-
Total suspended solids	16.0 mg/L	17.4 mg/L	8 (≤30)	-	-

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-056-GW	CFMW-DUP3-GW			
Ammonia	76.2 ug/L	80.9 ug/L	6 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to DUP RPD, data were qualified as estimated in nine samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120581-1

Sample	Analyte	Flag	A or P	Reason
CFMW-003a-GW CFMW-011a-GW CFMW-019a-GW CFMW-056a-GW CFMW-056-GW CFMW-DUP3-GW CFMW-028a-GW CFMW-001-GW CFMW-020-GW	Total suspended solids	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120581-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120581-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-056-GW	Chloride	459J+ ug/L	A

LDC #: 37228G6

SDG #: 460-120581-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/26/10

Page: 1 of 1

Reviewer: SD

2nd Reviewer: ✓

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ SO (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), ORPO4-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/20/10
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=(5)
VI.	Matrix Spike/Matrix Spike Duplicates	A	MS/D=(11,12) (14,15)
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	SW	FD=(6,7)
X.	Sample result verification		
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-003a-GW	460-120581-1	Water	09/20/16
2	CFMW-011a-GW	460-120581-2	Water	09/20/16
3	CFMW-019a-GW	460-120581-3	Water	09/20/16
4	CFMW-056a-GW	460-120581-4	Water	09/20/16
5	CFMW-EB7-AQ No TSS & TDS	460-120581-5	Water	09/20/16
6	CFMW-056-GW	460-120581-6	Water	09/20/16
7	CFMW-DUP3-GW	460-120581-7	Water	09/20/16
8	CFMW-028a-GW	460-120581-8	Water	09/20/16
9	CFMW-001-GW	460-120581-9	Water	09/20/16
10	CFMW-020-GW	460-120581-10	Water	09/20/16
11	CFMW-003a-GWMS 300.0	460-120581-1MS	Water	09/20/16
12	CFMW-003a-GWMSD	460-120581-1MSD	Water	09/20/16
13	CFMW-003a-GWDUP	460-120581-1DUP	Water	09/20/16
14	CFMW-011a-GWMS 9056A 300.0 353.2 NH3 CN	460-120581-2MS	Water	09/20/16
15	CFMW-011a-GWMSD	460-120581-2MSD	Water	09/20/16
16	CFMW-011a-GWDUP TSS, ALK, Hard, TDS	460-120581-2DUP	Water	09/20/16

LDC #: 372286b

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: a

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	–			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 31228G6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: W

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 32028660

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1-4, 7-10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 TSS Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 11-13	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 14-15	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 16	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37228G6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/20/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 6

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	5		6							
Chloride	152	1520	459 J+							

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37228G6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤ 35% for soil samples? If no, see qualifications below. A control limit of ±R.L. (±2X R.L. for soil) was used for sample values that were <5X the R.L., including the case when only one of the duplicate sample values was <5X R.L.. If field blanks were used for laboratory duplicates, note in the Overall Assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Difference (Limits)	Associated Samples	Qualifications
		16	W	TSS	7 (≤5)		1-4, 6-10	J/UJ/A (det)

Comments:

LDC#: 37228G6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JB
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	6	7		
Sulfate	4530 (ug/L)	4430 (ug/L)	2	
Chloride	459 (ug/L)	386 (ug/L)	17	
Fluoride	138 (ug/L)	131 (ug/L)	5	
Hardness	202000 (ug/L)	202000 (ug/L)	0	
Alkalinity	206000 (ug/L)	206000 (ug/L)	0	
TDS	222 (mg/L)	202 (mg/L)	9	
TSS	16.0 (mg/L)	17.4 (mg/L)	8	
Ammonia	76.2 (ug/L)	80.9 (ug/L)	6	

\\LDCFILESERVER\Validation\FIELD DUPLICATES\FD_inorganic\37228G6.wpd

LDC #: 37228G6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JSD
2nd Reviewer: [illegible]

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NH_3 was recalculated. Calibration date: 10/21/10

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NH_3	s1	0.0	914106	0.9992	0.9992	Y
		s2	0.1	2766909			
		s3	0.5	7115719			
		s4	1	12926771			
		s5	2	22454106			
		s6	4	46523808			
ICV 18:03 Calibration verification	NH_3	Found 2.082 mg/L	True 2 mg/L		104 %R	104 %R	
ICV 13:40 Calibration verification	CN	0.208 mg/L	0.2 mg/L		104 %R	104 %R	
ICV 12:47 Calibration verification	NO_3/NO_2-N	0.987 mg/L	1 mg/L		99 %R	99 %R	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 3722866

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 2:43	Laboratory control sample	Cl	1530 ug/L	1500 ug/L	102%R	102%R	Y
MS 11:55	Matrix spike sample	OPO4-P	(SSR-SR) 2286 ug/L	2500 ug/L	91%R	91%R	↓
DUP 11:09	Duplicate sample	TSS	205 mg/L	221 mg/L	8%RPD	7%RPD	↓*

Comments: *Rounding

TOTCLC.6

LDC #: 3122860

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: G

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A	Have results been reported and calculated correctly?	
Y N N/A	Are results within the calibrated range of the instruments?	
Y N N/A	Are all detection limits below the CRQL?	

Compound (analyte) results for (6) TDS reported with a positive detect were recalculated and verified using the following equation:

Concentration = $W_1 - W_2$

Recalculation: 71.3434g/100ml − 71.3212g/100ml = 0.0222 g/100ml

W_1 = 71.3434g/100ml
W_2 = 71.3212g/100ml

$0.0222 g/100ml \times \frac{10(100ml)}{1L} \times \frac{1000mg}{1g} = 222 mg/L$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
	1	Total CN	2.1	2.1	Y
	2	Hardness	118000	118000	↓
	3	NH3	97.7	97.7	↓
	4	Alkalinity	118000	118000	↓
	5	Cl	152	152	↓
	6	TDS	222mg/L	222mg/L	↓
	7	TSS	17.4mg/L	17.4mg/L	↓
	8	Hardness	66000	66000	↓
	9	Alkalinity	200000	200000	↓
	10	NO3/NO2-N	256	256	↓

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120664-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-049-GW	460-120664-1	Water	09/21/16
CFMW-023-GW	460-120664-4	Water	09/21/16
CFMW-007-GW	460-120664-5	Water	09/21/16
TRIP BLANK	460-120664-7	Water	09/21/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/24/16	1,1,2-Trichloro-1,2,2-trifluoroethane Cyclohexane	35.1 24.7	All samples in SDG 160-120664-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/26/16	Dichlorobromomethane Chlorodibromomethane Bromoform 1,2-Dibromo-3-chloropropane	21.3 33.6 34.4 40.9	All samples in SDG 160-120664-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D-460-393102 (All samples in SDG 460-120664-1)	1,2-Dichloroethane Dichlorobromomethane	- -	75 (76-121) 75 (76-120)	UJ (all non-detects) UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD %R, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120664-1

Sample	Compound	Flag	A or P	Reason
CFMW-049-GW CFMW-023-GW CFMW-007-GW TRIP BLANK	Dichlorobromomethane Chlorodibromomethane Bromoform 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-049-GW CFMW-023-GW CFMW-007-GW TRIP BLANK	1,2-Dichloroethane Dichlorobromomethane	UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

LDC #: 37228H1 **VALIDATION COMPLETENESS WORKSHEET** Date: 10/23/16
SDG #: 460-120664-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer: EJ
2nd Reviewer: al

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 4
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	as
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-049-GW	460-120664-1	Water	09/21/16
2	CFMW-023-GW	460-120664-4	Water	09/21/16
3	CFMW-007-GW	460-120664-5	Water	09/21/16
4	TRIP BLANK	460-120664-7	Water	09/21/16
5				
6				
7				
8				
9				

Notes:

	MB 460-393102						

LDC #: 37228 H1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37228H1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37228H1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
+	9/24/16	ICV-12	TTT	35.1	All	J+all/A ND
+			SSSS	24.7	↓	↓

ICVvoa.wpd

LDC #: 37228H1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?

Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?

Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	9/26/12	CCV-12	*	21.3		All	J-/UJ/A ND
-	2010		**	33.6		↓	↓
-			X	34.4			
-			MM	40.9			

	*	Dichlorobromomethane
	**	chlorodibromomethane

CONCAL.wpd

LDC #: 37228H1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a LCS required?
Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCSID-	L	( )	75 (76-121)	( )	All	J-/UJ/P ND
	460-393102	*	( )	75 (76-120)	( )	↓	↓
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
	* Dichlorobromomethane		( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37228H1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100std)	Recalculated (RRF 20/100std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/24/2016	M	0.2414	0.2414	0.2381	0.2381	6.8	6.8
	GCMS12		C	0.4381	0.4381	0.4435	0.4435	8.1	8.1
			CC	1.6538	1.6538	1.5582	1.5582	5.9	5.9
			JJJ	1.2851	1.2851	1.3359	1.3359	12.9	12.9

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37224 /

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV-12	9/26/16	M (IS1)	0.2381	0.2693	0.2693	13.1	13.1
			C (IS2)	0.4435	0.3909	0.3909	11.9	11.9
			CC (IS3)	1.5582	1.339	1.339	14.1	14.1
			JJJ (IS4)	1.3359	1.351	1.351	1.1	1.1
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37228H1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: ✓

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	46.1	92	92	0
1,2-Dichloroethane-d4	↓	41.3	83	83	↓
Toluene-d8	↓	43.8	88	88	↓
Bromofluorobenzene	↓	52.4	105	105	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37228H1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: 9

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs/b 460-393102

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	21.5	20.2	107	107	101	101	6	6
Trichloroethene	↓	↓	19.0	18.2	95	95	91	91	4	4
Benzene	↓	↓	17.8	18.6	89	89	93	93	4	4
Toluene	↓	↓	18.9	20.1	94	94	101	101	6	6
Chlorobenzene	↓	↓	18.7	20.3	94	94	101	101	8	8

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228H1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. ICS 460-393102 Toluene

Conc. = $\frac{218285\ (50.0)}{371361\ (1.5582)}$

=

18.9 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 27, 2016

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120664-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-049-GW	460-120664-1	Water	09/21/16
CFMW-EB8-AQ	460-120664-2	Water	09/21/16
CFMW-016a-GW	460-120664-3	Water	09/21/16
CFMW-023-GW	460-120664-4	Water	09/21/16
CFMW-007-GW	460-120664-5	Water	09/21/16
CFMW-008-GW	460-120664-6	Water	09/21/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB8-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

LDC #: 37228H4a
SDG #: 460-120664-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 10/26/16
Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/21/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB= (2)
VII.	Matrix Spike/Matrix Spike Duplicates	N	CS
VIII.	Duplicate sample analysis	N	
IX.	Serial Dilution	N	Not Performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-049-GW	460-120664-1	Water	09/21/16
2	CFMW-EB8-AQ	460-120664-2	Water	09/21/16
3	CFMW-016a-GW	460-120664-3	Water	09/21/16
4	CFMW-023-GW	460-120664-4	Water	09/21/16
5	CFMW-007-GW	460-120664-5	Water	09/21/16
6	CFMW-008-GW	460-120664-6	Water	09/21/16
7				
8				
9				
10				
11				
12				

Notes:

LDC #: 37728A4a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: JD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.			✓	
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

DC #: 37228H49

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?			✓	
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37228H49

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: CV

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-6	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37228H4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 16:48	ICP/MS (Initial calibration)	Ag	40.36 ug/L	40 ug/L	101%R	101%R	Y
ICV 13:55	CVAA (Initial calibration)	Hg	4.768 ug/L	5 ug/L	95%R	95%R	↓
	ICP (Continuing calibration)						
CCV 5:15	ICP/MS (Continuing calibration)	Al	481.47 ug/L	500 ug/L	96%R	96%R	Y
CCV 17:24	CVAA (Contining calibration)	Hg	4.915 ug/L	5 ug/L	98%R	98%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37228H4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JSD
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 3:50	ICP interference check	Cd	100.76 ug/L	100 ug/L	101%R	101%R	Y
LCS 14:04	Laboratory control sample	Hg	0.9816 ug/L	1 ug/L	98%R	98%R	Y
N	Matrix spike		(SSR-SR)				
N	Duplicate						
N	ICP serial dilution						

Comments:

TOTCLC.4SW

LDC #: 37208H4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Ba were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 136.614 ug/L x 2 = 273 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 136.614 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ba	273	273	Y
	2	Ca	71.7	71.7	
	3	Cu	3.6	3.6	
	4	K	600	600	
	5	Na	3050	3050	
	6	Zn	11.5	11.5	

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120664-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-049-GW	460-120664-1	Water	09/21/16
CFMW-023-GW	460-120664-4	Water	09/21/16
CFMW-007-GW	460-120664-5	Water	09/21/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/24/16 (CCV-4)	1,4-Dioxane	21.7	All samples in SDG 460-120664-1	UJ (all non-detects)	A
09/24/16 (CCV-4)	Hexachlorocyclopentadiene Indeno(1,2,3-cd)pyrene Dibenzo(a,h)anthracene Benzo(g,h,i)perylene	28.4 21.4 20.3 25.0	All samples in SDG 460-120664-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D-460-392433 (All samples in SDG 460-120664-1)	2,4-Dimethylphenol	99 (61-95)	-	NA	-
	2-Methylphenol	83 (43-80)	-		
	3&4-Methylphenol	80 (34-77)	-		
	Bis(2-chloroethoxy)methane	105 (67-104)	-		
	Bis(2-chloroethyl) ether	108 (63-106)	107 (63-106)		

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LCS/D-460-392433 (All samples in SDG 460-120664-1)	Caprolactam	39 (≤30)	UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD RPD, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120664-1

Sample	Compound	Flag	A or P	Reason
CFMW-049-GW CFMW-023-GW CFMW-007-GW	1,4-Dioxane	UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-049-GW CFMW-023-GW CFMW-007-GW	Caprolactam	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

LDC #: 37228H2a

SDG #: 460-120664-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

Page: 1 of 1

Reviewer: EJ

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	SW	LCS / D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-049-GW	460-120664-1	Water	09/21/16
2	CFMW-023-GW	460-120664-4	Water	09/21/16
3	CFMW-007-GW	460-120664-5	Water	09/21/16
4				
5				
6				
7				
8				

Notes:

	MB 460-392433						

LDC #: 37228#2a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT
2nd Reviewer: CA

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?			✓	
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?			✓	
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37228H2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FZ
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV.	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37228H2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	9/24/16	CCV-4	III	21.7		all	J-/UJ/A (ND)
+			X	28.4		↓	J+ det/A
+			JJJ	21.4			
+			KKK	20.3			
+			LLL	25.0			

CONCAL.wpd

LDC #: 37228H2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a LCS required?
Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	~~LCS~~ LCS ID -	O	99 (61-95)	( )	( )	All	J+ all / P ND
	460 - 392433	G	83 (43-80)	( )	( )		
		QQQQ	80 (34-77)	( )	( )		
		P	105 (67-104)	( )	( )		
		B	108 (63-106)	~~B~~ 107 (63-106)	( )		
		~~MMMM~~	( )	~~39 (10-43)~~	( )		~~J/UJ/P~~
		MMMM	( )	( )	39 (30)		J/UJ/P
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37228H2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms4	9/16/2016	A	1.3044	1.3044	1.4076	1.4076	9.6	9.6
			M	0.7088	0.7088	0.8284	0.8284	16.7	16.7
			GG	1.0548	1.0548	1.0136	1.0136	7.0	7.0
			UU	0.9687	0.9687	0.9792	0.9792	18.2	18.2
			EEE	0.8710	0.8710	0.8680	0.8680	13.6	13.6
			III	1.0694	1.0694	1.0483	1.0483	5.4	5.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228H2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0322	9/24/16	A (1st IS)	1.4076	1.333	1.333	5.3	5.3
			M (2nd IS)	0.8284	0.7227	0.7227	12.8	12.8
			GG (3rd IS)	1.0136	1.054	1.054	4.0	4.0
			UU (4th IS)	0.9792	0.9557	0.9557	2.4	2.4
			EEE (5th IS)	0.8680	0.8538	0.8538	1.6	1.6
			III (6th IS)	1.0483	0.9776	0.9776	6.7	6.7
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228H2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.33	93	93	0
2-Fluorobiphenyl		8.54	85	85	
Terphenyl-d14		8.87	89	89	
Phenol-d5		2.85	28	28	
2-Fluorophenol		4.76	48	48	
2,4,6-Tribromophenol		6.58	66	66	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37228H2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460-392433

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	34.8	31.2	43	43	39	39	11	11
N-Nitroso-di-n-propylamine	↓	↓	83.4	77.9	104	104	97	97	7	7
4-Chloro-3-methylphenol			77.3	69.2	97	97	86	86	11	11
Acenaphthene			72.2	70.3	90	90	88	88	3	3
Pentachlorophenol	160	160	151	146	94	94	91	91	3	3
Pyrene	80.0	80.0	86.2	83.7	108	108	105	105	3	3

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228H2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. VCS 460-392433 A

Conc. = $\frac{(2358032)(8)(2)(1000)}{(299330)(1.4502)(250)}$

=

34.8 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120664-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-049-GW	460-120664-1	Water	09/21/16
CFMW-EB8-AQ	460-120664-2	Water	09/21/16
CFMW-016a-GW	460-120664-3	Water	09/21/16
CFMW-023-GW	460-120664-4	Water	09/21/16
CFMW-007-GW	460-120664-5	Water	09/21/16
CFMW-008-GW	460-120664-6	Water	09/21/16
CFMW-008-GWMS	460-120664-6MS	Water	09/21/16
CFMW-008-GWMSD	460-120664-6MSD	Water	09/21/16
CFMW-008-GWDUP	460-120664-6DUP	Water	09/21/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB8-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB8-AQ	09/21/16	Chloride	144 ug/L	CFMW-016a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-008-GWMS/MSD (CFMW-049-GW CFMW-023-GW CFMW-007-GW)	Chloride	85 (90-110)	85 (90-110)	J- (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-008-GWMS/MSD (CFMW-049-GW CFMW-016a-GW CFMW-023-GW CFMW-007-GW CFMW-008-GW)	Orthophosphate as P	84 (90-110)	88 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120664-1

Sample	Analyte	Flag	A or P	Reason
CFMW-049-GW CFMW-023-GW CFMW-007-GW	Chloride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-049-GW CFMW-016a-GW CFMW-023-GW CFMW-007-GW CFMW-008-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120664-1

No Sample Data Qualified in this SDG

LDC #: 37228H6

SDG #: 460-120664-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/26/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ SO (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), ortho-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/21/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = (3)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = CFMW-053a-GW MS/D (SDG: 460-120477)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-049-GW	460-120664-1	Water	09/21/16
2	CFMW-EB8-AQ No TSS & TDS	460-120664-2	Water	09/21/16
3	CFMW-016a-GW	460-120664-3	Water	09/21/16
4	CFMW-023-GW	460-120664-4	Water	09/21/16
5	CFMW-007-GW	460-120664-5	Water	09/21/16
6	CFMW-008-GW	460-120664-6	Water	09/21/16
7	CFMW-008-GWMS 9056A 300.0	460-120664-6MS	Water	09/21/16
8	CFMW-008-GWMSD	460-120664-6MSD	Water	09/21/16
9	CFMW-008-GWDUP	460-120664-6DUP	Water	09/21/16
10				
11				
12				
13				
14				

Notes:

DC #: 3722846

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37228H6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 35228HV

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1,3-6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
2	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 7-9	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37228H6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/21/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 3

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	2		No Qual.							
Chloride	144	1440								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37228H6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: JD
2nd Reviewer: a

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	7/8	W	Cl	85 (90-110)	85 (90-110)		1, 4-5*	J-/UJ/A (det)
			OPO4-P	84 (90-110)	88 (90-110)		1, 3-6	J-/UJ/A (nd)

Comments: *#6 was parent sample, but was not rebatched with 1, 4-5.
EB not associated (diff matrix)

LDC #: 37228H6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of CN was recalculated.Calibration date: 9/27/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	CN	s1	0	-0.0296	0.99937	0.99990	Y*
		s2	0.01	0.518			
		s3	0.025	1.24			
		s4	0.05	2.45			
		s5	0.1	4.87			
		s6	0.2	9.65			
		s7	0.4	18.4			
ICV 12:34 Calibration verification	CN	Found 0.206mg/l	True 0.2mg/l		103%R	103%R	Y
ICV 12:42 Calibration verification	NH_3	1.999mg/l	2mg/l		100%R	100%R	
ICV 11:35 Calibration verification	NO_3/NO_2-N	0.978mg/l	1mg/l		98%R	98%R	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37228H6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 17:28	Laboratory control sample	Alkalinity	9148ug/L	87600 ug/L	104.7%R	104.7%R	Y
MS 11:35	Matrix spike sample	OPO4-P	(SSR-SR) 2107ug/L	2500ug/L	84%R	84%R	
MSD 11:53	Duplicate sample	OPO4-P	2208ug/L	2107ug/L	5%RPD	5%RPD	

Comments:

TOTCLC.6

LDC #: 37228H6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (1) CN reported with a positive detect were recalculated and verified using the following equation:

Concentration = 0.0212×A - 5.46e-4 Recalculation: 0.0212×4.42 - 5.46e-4 + 1000 ug/1 mg ≈ 93.2 ug/L

R 3D

A = 4.42

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	CN	93.2	93.2	Y
	2	Cl	144	144	
	3	NH_3	674	674	
	4	NO_3/NO_2-N	264	264	
	5	Hardness	184000	184000	
	6	Alkalinity	347000	347000	
	6	TDS	353 mg/L	353 mg/L	
	6	TSS	543 mg/L	543 mg/L	Y

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120751-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFWC-002-WCL	460-120751-1	Water	09/22/16
TRIP BLANK	460-120751-2	Water	09/22/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/28/16 (10:24)	Chloromethane Bromomethane Acetone 2-Butanone 1,2-Dichloropropane 1,2-Dibromo-3-chloropropane	20.6 30.7 34.0 24.7 23.3 20.6	All samples in SDG 160-120751-1	J- (all detects) UJ (all non-detects)	A
09/28/16 (10:24)	Trichlorofluoromethane	48.3	All samples in SDG 160-120751-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D-460-393368 (All samples in SDG 460-120751-1)	1,2-Dichloropropane cis-1,2-Dichloroethene	- -	74 (77-123) 79 (80-120)	UJ (all non-detects) UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LCS/D-460-393368 (All samples in SDG 460-120751-1)	Chloroethane	34 (≤30)	UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD %R and RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120751-1

Sample	Compound	Flag	A or P	Reason
CFWC-002-WCL TRIP BLANK	Chloromethane Bromomethane Acetone 2-Butanone 1,2-Dichloropropane 1,2-Dibromo-3-chloropropane	J- (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFWC-002-WCL TRIP BLANK	1,2-Dichloropropane cis-1,2-Dichloroethene	UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)
CFWC-002-WCL TRIP BLANK	Chloroethane	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

LDC #: 37228I1

SDG #: 460-120751-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/23/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	%RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	FB = 2
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFWC-002-WCL	460-120751-1	Water	09/22/16
2	TRIP BLANK	460-120751-2	Water	09/22/16
3				
4				
5				
6				
7				
8				
9				

Notes:

	MB 460-393368						

LDC #: 37228I1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?			✓	
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37228 I1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 87228I /

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications	
-	9/28/16	CCV-5	A	20.6		All	J-/UJ/A	ND
-	1024		B	30.7		↓	↓	↓
+			KK	48.3		↓	J+ det/A	ND
-			F	34.0		↓	J-/UJ/A	ND+Det
-			M	24.7		↓	↓	↓
-			Q	23.3		↓	↓	↓
			MM	20.6		↓	↓	↓

CONCAL.wpd

LDC #: 37228I1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a LCS required?
Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460 –	Q	~~7~~ ( )	74 (77-123)	( )	all	J-/UJ/P (all ND)
	39 3368	~~D~~	~~( )~~	~~126 (52-150)~~	F7 ( )		
		QQQ	( )	79 (80-120)	( )	↓	J-/UJ/P
		D	( )	( )	34 (30)	↓	J/UJ/P
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37228I /

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: C

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100std)	Recalculated (RRF 20/100std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/10/2016	M	0.4055	0.4055	0.4321	0.4055	4.1	4.1
	GCMS5		C	0.4288	0.4288	0.4497	0.4288	4.6	4.6
			CC	1.4369	1.4369	1.5059	1.4369	4.8	4.8
			JJJ	1.2251	1.2251	1.2563	1.2251	3.9	3.9

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228I1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV-5 1024	9/28/16	M (IS1)	0.4321	0.3255	0.3255	24.7	24.7
			C (IS2)	0.4497	0.3602	0.3602	19.9	19.9
			CC (IS3)	1.5059	1.418	1.418	5.9	5.9
			JJJ (IS4)	1.2563	1.2444	1.2444	1.0	1.0
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37228I1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	46.2	92	92	0
1,2-Dichloroethane-d4		47.1	94	94	
Toluene-d8		45.8	92	92	
Bromofluorobenzene		58.9	118	118	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37228I /

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA

Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lab ID 460 - 393368

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	16.5	16.7	83	83	84	84	1	1
Trichloroethene	↓	↓	17.3	16.6	86	86	83	83	4	4
Benzene	↓	↓	17.9	17.8	90	90	89	89	1	1
Toluene	↓	↓	18.5	18.8	93	93	94	94	2	2
Chlorobenzene	↓	↓	18.6	19.2	93	93	96	96	3	3

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228I1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #1, F:

Conc. = ( ) ( ) ( ) / ( ) ( ) ( ) ( )

=

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification
	4616 (250) / 230216 = 0.2826 (X)		+ 1.8647		
	X =	Acetone = 11.1	ug/L		

RECALC.1SB.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 25, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120751-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFWC-002-WCL	460-120751-1	Water	09/22/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/29/16	2,2'-Oxybis(1-chloropropane) 2-Methylphenol N-Nitroso-di-n-propylamine 3&4-Methylphenol	23.1 20.4 21.6 20.9	All samples in SDG 460-120751-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

LDC #: 37228I2a

SDG #: 460-120751-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/22/16

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFWC-002-WCL	460-120751-1	Water	09/22/16
2				
3				
4				
5				
6				
7				
8				

Notes:

	HB 460-392928						

LDC #: 3722B12a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37228I2a

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV.	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37228 12a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	9/29/16	ccV-6	H	23.1		All	J+ det/A ND
+	0028		G	20.4			
+			J	21.6		↓	↓
+			QQQ6	20.9			

CONCAL.wpd

LDC #: 372812a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF20 std)	Recalculated (RRF20 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	9/23/2016	A	1.6059	1.6059	1.4502	1.4502	12.2	12.2
			S	0.7643	0.7643	0.8991	0.8991	10.8	10.8
			DD	1.5344	1.5344	1.5414	1.5414	5.0	5.0
			UU	0.9302	0.9302	0.9044	0.9044	8.1	8.1
			EEE	0.6141	0.6141	0.6530	0.6530	10.4	10.4
			III	0.9490	0.9490	0.9924	0.9924	6.3	6.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228I2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0416	9/28/16	A (1st IS)	1.4502	1.574	1.574	8.6	8.6
			S (2nd IS)	0.8991	0.9336	0.9336	3.8	3.8
			DD (3rd IS)	1.5414	1.455	1.455	5.6	5.6
			HH (4th IS)	0.9044	0.9284	0.9284	2.7	2.7
			EEE (5th IS)	0.6530	0.6251	0.6251	4.3	4.3
			III (6th IS)	0.9924	0.9780	0.9780	1.5	1.5
2	CCV 0028	9/29/16	(1st IS)		1.592	1.592	9.8	9.8
			(2nd IS)		0.9502	0.9502	5.7	5.7
			(3rd IS)		1.577	1.577	2.3	2.3
			(4th IS)		0.9322	0.9322	3.1	3.1
			(5th IS)		0.6612	0.6612	1.2	1.2
			(6th IS)		1.019	1.019	2.6	2.6
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228l2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: CA

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.89	89	89	0
2-Fluorobiphenyl		7.73	77	77	
Terphenyl-d14		8.88	89	89	
Phenol-d5		2.39	24	24	
2-Fluorophenol		3.77	38	38	
2,4,6-Tribromophenol		8.05	81	81	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37228I2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: lcs 460 - 392928

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
Phenol	80.0	NA	29.3	NA	37	37				
N-Nitroso-di-n-propylamine	↓	↓	71.4	↓	89	89				
4-Chloro-3-methylphenol	↓	↓	60.7	↓	76	76				
Acenaphthene	↓	↓	63.0	↓	79	79				
Pentachlorophenol	160	↓	137	↓	86	86				
Pyrene	~~NA~~ 80	↓	74.1	↓	93	93	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37228129

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-392928 A

Conc. = $\frac{(2310554)(8)(2)}{(346960)} \frac{(100\ U)}{(250)(1.4502)}$

=

29.3

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 27, 2016

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120751-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFWC-002-WCL	460-120751-1	Water	09/22/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

LDC #: 37228I4a

SDG #: 460-120751-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/26/16

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/20/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	N	CS
VIII.	Duplicate sample analysis	N	
IX.	Serial Dilution	N	Not Performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFWC-002-WCL	460-120751-1	Water	09/22/16
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Notes:

DC #: 37228IVc

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.			✓	
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

DC #: 3722854a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?			✓	
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 37228S49

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___

Comments: Mercury by CVAA if performed

LDC #: 37228S4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 13:14	ICP/MS (Initial calibration)	Ag	41.03 ug/L	40 ug/L	103%R	103%R	Y
ICV 13:52	CVAA (Initial calibration)	Hg	4.954 ug/L	5 ug/L	99%R	99%R	Y
	ICP (Continuing calibration)						
CCV 18:01	ICP/MS (Continuing calibration)	Al	485.3 ug/L	500 ug/L	97%R	97%R	Y
CCV 19:32	CVAA (Contining calibration)	Hg	5.128 ug/L	5 ug/L	103%R	103%R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

calclc.4sw.wpd

LDC #: 37228I4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICSAB 13:29	ICP interference check	Ag	198.5 ug/L	200 ug/L	99%R	99%R	Y
LCS (8:41)	Laboratory control sample	Hg	0.966 ug/L	1 ug/L	97%R	97%R	↓
	Matrix spike		(SSR-SR)				
	Duplicate						
	ICP serial dilution						

Comments: _____

LDC #: 37228SC4q

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for Cs V were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation:

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 2.468 ug/L x 2 = 4.9 ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	474	474	Y
		Sb	0.62	0.62	
		Ba	132	132	
		Ca	7900	7900	
		Cs	11.9	11.9	
		Cu	3.2	3.2	
		Fe	44.7	44.7	
		Mg	228	228	
		K	11000	11000	
		Na	45600	45600	
		V	4.9	4.9	

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 26, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120751-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFWC-002-WCL	460-120751-1	Water	09/22/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Fluoride by Environmental Protection Agency (EPA) Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120751-1

No Sample Data Qualified in this SDG

LDC #: 37228I6

SDG #: 460-120751-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/20/16

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Fluoride (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/22/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	CS
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS/D
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFWC-002-WCL	460-120751-1	Water	09/22/16
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

Notes:

LDC #: 37128516

VALIDATION FINDINGS CHECKLIST

Reviewer: 3SD
2nd Reviewer: G

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.			✓	
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37228SL0

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 37228SY

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 52228J6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: 3D
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of CN was recalculated.Calibration date: 9/27/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration		s1	0	-0.00229	0.99950	0.99993	Y*
		s2	0.01	0.525			
		s3	0.025	1.23			
		s4	0.05	2.4			
		s5	0.1	4.84			
		s6	0.2	9.55			
		s7	0.4	18.3			
ICV 13:40 Calibration verification	CN	Found 0.208mg/L	True 0.2mg/L		104%R	104%R	Y
ICV 15:58 Calibration verification	F	0.904mg/L	1mg/L		90.4%R	90.4%R	
CCV 20:04 Calibration verification	F	0.971mg/L	1mg/L		97.1%R	97.1%R	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37228S6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 20:31	Laboratory control sample	Alkalinity	90250 ug/L	87600 ug/L	103.0%	103.0%	Y
N	Matrix spike sample		(SSR-SR)				
N	Duplicate sample						

Comments:

TOTCLC.6

LDC #: 37228S46

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: CW

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (1) Alkalinity reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

V = 25ml
T = 4.3232 ml
N = 0.02N

Recalculation: $\frac{(4.3232\,ml)(0.02N)(50000)}{25ml} \times \frac{1000\,ug}{1\,mg} \approx 173000\,ug/L$

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	CN	27.8	27.8	Y
		Hardness	178000	178000	↓
		Alkalinity	173000	173000	↓
		F	1700	1700	↓

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 11, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-114944-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-018-SW	460-114944-1	Water	06/06/16
CFSWP-019-SW	460-114944-2	Water	06/06/16
CFSWP-020-SW	460-114944-3	Water	06/06/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/13/16	Vinyl chloride Chloroethane Acetone Methyl acetate Cyclohexane	21.1 35.5 41.9 27.1 21.3	All samples in SDG 460-114944-1	NA	-
06/13/16	Bromomethane	39.4	All samples in SDG 460-114944-1	UJ (all non-detects)	P

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB2-AQ (from SDG 460-114456-1) was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Compound	Concentration	Associated Samples
CFMW-EB2-AQ	05/25/16	Methylene chloride	1.2 ug/L	CFSWP-019-SW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
CFSWP-019-SW	Methylene chloride	0.50 ug/L	1.0U ug/L

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in three samples.

Due to equipment blank contamination, data were qualified as not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-114944-1

Sample	Compound	Flag	A or P	Reason
CFSWP-018-SW CFSWP-019-SW CFSWP-020-SW	Bromomethane	UJ (all non-detects)	P	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-114944-1

Sample	Compound	Modified Final Concentration	A or P
CFSWP-019-SW	Methylene chloride	1.0U ug/L	A

LDC #: 36559A1

SDG #: 460-114944-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/5/16

Page: 1 of 1

Reviewer: FJ

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / Δ	
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration/ICV	A / A	% PSD ≤ 15/30, r^2 1cr ≤ 20
IV.	Continuing calibration	SW	ccr ≤ 20
V.	Laboratory Blanks	Δ	
VI.	Field blanks	SW	EB= CFMW-EB2-AQ (460-114456-1)
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	Δ	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	Δ	
XII.	Compound quantitation RL/LOQ/LODs	Δ	
XIII.	Target compound identification	Δ	
XIV.	System performance	A	
XV.	Overall assessment of data	Δ	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-018-SW	460-114944-1	Water	06/06/16
2	CFSWP-019-SW	460-114944-2	Water	06/06/16
3	CFSWP-020-SW	460-114944-3	Water	06/06/16
4				
5				
6				
7				
8				

Notes:

	MB 460-373222						

LDC #: 36559 A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FJ
2nd Reviewer: G

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓	~~✓~~	FJ	
Were target compounds detected in the field blanks?	✓		~~✓~~	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 36559A

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 36559A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	6/13/16	ccv-13	C	21.1 (ccc)		all	J+ det / ~~A~~ P ND
-	0855		B	39.4		↓	J-/UJ/~~A~~ P
+			D	35.5			J+ det / ~~A~~ P
+			F	41.9			↓
+			QQQQ	27.1			
+			SSSS	21.3		↓	↓

CONCAL.wpd

LDC #: 36559 A 1

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were field blanks identified in this SDG?

Y N N/A Were target compounds detected in the field blanks?

EB= CFMW-EBZ-AQ

Blank units: ug/L **Associated sample units:**_____

Sampling date: 5/25/16

Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: EB Associated Samples: 2

Compound	Blank ID	Sample Identification								
	EB		2							
E	1.2		~~0.0~~ 0.50/1.04							

Blank units:_____ **Associated sample units:**_____

Sampling date:_____

Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other:_____ Associated Samples:_____

Compound	Blank ID	Sample Identification								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as Methylene chloride, Acetone, 2-Butanone and Carbon disulfide that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

LDC #: 36559A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS 13	5/24/2016	M	0.3558	0.3558	0.3535	0.3535	3.60	3.60
			C	0.4921	0.4921	0.4772	0.4772	6.10	6.10
			V	1.5691	1.5691	1.5135	1.5135	4.70	4.70
			BB	0.3192	0.3192	0.3011	0.3011	13.00	13.00

LDC #: 36559A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	ccV 0855	6/13/16	M (IS1)	0.3535	0.3050	0.3050	13.7	13.7
			C (IS2)	0.4772	0.5780	0.5780	21.1	21.1
			V (IS3)	1.5135	1.637	1.637	8.2	8.2
			BB (IS4)	0.3011	0.8644	0.8644	0.8	0.8
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 36559A 1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	42.7	85	85	0
1,2-Dichloroethane-d4	↓	43.7	87	87	↓
Toluene-d8		43.0	86	86	
Bromofluorobenzene		54.7	109	109	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 36559A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs 460-373222

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	24.2	23.0	121	121	115	115	5	5
Trichloroethene	↓	↓	21.8	21.2	109	109	106	106	3	3
Benzene	↓	↓	21.6	21.3	108	108	106	106	2	2
Toluene	↓	↓	21.4	21.4	107	107	107	107	0	0
Chlorobenzene	↓	↓	21.0	20.7	105	105	103	103	2	2

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 36559A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #1, E:

Conc. = $\frac{(908)(50)}{(334696)(0.2893)}$

= 0.47 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 11, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-114944-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-018-SW	460-114944-1	Water	06/06/16
CFSWP-019-SW	460-114944-2	Water	06/06/16
CFSWP-020-SW	460-114944-3	Water	06/06/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB2-AQ (from SDG 460-114456-1) was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Compound	Concentration	Associated Samples
CFMW-EB2-AQ	05/25/16	Bis(2-ethylhexyl)phthalate	5.7 ug/L	CFSWP-019-SW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

LDC #: 36559A2a

SDG #: 460-114944-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/5/16

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / Δ	
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration/ICV	A / Δ	% RSD ≤ 20, 1² 1cr ≤ 30
IV.	Continuing calibration	Δ	ccr ≤ 20
V.	Laboratory Blanks	Δ	
VI.	Field blanks	SW	EB = CFMW - EB2 - AQ (460-114456-1)
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	Δ	
XII.	Compound quantitation RL/LOQ/LODs	Δ	
XIII.	Target compound identification	Δ	
XIV.	System performance	Δ	
XV.	Overall assessment of data	Δ	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-018-SW	460-114944-1	Water	06/06/16
2	CFSWP-019-SW	460-114944-2	Water	06/06/16
3	CFSWP-020-SW	460-114944-3	Water	06/06/16
4				
5				
6				
7				
8				

Notes:

	MB 460-372382						

LDC #: 36559A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
IIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓	~~N~~ F?		
Were target compounds detected in the field blanks?	✓	F	~~N~~	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 36559A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	T. 4-Chloroaniline	MM. 4-Chlorophenyl-phenyl ether	FFF. Di-n-octylphthalate	YYY. 2,3,5-Trimethylnaphthalene
B. Bis (2-chloroethyl) ether	U. Hexachlorobutadiene	NN. Fluorene	GGG. Benzo(b)fluoranthene	ZZZ. Perylene
C. 2-Chlorophenol	V. 4-Chloro-3-methylphenol	OO. 4-Nitroaniline	HHH. Benzo(k)fluoranthene	AAAA. Dibenzothiophene
D. 1,3-Dichlorobenzene	W. 2-Methylnaphthalene	PP. 4,6-Dinitro-2-methylphenol	III. Benzo(a)pyrene	BBBB. Benzo(a)fluoranthene
E. 1,4-Dichlorobenzene	X. Hexachlorocyclopentadiene	QQ. N-Nitrosodiphenylamine	JJJ. Indeno(1,2,3-cd)pyrene	CCCC. Benzo(b)fluorene
F. 1,2-Dichlorobenzene	Y. 2,4,6-Trichlorophenol	RR. 4-Bromophenyl-phenylether	KKK. Dibenz(a,h)anthracene	DDDD. cis/trans-Decalin
G. 2-Methylphenol	Z. 2,4,5-Trichlorophenol	SS. Hexachlorobenzene	LLL. Benzo(g,h,i)perylene	EEEE. Biphenyl
H. 2,2'-Oxybis(1-chloropropane)	AA. 2-Chloronaphthalene	TT. Pentachlorophenol	MMM. Bis(2-Chloroisopropyl)ether	FFFF. Retene
I. 4-Methylphenol	BB. 2-Nitroaniline	UU. Phenanthrene	NNN. Aniline	GGGG. C30-Hopane
J. N-Nitroso-di-n-propylamine.	CC. Dimethylphthalate	VV. Anthracene	OOO. N-Nitrosodimethylamine	HHHH. 1-Methylphenanthrene
K. Hexachloroethane	DD. Acenaphthylene	WW. Carbazole	PPP. Benzoic Acid	IIII. 1,4-Dioxane
L. Nitrobenzene	EE. 2,6-Dinitrotoluene	XX. Di-n-butylphthalate	QQQ. Benzyl alcohol	JJJJ. Acetophenone
M. Isophorone	FF. 3-Nitroaniline	YY. Fluoranthene	RRR. Pyridine	KKKK. Atrazine
N. 2-Nitrophenol	GG. Acenaphthene	ZZ. Pyrene	SSS. Benzidine	LLLL. Benzaldehyde
O. 2,4-Dimethylphenol	HH. 2,4-Dinitrophenol	AAA. Butylbenzylphthalate	TTT. 1-Methylnaphthalene	MMMM. Caprolactam
P. Bis(2-chloroethoxy)methane	II. 4-Nitrophenol	BBB. 3,3'-Dichlorobenzidine	UUU.Benzo(b)thiophene	NNNN.
Q. 2,4-Dichlorophenol	JJ. Dibenzofuran	CCC. Benzo(a)anthracene	VVV.Benzonaphthothiophene	OOOO.
R. 1,2,4-Trichlorobenzene	KK. 2,4-Dinitrotoluene	DDD. Chrysene	WWW.Benzo(e)pyrene	PPPP.
S. Naphthalene	LL. Diethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	XXX. 2,6-Dimethylnaphthalene	QQQQ.

LDC #: 36559 A2a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer: CL

EB = CFMW-EB2-AQ

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target compounds detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 5/25/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2 (ND)

Compound	Blank ID	Sample Identification								
	EB									
> EEE	5.7									

Blank units: _____ **Associated sample units:** _____
Sampling date: _____
Field blank type: (circle one) Field Blank / Rinsate / Other: _____ Associated Samples: _____

Compound	Blank ID	Sample Identification								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as the phthalates and TICs noted above that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

LDC #: 36559A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20 std)	Recalculated (RRF20 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/10/2016	A	2.0967	2.0967	2.1174	2.1174	6.2	6.2
	GCMS6		S	0.9428	0.9428	0.9617	0.9617	7.5	7.5
			GG	1.1207	1.1207	1.2082	1.2082	8.9	8.9
			UU	1.0339	1.0339	1.0536	1.0536	4.2	4.2
			EEE	0.9135	0.9135	0.9126	0.9126	3.4	3.4
			LLL	1.0420	1.0420	1.0239	1.0239	12.9	12.9

LDC #: 36559A02

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20 std)	Recalculated (RRF20 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/13/2016	A	1.4712	1.4712	1.4657	1.4657	4.4	4.4
	GCMS 13		S	1.0260	1.0260	1.0238	1.0238	5.7	5.7
			GG	1.2300	1.2300	1.2098	1.2098	2.6	2.6
			UU	1.1689	1.1689	1.1589	1.1589	2.6	2.6
			EEE	0.8479	0.8479	0.8239	0.8239	6.2	6.2
			LLL	1.3775	1.3775	1.3265	1.3265	9.2	9.2

LDC #: 36559A29

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 11:31	6/13/16	A (1st IS)	1.4657	1.460	1.460	0.4	0.4
			S (2nd IS)	1.0238	1.031	1.031	0.7	0.7
			GG (3rd IS)	1.2098	1.210	1.210	0.0	0
			UU (4th IS)	1.1589	1.175	1.175	1.4	1.4
			EEE (5th IS)	0.8239	0.7930	0.7930	3.8	3.8
			LLL (6th IS)	1.3265	1.370	1.370	3.2	3.2
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 36539A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270~~C~~D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10	7.68	77	77	0
2-Fluorobiphenyl	↓	8.26	83	83	↓
Terphenyl-d14	↓	9.40	94	94	↓
Phenol-d5	↓	2.89	29	29	↓
2-Fluorophenol	↓	4.16	42	42	↓
2,4,6-Tribromophenol	↓	7.78	78	78	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 36559A29

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 372382

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	26.2	27.0	33	33	34	34	3	3
N-Nitroso-di-n-propylamine	↓	↓	64.5	64.1	81	81	80	80	1	1
4-Chloro-3-methylphenol	↓	↓	65.1	64.8	81	81	81	81	0	0
Acenaphthene	↓	↓	62.8	66.5	79	79	83	83	6	6
Pentachlorophenol	160.0	160	151	151	94	94	94	94	0	0
Pyrene	80.0	80.0	82.8	81.3	104	104	102	102	2	2

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 36559A2c

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-372382 Phenol

Conc. = $\frac{205985\ (8)\ (2)\ (1000)}{237472\ (2.1174)\ (250)}$

= 26.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 11, 2016

Parameters: Chlorinated Pesticides

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-114944-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-018-SW	460-114944-1	Water	06/06/16
CFSWP-019-SW	460-114944-2	Water	06/06/16
CFSWP-020-SW	460-114944-3	Water	06/06/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Chlorinated Pesticides by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Retention time windows were established as required by the method.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB2-AQ (from SDG 460-114456-1) was identified as an equipment blank. No contaminants were found.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Column	Surrogate	%R (Limits)	Affected Compound	Flag	A or P
CFSWP-018-SW	CLP-2	Decachlorobiphenyl	149 (16-144)	All compounds	NA	-
CFSWP-019-SW	CLP-2 CLP1	Decachlorobiphenyl Decachlorobiphenyl	171 (16-144) 160 (16-144)	All compounds	NA	-
CFSWP-020-SW	CLP-2 CLP1	Decachlorobiphenyl Decachlorobiphenyl	169 (16-144) 175 (16-144)	All compounds	NA	-

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-372342 (All samples in SDG 460-114944-1)	4,4'-DDD (CLP 2)	156 (61-150)	-	NA	-
	4,4'-DDD (CLP 1)	167 (61-150)	-		
	4,4'-DDE (CLP 1)	158 (58-150)	-		
	4,4'-DDT (CLP 1)	161 (58-150)	-		
	alpha-BHC (CLP 1)	159 (63-150)	-		
	alpha-Chlordane (CLP 1)	153 (60-150)	-		
	beta-BHC (CLP 1)	155 (61-150)	-		
	delta-BHC (CLP 1)	166 (54-150)	-		
	Dieldrin (CLP 1)	162 (60-150)	-		
	Endosulfan I (CLP 1)	156 (64-150)	-		
	Endosulfan II (CLP 1)	159 (62-150)	-		
	Endosulfan sulfate (CLP 1)	157 (62-150)	-		
	Endrin (CLP 2)	151 (60-150)	-		
	Endrin (CLP 1)	164 (60-150)	-		
	Endrin aldehyde (CLP 1)	164 (62-150)	-		
	Endrin ketone (CLP 1)	155 (64-150)	-		
	gamma-BHC (CLP 1)	155 (65-150)	-		
	gamma-Chlordane (CLP 1)	151 (57-150)	-		
	Heptachlor epoxide (CLP 1)	157 (66-150)	-		
	Methoxychlor (CLP 1)	159 (52-150)	-		

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Compound Quantitation

All compound quantitations met validation criteria.

XII. Target Compound Identification

All target compound identifications met validation criteria.

XIII. System Performance

The system performance was acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Chlorinated Pesticides - Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Chlorinated Pesticides - Laboratory Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Chlorinated Pesticides - Field Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

LDC #: 36559A3a
SDG #: 460-114944-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7/5/16
Page: 1 of 1
Reviewer: EJ
2nd Reviewer: [illegible]

METHOD: GC Chlorinated Pesticides (EPA SW846 Method 8081B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC Instrument Performance Check	A	
III.	Initial calibration/ICV	A / A	% RSD/ICV ≤20
IV.	Continuing calibration	A	CCV ≤20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	EB= CFMW-EB2-AQ (460-114456-1)
VII.	Surrogate spikes /IS	SW	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	SW	LCS ID
X.	Field duplicates	N	
XI.	Compound quantitation/RL/LOQ/LODs	A	
XII.	Target compound identification	A	
XIII.	System Performance	A	
XIV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-018-SW	460-114944-1	Water	06/06/16
2	CFSWP-019-SW	460-114944-2	Water	06/06/16
3	CFSWP-020-SW	460-114944-3	Water	06/06/16
4				
5				
6				
7				
8				
9				
10				

Notes:

	MB 460-372342						

LDC #: 36559 A3a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Pesticides (EPA SW 846 Method 8081)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/ECD instrument performance check				
Was the instrument performance found to be acceptable?	✓			
Were Evaluation mix standards analyzed prior to the initial calibration and at beginning of each 12-hour shift?	✓			
Were endrin and 4,4'-DDT breakdowns ≤ 15% for individual breakdown in the Evaluation mix standards?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were the RT windows properly established?	✓			
IIIb. Initial calibration verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration analyzed daily?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
Were all the retention times within the acceptance windows?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks identified in this SDG?	✓	~~✓~~	~~✓~~	FT
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes/Internal Standards				
Were all surrogate percent recovery (%R) within the QC limits?		✓		

LDC #: 36559A3a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
If the percent recovery (%R) of one or more surrogates was outside QC limits, was a reanalysis performed to confirm %R?	~~N~~	~~N~~ ✓		
If any percent recovery (%R) was less than 10 percent, was a reanalysis performed to confirm %R?	~~N~~		✓	
Were internal standard area counts within ± 50% of the average area calculated during calibration?	✓	~~N~~		
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Compound quantitation				
Were compound quantitation and RLs adjusted to reflect all sample dilutions, dry weight factors, and clean-up activities applicable to level IV validation?	✓			
Were relative percent difference (RPD) of the results between two columns ≤ 40%?	✓			
XII. Target compound identification				
Were the retention times of reported detects within the RT windows?	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPA SW 846 Method 8081/8082)

A. alpha-BHC	I. Dieldrin	Q. Endrin ketone	Y. Aroclor-1242	GG. Chlordane
B. beta-BHC	J. 4,4'-DDE	R. Endrin aldehyde	Z. Aroclor-1248	HH. Chlordane (Technical)
C. delta-BHC	K. Endrin	S. alpha-Chlordane	AA. Aroclor-1254	II. Arochlor 1262
D. gamma-BHC	L. Endosulfan II	T. gamma-Chlordane	BB. Aroclor-1260	JJ. Aroclor 1268
E. Heptachlor	M. 4,4'-DDD	U. Toxaphene	CC. 2,4'-DDD	KK. Oxychlordane
F. Aldrin	N. Endosulfan sulfate	V. Aroclor-1016	DD. 2,4'-DDE	LL. trans-Nonachlor
G. Heptachlor epoxide	O. 4,4'-DDT	W. Aroclor-1221	EE. 2,4'-DDT	MM. cis-Nonachlor
H. Endosulfan I	P. Methoxychlor	X. Aroclor-1232	FF. Hexachlorobenzene	NN.

Notes:_____

LDC #: 36559A3a

VALIDATION FINDINDS WORKSHEET
Surrogate Recovery

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: ✓ GC ___ HPLC

Are surrogates required by the method? Yes____ or No____.

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were surrogates spiked into all samples and blanks?

Y N N/A Did all surrogate recoveries (%R) meet the QC limits?

#	Sample ID	Detector/ Column	Surrogate Compound	%R (Limits)		Qualifications	
	1	CLP-2	θ	149	(16 - 144)	J dit/P	ND
					( )		
					( )		
	2	↓	θ	171	(↓)	↓	ND
		CLP1	θ	160	(↓)	↓	
					( )		
					( )		
	3	↓	↓	169	(↓)	↓	ND
		↓	↓	175	(↓)	↓	
					( )		
					( )		
					( )		
	MB 460-372342	↓	↓	148	(↓)	↓	ND
		↓	↓	152	(↓)	↓	
					( )		
					( )		
					( )		
					( )		
					( )		
					( )		
					( )		

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC #: 36559A3c

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: ✓ GC __ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a laboratory control samples (LCS) and laboratory control sample duplicate (LCSD) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent differences (RPD) within the QC limits?

Level IV/D Only

Y N N/A Was an LCS analyzed every 20 samples for each matrix or whenever a sample extraction was performed?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460-372342	see following pages	( )	( )	( )	all	all J+dit/P
			( )	( )	( )		all ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

FORM III
PESTICIDES LAB CONTROL SAMPLE RECOVERY

Lab Name: TestAmerica Edison Job No.: 460-114944-1

SDG No.:

Matrix: Water Level: Low Lab File ID: P4194969.D

Lab ID: LCS 460-372342/2-A Client ID:

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS REC	#
4,4'-DDD M CLP 2	0.800	1.25	156	61-150	*
4,4'-DDD M CLP 1	0.800	1.34	167	61-150	*
4,4'-DDE	0.800	1.15	143	58-150	
4,4'-DDE J CLP1	0.800	1.26	158	58-150	*
4,4'-DDT	0.800	1.18	148	58-150	
4,4'-DDT O CLP1	0.800	1.29	161	58-150	*
Aldrin	0.800	0.841	105	60-150	
Aldrin	0.800	0.942	118	60-150	
alpha-BHC	0.800	1.12	140	63-150	
alpha-BHC A CLP1	0.800	1.27	159	63-150	*
alpha-Chlordane	0.800	1.13	141	60-150	
alpha-Chlordane S CLP1	0.800	1.22	153	60-150	*
beta-BHC	0.800	1.18	148	61-150	
beta-BHC B CLP1	0.800	1.24	155	61-150	*
delta-BHC	0.800	1.18	147	54-150	
delta-BHC C CLP1	0.800	1.33	166	54-150	*
Dieldrin	0.800	1.20	150	60-150	
Dieldrin I CLP1	0.800	1.29	162	60-150	*
Endosulfan I	0.800	1.18	148	64-150	
Endosulfan I H CLP1	0.800	1.25	156	64-150	*
Endosulfan II	0.800	1.19	148	62-150	
Endosulfan II L CLP1	0.800	1.27	159	62-150	*
Endosulfan sulfate	0.800	1.19	148	62-150	
Endosulfan sulfate N CLP1	0.800	1.26	157	62-150	*
Endrin K CLP2	0.800	1.21	151	60-150	*
Endrin K CLP1	0.800	1.31	164	60-150	*
Endrin aldehyde	0.800	1.15	144	62-150	
Endrin aldehyde R CLP1	0.800	1.31	164	62-150	*
Endrin ketone	0.800	1.18	147	64-150	
Endrin ketone Q CLP1	0.800	1.24	155	64-150	*
gamma-BHC (Lindane)	0.800	1.13	141	65-150	
gamma-BHC (Lindane) P CLP1	0.800	1.24	155	65-150	*
gamma-Chlordane	0.800	1.09	136	57-150	
gamma-Chlordane T CLP1	0.800	1.21	151	57-150	*
Heptachlor	0.800	0.885	111	60-150	
Heptachlor	0.800	0.983	123	60-150	
Heptachlor epoxide	0.800	1.14	142	66-150	
Heptachlor epoxide G CLP1	0.800	1.26	157	66-150	*
Methoxychlor	0.800	1.18	147	52-150	
Methoxychlor P CLP1	0.800	1.27	159	52-150	*

Column to be used to flag recovery and RPD values

FORM III 8081B

LDC #: 36559A3a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC X HPLC _____

The calibration factors (CF), average CF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

CF = A/C
average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where:
A = Area of compound
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported 100	Recalculated 100	Reported Average CF (Initial)	Recalculated Average CF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	5/17/2016	Endosulfan 1 CLP2	0.9940	0.9940	0.9673	0.9673	7.5	7.5
	GC4		Methoxychlor	0.5237	0.5237	0.5368	0.5368	5.9	5.9
			Endosulfan 1 CLP1	0.8856	0.8856	0.8689	0.8689	8.8	8.8
			Methoxychlor	0.4581	0.4581	0.4442	0.4442	9.3	9.3

LDC #: 36559A3a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 6 of 7
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC Pesticides (EPA SW 846 Method 8081)

Percent difference (%D) = 100 * (N - C)/N

Where: N = Initial Calibration Factor or Nominal Amount (ng)
C = Calibration Factor from Continuing Calibration Standard or Calculated Amount (ng)

Standard ID	Calibration Date/Time	Compound	Average CF/ CCV Conc	Reported CF/Conc CCV	Recalculated CF/Conc CCV	Reported %D	Recalculated %D
ccv 0521	6/9/16	endosulfan I CLP2	100	102	102.4	2.4	2.4
		Methoxychlor	100	102	102.2	2.2	2.2
		CLP1	100	105	105.5	5.5	5.5
			100	115	114.7	14.7	14.7

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 36559A3a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC Pesticides (EPA SW 846 Method 8081)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

Surrogate	Column	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Tetrachloro-m-xylene	CLP2	100	89.5	~~149~~ 89	89	0
Tetrachloro-m-xylene	1	↓	88.0	88	88	↓
Decachlorobiphenyl	CLP2	↓	148.9	~~89~~ 149	149	↓
Decachlorobiphenyl	1	↓	148.8	144	144	↓

Sample ID:

Surrogate	Column	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Tetrachloro-m-xylene						
Tetrachloro-m-xylene						
Decachlorobiphenyl						
Decachlorobiphenyl						

Sample ID:

Surrogate	Column	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Tetrachloro-m-xylene						
Tetrachloro-m-xylene						
Decachlorobiphenyl						
Decachlorobiphenyl						

Sample ID:

Surrogate	Column	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Tetrachloro-m-xylene						
Tetrachloro-m-xylene						
Decachlorobiphenyl						
Decachlorobiphenyl						

Notes:

LDC #: 36559A3a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicate Results Verification

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC Pesticides (EPA SW 846 Method 8081A)

The percent recoveries (%R) and Relative Percent difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100* (SSC-SC)/SA

Where: SSC = Spiked sample concentration
SA = Spike added
SC = Concentration

RPD = I LCS - LCSD I * 2/(LCS + LCSD)

LCS = Laboratory control sample percent recovery
LCSD = Laboratory control sample duplicate percent recovery

LCS/LCSD samples: LCS 460-372342

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
gamma-BHC	0.80		1.13	0.953	141	141	119	119	17	17
4,4'-DDT	↓		1.18	1.03	148	148	129	129	14	14

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 36559A3c

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: [illegible]
2nd reviewer: [illegible]

METHOD: GC Pesticides (EPA SW 846 Method 8081A)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-372342 4,4 DDT

Conc. = $\frac{(642408260)(100)(1)}{(22837023)(0.9513)(250)}$

= 1.18 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 11, 2016

Parameters: Polychlorinated Biphenyls

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-114944-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-018-SW	460-114944-1	Water	06/06/16
CFSWP-019-SW	460-114944-2	Water	06/06/16
CFSWP-020-SW	460-114944-3	Water	06/06/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Retention time windows were established as required by the method.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB2-AQ (from SDG 460-114456-1) was identified as an equipment blank. No contaminants were found.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

All compound quantitations met validation criteria.

XI. Target Compound Identification

All target compound identifications met validation criteria.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Polychlorinated Biphenyls - Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

LDC #: 36559A3b

SDG #: 460-114944-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/5/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC Polychlorinated Biphenyls (EPA SW846 Method 8082A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	Initial calibration/ICV	A / A	% RSD / ICV ± 20
III.	Continuing calibration	A	CCV ± 20
IV.	Laboratory Blanks	A	
V.	Field blanks	ND	EB = CFMW-EB2-AQ (460-114456-1)
VI.	Surrogate spikes / IS	A	
VII.	Matrix spike/Matrix spike duplicates	N	
VIII.	Laboratory control samples	A	LCS / LD
IX.	Field duplicates	N	
X.	Compound quantitation/RL/LOQ/LODs	A	
XI.	Target compound identification	A	
XII.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-018-SW	460-114944-1	Water	06/06/16
2	CFSWP-019-SW	460-114944-2	Water	06/06/16
3	CFSWP-020-SW	460-114944-3	Water	06/06/16
4				
5				
6				
7				
8				
9				
10				
11				
12				

Notes:

	MB 460-372343					

LDC #: 36559A3b

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: [illegible]

Method: ✓ GC _____ HPLC

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
IIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥0.990?		✓		
Were the RT windows properly established?		✓		
IIb. Initial calibration verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
III. Continuing calibration				
Was a continuing calibration analyzed daily?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
Were all the retention times within the acceptance windows?	✓			
IV. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. Field Blanks				
Were field blanks identified in this SDG?	✓	~~N~~	PJ	
Were target compounds detected in the field blanks?		✓	~~N~~	
VI. Surrogate spikes				
Were all surrogate percent recovery (%R) within the QC limits?	✓			
If the percent recovery (%R) of one or more surrogates was outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	

LDC #: 36559A3b

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
X Compound quantitation				
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI Target compound identification				
Were the retention times of reported detects within the RT windows?	✓			
XIII Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

LDC #: 36559A36

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC X HPLC _____

The calibration factors (CF), average CF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

CF = A/C
average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where:
A = Area of compound
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported 1000	Recalculated 1000	Reported Average CF (Initial)	Recalculated Average CF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	5/11/2016 GC11	PCB 1260-1 RTX CLPI	0.0368	0.0368	0.0393	0.0393	6.6	6.6
			PCB 1260-1 RTX CLPII	0.0220	0.0220	0.0236	0.0236	5.2	5.2

LDC #: 36559A3b

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: ET
2nd Reviewer: [illegible]

METHOD: GC ✓ HPLC _____

The percent difference (%D) of the initial calibration average Calibration Factors (CF) and the continuing calibration CF were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. CF -CF)/ave.CF

Where: ave. CF = initial calibration average CF
CF = continuing calibration CF
A = Area of compound
C = Concentration of compound

#	Standard ID	Calibration Date	Compound	Average CF(ICAL)/ CCV Conc.	Reported CF/ Conc. CCV	Recalculated CF/ Conc. CCV	Reported %D	Recalculated %D
1	CCV 0217	6/9/16	PCB 1260-1 CLP2	1000	1020	1023.4	2.3	2.3
			-2 CLP1	1000	983	983.0	1.7	1.7
2								
3								
4								

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 36559A3b

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 2
Reviewer: FT
2nd reviewer: [illegible]

METHOD: ✓ GC ___ HPLC

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: H 1

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
DCB	CLP2	100	94.0	94	94	0
↓	CLP1	↓	93.3	93	93	0

Sample ID: _____

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC #: 36559A36

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: ✓ GC ___ HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

%Recovery = 100 * (SSC/SA)
RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

Where SSC = Spiked sample concentration
LCS = Laboratory Control Sample
SA = Spike added
LCSD = Laboratory Control Sample duplicate

LCS/LCSD samples: lcs/D 460-372343

Compound	Spike Added (ug/L)		Spike Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
Gasoline (8015)										
Diesel (8015)										
Benzene (8021B)										
Methane (RSK-175)										
2,4-D (8151)										
Dinoseb (8151)										
Naphthalene (8310)										
Anthracene (8310)										
HMX (8330)										
2,4,6-Trinitrotoluene (8330)										
Phorate (8141A)										
Malathion (8141A)										
Formaldehyde (8315A)										
Aroclor 1260	4.0	4.0	5.12	5.05	128	128	126	126	1	1

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 36559A3b

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: ✓ GC __ HPLC

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds within 10% of the reported results?

Concentration= (A)(Fv)(Df) / (RF)(Vs or Ws)(%S/100)

A= Area or height of the compound to be measured
Fv= Final Volume of extract
Df= Dilution Factor
RF= Average response factor of the compound In the initial calibration
Vs= Initial volume of the sample
Ws= Initial weight of the sample
%S= Percent Solid

Example:

Sample ID. LCS 460-372343 Compound Name Aroclor 1260

Concentration = 1279.8 (1) / (250) =

= 5.12 ug/L

#	Sample ID	Compound	Reported Concentrations ( )	Recalculated Results Concentrations ( )	Qualifications
	1260-1 = 68	477757 (20)	= 1213	1260-1 = ~~1274.8~~ 1213.0	
	478	39615 (0.0236)		2 1249.1	
				3 1279.6	
				4 1265.6	
				5 1341.2	
				6 1312.3	
				7 1277.4	
				8 1300.0	
				Ave = 1279.8	

Comments:

SAMPCLC_r1.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 12, 2016

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-114944-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-018-SW	460-114944-1	Water	06/06/16
CFSWP-019-SW	460-114944-2	Water	06/06/16
CFSWP-020-SW	460-114944-3	Water	06/06/16
CFSWP-021-SW	460-114944-4	Water	06/06/16
CFSWP-022-SW	460-114944-5	Water	06/06/16
CFSWP-009-SW	460-114997-1	Water	06/07/16
CFSWP-010-SW	460-114997-2	Water	06/07/16
CFSWP-011-SW	460-114997-3	Water	06/07/16
CFSWP-012-SW	460-114997-4	Water	06/07/16
CFSWP-013-SW	460-114997-5	Water	06/07/16
CFSWP-DUP1-SW	460-114997-6	Water	06/07/16
CFSWP-011-SWMS	460-114997-3MS	Water	06/07/16
CFSWP-011-SWDUP	460-114997-3DUP	Water	06/07/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFSWP-013-SW and CFSWP-DUP1-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-013-SW	CFSWP-DUP1-SW			
Aluminum	30.0	34.6	14 (≤30)	-	-
Barium	78.0	81.2	4 (≤30)	-	-
Calcium	46500	47700	3 (≤30)	-	-
Copper	2.2	11.7	137 (≤30)	J (all detects)	A
Magnesium	10700	11100	4 (≤30)	-	-
Manganese	10.7	11.0	3 (≤30)	-	-
Potassium	530	556	5 (≤30)	-	-
Sodium	2030	2120	4 (≤30)	-	-
Vanadium	1.9	1.8	5 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-114944-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-013-SW CFSWP-DUP1-SW	Copper	J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

LDC #: 36559A4a
SDG #: 460-114944-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7/11/16
Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	6/6-7/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(12)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD=(10,11)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFSWP-018-SW		460-114944-1	Water	06/06/16
2	CFSWP-019-SW		460-114944-2	Water	06/06/16
3	CFSWP-020-SW		460-114944-3	Water	06/06/16
4	CFSWP-021-SW		460-114944-4	Water	06/06/16
5	CFSWP-022-SW		460-114944-5	Water	06/06/16
6	CFSWP-009-SW		460-114997-1	Water	06/07/16
7	CFSWP-010-SW		460-114997-2	Water	06/07/16
8	CFSWP-011-SW		460-114997-3	Water	06/07/16
9	CFSWP-012-SW		460-114997-4	Water	06/07/16
10	CFSWP-013-SW		460-114997-5	Water	06/07/16
11	CFSWP-DUP 1-SW (no space)		460-114997-6	Water	06/07/16
12	CFSWP-011-SWMS	All	460-114997-3MS	Water	06/07/16
13	CFSWP-011-SWDUP	↓	460-114997-3DUP	Water	06/07/16
14					
15					

LDC #: 36559A4q

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 36557A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SO
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 36559A4c

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: [illegible]
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-11	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC-12-13	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC#: 36559A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JD
2nd Reviewer: G

METHOD: Metals (EPA Method 6010B/7000)

Y/N NA Were field duplicate pairs identified in this SDG?
Y/N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	10	11		
Aluminum	30.0	34.6	14	
Barium	78.0	81.2	4	
Calcium	46500	47700	3	
Copper	2.2	11.7	137	Jdet/A (det)
Magnesium	10700	11100	4	
Manganese	10.7	11.0	3	
Potassium	530	556	5	
Sodium	2030	2120	4	
Vanadium	1.9	1.8	5	

LDC #: 36599A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JO
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found}}{\text{True}} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 13:08	ICP/MS (Initial calibration)	Ag	40.17 ug/L	40 ug/L	100%R	100%R	Y
ICV 13:10	CVAA (Initial calibration)	Hg	5.075 ug/L	5 ug/L	102%R	101%R	Y*
	ICP (Continuing calibration)						
CCV 21:19	ICP/MS (Continuing calibration)	Al	515.7 ug/L	500 ug/L	103%R	103%R	Y
CCV 15:44	CVAA (Contining calibration)	Hg	4.756 ug/L	5 ug/L	95%R	95%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 36599A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 18:37	ICP interference check	As	101.57 ug/L	100 ug/L	102%R	102%R	Y
LCS 20:26	Laboratory control sample	Ba	50.38 ug/L	50 ug/L	101%R	101%R	
MS 20:38	Matrix spike	Be	(SSR-SR) 24.54 ug/L	25 ug/L	98%R	98%R	
DUP 20:44	Duplicate	Na	2134 ug/L	2119 ug/L	0.7%RPD	0.7%RPD	
SER 20:56	ICP serial dilution	Mg	11043 ug/L	10769 ug/L	2.5%D	2.5%D	

Comments:

TOTCLC.4SW

LDC #: 36599A49

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (11) As were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 0.35 ug/L x 2 = 0.70 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 0.35 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	As	0.71	0.70	Y*
	2	Al	18.7	18.7	Y
	3	Ba	305	305	Y
	4	Ca	50500	50500	
	5	Cu	2.6	2.6	
	6	Mg	12600	12600	
	7	Mn	7.8	7.8	
	8	K	540	540	
	9	Na	2080	2080	
	10	V	1.9	1.9	
	11	Ca	47700	47700	

Note: *Rounding

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 12, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-114944-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-018-SW	460-114944-1	Water	06/06/16
CFSWP-019-SW	460-114944-2	Water	06/06/16
CFSWP-020-SW	460-114944-3	Water	06/06/16
CFSWP-021-SW	460-114944-4	Water	06/06/16
CFSWP-022-SW	460-114944-5	Water	06/06/16
CFSWP-009-SW	460-114997-1	Water	06/07/16
CFSWP-010-SW	460-114997-2	Water	06/07/16
CFSWP-011-SW	460-114997-3	Water	06/07/16
CFSWP-012-SW	460-114997-4	Water	06/07/16
CFSWP-013-SW	460-114997-5	Water	06/07/16
CFSWP-DUP1-SW	460-114997-6	Water	06/07/16
CFSWP-018-SWDUP	460-114944-1DUP	Water	06/06/16
CFSWP-010-SWMS	460-114997-2MS	Water	06/07/16
CFSWP-010-SWMSD	460-114997-2MSD	Water	06/07/16
CFSWP-011-SWMS	460-114997-3MS	Water	06/07/16
CFSWP-011-SWMSD	460-114997-3MSD	Water	06/07/16
CFSWP-011-SWDUP	460-114997-3DUP	Water	06/07/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-011-SWMS/MSD (All samples in SDG 460-114944-1)	Chloride	-	116 (90-110)	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFSWP-013-SW and CFSWP-DUP1-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (mg/L)		RPD (Limits)	Flag	A or P
	CFSWP-013-SW	CFSWP-DUP1-SW			
Hardness	156000 ug/L	156000 ug/L	0 (≤30)	-	-
Alkalinity	179000 ug/L	160000 ug/L	11 (≤30)	-	-
Total dissolved solids	173 mg/L	159 mg/L	8 (≤30)	-	-
Total suspended solids	1.2 mg/L	1.1 mg/L	9 (≤30)	-	-
Ammonia	23.0U ug/L	27.9 ug/L	19 (≤30)	-	-
Chloride	1780 ug/L	1700 ug/L	5 (≤30)	-	-
Fluoride	39.2 ug/L	38.3 ug/L	2 (≤30)	-	-
Sulfate	1910 ug/L	1960 ug/L	3 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in eleven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-114944-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-018-SW CFSWP-019-SW CFSWP-020-SW CFSWP-021-SW CFSWP-022-SW CFSWP-009-SW CFSWP-010-SW CFSWP-011-SW CFSWP-012-SW CFSWP-013-SW CFSWP-DUP1-SW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-114944-1

No Sample Data Qualified in this SDG

LDC #: 36559A6

SDG #: 460-114944-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/11/16

Page: 1 of 2

Reviewer: SD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ SD (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	6/16 - 7/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = (13,14) (15,16)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	SW	FD = (10,11)
X.	Sample result verification		
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFSWP-018-SW	All	460-114944-1	Water	06/06/16
2	CFSWP-019-SW		460-114944-2	Water	06/06/16
3	CFSWP-020-SW		460-114944-3	Water	06/06/16
4	CFSWP-021-SW		460-114944-4	Water	06/06/16
5	CFSWP-022-SW		460-114944-5	Water	06/06/16
6	CFSWP-009-SW		460-114997-1	Water	06/07/16
7	CFSWP-010-SW		460-114997-2	Water	06/07/16
8	CFSWP-011-SW		460-114997-3	Water	06/07/16
9	CFSWP-012-SW		460-114997-4	Water	06/07/16
10	CFSWP-013-SW		460-114997-5	Water	06/07/16
11	CFSWP-DUP1-SW (No Space)		460-114997-6	Water	06/07/16
12	CFSWP-018-SWDUP	Alk	460-114944-1DUP	Water	06/06/16
13	CFSWP-010-SWMS	CN	460-114997-2MS	Water	06/07/16
14	CFSWP-010-SWMSD		460-114997-2MSD	Water	06/07/16
15	CFSWP-011-SWMS	300.0 NO_3/NO_2 NH_3	460-114997-3MS	Water	06/07/16
16	CFSWP-011-SWMSD		460-114997-3MSD	Water	06/07/16

OPO4 cancelled due to lab error

LDC #: 36559A6

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/11/16

SDG #: 460-114944-1

Page: 2 of 2

Laboratory: Test America, Inc.

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

	Client ID	Lab ID	Matrix	Date
17	CFSWP-011-SWDUP 300.0, TSS, TDS, Hard, Alk	460-114997-3DUP	Water	06/07/16
18				
19				
20				
21				
22				

Notes:

LDC #: 36559A6

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 36559IA4

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 36559A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer:

All circled methods are applicable to each sample.

Sample ID	Parameter
1-11	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:12	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:13-14	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:15-16	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:17	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 TSS Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 36559A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	15/16	W	Cl		116 (90-110)		All	J+det/A (det)

Comments:

LDC#: 36559A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	10	11		
Hardness	156000 (ug/L)	156000 (ug/L)	0	
Alkalinity	179000 (ug/L)	160000 (ug/L)	11	
TDS	173 (mg/L)	159 (mg/L)	8	
TSS	1.2 (mg/L)	1.1 (mg/L)	9	
Ammonia	23.0U (ug/L)	27.9 (ug/L)	19	
Chloride	1780 (ug/L)	1700 (ug/L)	5	
Fluoride	39.2 (ug/L)	38.3 (ug/L)	2	
Sulfate	1910 (ug/L)	1960 (ug/L)	3	

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LDC #: 36559A6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NH_3 was recalculated. Calibration date: 6/14/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NH_3	s1	0.0	248461	0.9995	0.9995	Y
		s2	0.1	1307994			
		s3	0.5	4316647			
		s4	1	8027546			
		s5	2	16854510			
		s6	4	31532148			
ICV 13:12 Calibration verification	NH_3	Found 1.97 mg/L	True 2 mg/L		99%R	99%R	Y
ICV 3:05 ~~2:07~~ JD Calibration verification	SO_4	6.822 mg/L ~~6.922 mg/L~~	7.5 mg/L		91 JD ~~92.3%R~~	91 JD ~~92.3%R~~	↓
ICV 9:21 Calibration verification	NO_3/NO_2-N	0.9918 mg/L	1 mg/L		99%R	99%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 36559A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: AL

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 7:18	Laboratory control sample	Cl	1414 ug/L	1500 ug/L	94%R	94%R	Y
MS 9:47	Matrix spike sample	NO_3/NO_2-N	(SSR-SR) 948.1 ug/L	1000 ug/L	95%R	95%R	↓
DUP 11:30	Duplicate sample	Alkalinity	162 mg/L	162 mg/L	0%RPD	0%RPD	↓

Comments:

TOTCLC.6

LDC #: 36559A10

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd reviewer: CR

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (10) SO4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A-(-42516.040)}{70183.8293}$

Recalculation: $\frac{91428-(-42516.040)}{70183.8293} \times \frac{1000\,ug}{1\,mg} \approx 1910\ ug/L$

A = 91428

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	NH3	178	178	Y
	2	Hardness	180000	180000	
	3	NO3/NO2-N	117	117	
	4	Alkalinity	148000	148000	
	5	TDS	169mg/L	169mg/L	
	6	NH3	48.9	48.9	
	7	TSS	1.5mg/L	1.5mg/L	
	8	Cl	1710	1710	
	9	F	39.5	39.5	
	10	SO4	1910	1910	
	11	Cl	1700	1700	
	3	CN	12.5	12.5	

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 19, 2016

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-119361-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-014-SW	460-119361-1	Water	08/29/16
CFSWP-015-SW	460-119361-2	Water	08/29/16
CFSWP-016-SW	460-119361-3	Water	08/29/16
CFSWP-DUP2-SW	460-119361-4	Water	08/29/16
CFSWP-016-SWMS	460-119361-3MS	Water	08/29/16
CFSWP-016-SWDUP	460-119361-3DUP	Water	08/29/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFSWP-016-SWMS, no data were qualified for Calcium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFSWP-015-SW and CFSWP-DUP2-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-015-SW	CFSWP-DUP2-SW			
Aluminum	44.9	39.7	12 (≤30)	-	-
Barium	103	101	2 (≤30)	-	-
Calcium	47500	44600	6 (≤30)	-	-
Magnesium	13600	13400	1 (≤30)	-	-
Manganese	8.6	5.9	37 (≤30)	J (all detects)	A
Potassium	405	357	13 (≤30)	-	-
Sodium	2870	2620	9 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-119361-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-015-SW CFSWP-DUP2-SW	Manganese	J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-119361-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-119361-1

No Sample Data Qualified in this SDG

LDC #: 37212A4a

SDG #: 460-119361-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/21/16

Page: 1 of 1

Reviewer: SD

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	8/29/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS = (5) = Ca > 4x
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER = (3)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD = (2,4)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-014-SW	460-119361-1	Water	08/29/16
2	CFSWP-015-SW	460-119361-2	Water	08/29/16
3	CFSWP-016-SW	460-119361-3	Water	08/29/16
4	CFSWP-DUP2-SW	460-119361-4	Water	08/29/16
5	CFSWP-016-SWMS AU	460-119361-3MS	Water	08/29/16
6	CFSWP-016-SWDUP J	460-119361-3DUP	Water	08/29/16
7				
8				
9				
10				
11				
12				
13				

Notes:

LDC #: 37212A49

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37212A4

VALIDATION FINDINGS CHECKLIST

Reviewer: ZSD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 31212A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: G

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-4	W	~~Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn,~~ Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC-5-6	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37212A4a

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: SD
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?
Y N N/A Are all correlation coefficients ≥0.995?
Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
	09/02/16	CRI (21:36)	Ca	137 (70-130)	All	No Qual. (>2X RL)

Comments:

LDC#:37212A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: SD
2nd Reviewer: G

METHOD: Metals (EPA Method 6010B/7000)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	2	4		
Aluminum	44.9	39.7	12	
Barium	103	101	2	
Calcium	47500	44600	6	
Magnesium	13600	13400	1	
Manganese	8.6	5.9	37	Jdet/A (det)
Potassium	405	357	13	
Sodium	2870	2620	9	

LDC #: 37212A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer: Q

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 21:18	ICP/MS (Initial calibration)	Sb	39.62 ug/L	40 ug/L	99%R	99%R	Y
ICV 14:12	CVAA (Initial calibration)	Hg	4.871 ug/L	5 ug/L	97%R	97%R	Y
	ICP (Continuing calibration)						
CCV 23:55	ICP/MS (Continuing calibration)	As	51.24 ug/L	50 ug/L	102%R	102%R	Y
CCV 14:37	CVAA (Contining calibration)	Hg	5.043 ug/L	5 ug/L	101%R	101%R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

LDC #: 31212A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICSAB 21:47	ICP interference check	Co	187.05 ug/L	200 ug/L	94%R	94%R	Y
LCS 14:22	Laboratory control sample	Hg	0.958 ug/L	1 ug/L	96%R	96%R	
MS 14:28	Matrix spike	Hg	(SSR-SR) 0.865 ug/L	1 ug/L	87%R	87%R	
DUP 00:31	Duplicate	Ba	102.22 ug/L	99.46 ug/L	3%RPD	3%RPD	
SER 1:10	ICP serial dilution	Ca	44651 ug/L	44419 ug/L	0.52%D	0.52%D	

Comments: _____

TOTCLC.4SW

LDC #: 37202A46

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (3) K were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation:

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 183.41 ug/L x 2 = 367 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	37.6	37.6	Y
	2	Ba	103	103	↓
	3	K	367	367	↓
	4	Na	2620	2620	↓

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 19, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-119361-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-014-SW	460-119361-1	Water	08/29/16
CFSWP-015-SW	460-119361-2	Water	08/29/16
CFSWP-016-SW	460-119361-3	Water	08/29/16
CFSWP-DUP2-SW	460-119361-4	Water	08/29/16
CFSWP-016-SWMS	460-119361-3MS	Water	08/29/16
CFSWP-016-SWMSD	460-119361-3MSD	Water	08/29/16
CFSWP-016-SWDUP	460-119361-3DUP	Water	08/29/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-016-SWMS/MSD (All samples in SDG 460-119361-1)	Orthophosphate as P	79 (90-110)	79 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFSWP-015-SW and CFSWP-DUP2-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFSWP-015-SW	CFSWP-DUP2-SW			
Chloride	2600 ug/L	2610 ug/L	0 (≤30)	-	-
Fluoride	62.4 ug/L	62.3 ug/L	0 (≤30)	-	-
Sulfate	2740 ug/L	3100 ug/L	12 (≤30)	-	-
Total cyanide	2.3 ug/L	2.0 ug/L	14 (≤30)	-	-
Hardness	178000 ug/L	170000 ug/L	5 (≤30)	-	-
Alkalinity	171000 ug/L	169000 ug/L	1 (≤30)	-	-
Total dissolved solids	182 mg/L	176 mg/L	3 (≤30)	-	-
Total suspended solids	1.3 mg/L	1.1 mg/L	17 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-119361-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-014-SW CFSWP-015-SW CFSWP-016-SW CFSWP-DUP2-SW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-119361-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-119361-1

No Sample Data Qualified in this SDG

LDC #: 37212A6

SDG #: 460-119361-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/17/16

Page: 1 of 1

Reviewer: SD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ SO (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), OPO4-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	8/29/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = (5,6)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	SW	FD=(2,4)
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFSWP-014-SW		460-119361-1	Water	08/29/16
2	CFSWP-015-SW		460-119361-2	Water	08/29/16
3	CFSWP-016-SW		460-119361-3	Water	08/29/16
4	CFSWP-DUP2-SW		460-119361-4	Water	08/29/16
5	CFSWP-016-SWMS	353.2 NH3 CN OPO4P	460-119361-3MS	Water	08/29/16
6	CFSWP-016-SWMSD	↓ ↓ ↓ ↓	460-119361-3MSD	Water	08/29/16
7	CFSWP-016-SWDUP	Alk, Hard, TDS, TSS	460-119361-3DUP	Water	08/29/16
8					
9					
10					
11					
12					
13					
14					

Notes:

LDC #: 35212A4

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37212D0

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 31242PO

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer:

All circled methods are applicable to each sample.

Sample ID	Parameter
1-4	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC-5-6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC-7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37212A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: C of 1
Reviewer: JP
2nd Reviewer: a

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	5/6	W	OPO4-P	79 (90-110)	79 (90-110)		All	J-/UJ/A (nd)

Comments:

37212A6.wpd

LDC#: 37212A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JD
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	2	4		
Chloride	2600 (ug/L)	2610 (ug/L)	0	
Fluoride	62.4 (ug/L)	62.3 (ug/L)	0	
Sulfate	2740 (ug/L)	3100 (ug/L)	12	
Total Cyanide	2.3 (ug/L)	2.0 (ug/L)	14	
Hardness	178000 (ug/L)	170000 (ug/L)	5	
Alkalinity	171000 (ug/L)	169000 (ug/L)	1	
TDS	182 (mg/L)	176 (mg/L)	3	
TSS	1.3 (mg/L)	1.1 (mg/L)	17	

\\LDCFILESERVER\Validation\FIELD DUPLICATES\FD_inorganic\37212A6.wpd

LDC #: 37212A6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JSP
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NH3 was recalculated. Calibration date: 9/7/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{\text{Found} \times 100}{\text{True}}$

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NH3	s1	0.0	210374	0.9990	0.9990	Y
		s2	0.1	1083162			
		s3	0.5	4678212			
		s4	1	9984013			
		s5	2	16992880			
		s6	4	35970172			
ICV 13:53 Calibration verification	NH3	Found 1.97mg/L	True 2mg/L		99%R	99%R	Y
ICV 15:39 Calibration verification	F	0.913mg/L	1mg/L		91.3%R	91.3%R	Y
ICV 15:39 Calibration verification	OPO4-P	2.36mg/L	2.5mg/L		94.4%R	94.3%R	Y*

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37222A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 18:59	Laboratory control sample	CN	97ug/L	100ug/L	97%R	97%R	Y
MS 14:16	Matrix spike sample	NH3	(SSR-SR) 933 ug/L	1000ug/L	93%R	93%R	
DUP 15:18	Duplicate sample	Alkalinity	173mg/L	173mg/L	0%RPD	0%RPD	

Comments:

TOTCLC.6

LDC #: 37212A4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: ZSD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A(-11607.612)}{96427.288}$

Dilution = 2x
A = 11715

Recalculation: $\frac{(11715-(11607.612)}{96427.288} \times 2 = 2.670$ mg/L

2.670 mg/L × $\frac{1000 ug}{1 mg}$ = 2670 ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Hardness	164000	164000	Y
	2	CN	2.3	2.3	
	3	Alkalinity	173000	173000	
	4	TDS	176 mg/L	176 mg/L	
	4	TSS	1.1 mg/L	1.1 mg/L	
	1	Cl	2670	2670	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 19, 2016

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-119967-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-003-SW	460-119967-1	Water	09/09/16
CFSWP-004-SW	460-119967-2	Water	09/09/16
CFSWP-005-SW	460-119967-3	Water	09/09/16
CFSWP-006-SW	460-119967-4	Water	09/09/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-119967-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-119967-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-119967-1

No Sample Data Qualified in this SDG

LDC #: 37212E4a
SDG #: 460-119967-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 10/8/16
Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/9/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	N	CS
VIII.	Duplicate sample analysis	N	
IX.	Serial Dilution	N	Not Performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-003-SW	460-119967-1	Water	09/09/16
2	CFSWP-004-SW	460-119967-2	Water	09/09/16
3	CFSWP-005-SW	460-119967-3	Water	09/09/16
4	CFSWP-006-SW	460-119967-4	Water	09/09/16
5				
6				
7				
8				
9				
10				
11				
12				
13				

Notes:

FB cancelled and to be recollected

LDC #: 37272E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.			✓	
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37212E4b

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?			✓	
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 32264

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JSP
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-4	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___

Comments: Mercury by CVAA if performed

LDC #: 37212E4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 18:06	ICP/MS (Initial calibration)	Zn	40.69ug/L	40ug/L	102%R	102%R	Y
ICV 13:41	CVAA (Initial calibration)	Hg	5.083ug/L	5ug/L	102%R	102%R	Y
	ICP (Continuing calibration)						
CCV 19:25	ICP/MS (Continuing calibration)	V	49.85ug/L	50ug/L	100%R	100%R	Y
CCV 16:31	CVAA (Contining calibration)	Hg	4.978ug/L	5ug/L	100%R	100%R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

LDC #: 37212E49

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 18:19	ICP interference check	Ag	177.52 ug/L	200 ug/L	89 %R	89 %R	Y
LCS 19:02	Laboratory control sample	Se	48.38 ug/L	50 ug/L	97 %R	97 %R	Y
	Matrix spike		(SSR-SR)				
	Duplicate						
	ICP serial dilution						

Comments: _____

TOTCLC.4SW

LDC #: 37212EA9

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 31.746 ug/L x 2 = 63.5 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 31.746 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	63.5	63.5	Y
	2	Ba	197	197	↓
	3	Fe	256	256	↓
	4	K	328	328	↓

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 19, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-119967-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-003-SW	460-119967-1	Water	09/09/16
CFSWP-004-SW	460-119967-2	Water	09/09/16
CFSWP-005-SW	460-119967-3	Water	09/09/16
CFSWP-006-SW	460-119967-4	Water	09/09/16
CFSWP-003-SWMS	460-119967-1MS	Water	09/09/16
CFSWP-003-SWMSD	460-119967-1MSD	Water	09/09/16
CFSWP-003-SWDUP	460-119967-1DUP	Water	09/09/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS (All samples in SDG 460-119967-1)	Ammonia	89 (90-110)	NA	UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to LCS %R, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-119967-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW	Ammonia	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-119967-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-119967-1

No Sample Data Qualified in this SDG

LDC #: 37212E6

SDG #: 460-119967-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/18/16

Page: 1 of 1

Reviewer: SD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), ORTHO-P (EPA Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/9/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	MS/D = (5.6)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	SW	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFSWP-003-SW		460-119967-1	Water	09/09/16
2	CFSWP-004-SW		460-119967-2	Water	09/09/16
3	CFSWP-005-SW		460-119967-3	Water	09/09/16
4	CFSWP-006-SW		460-119967-4	Water	09/09/16
5	CFSWP-003-SWMS	353.2 CN	460-119967-1MS	Water	09/09/16
6	CFSWP-003-SWMSD	↓ ↓	460-119967-1MSD	Water	09/09/16
7	CFSWP-003-SWDUP	Alk, Hard	460-119967-1DUP	Water	09/09/16
8					
9					
10					
11					
12					
13					
14					

Notes:

LDC #: 37222E6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37212E10

VALIDATION FINDINGS CHECKLIST

Reviewer: ZSD
2nd Reviewer: CL

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 31225E0

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1-4	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37212E6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010B/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
	LCS	W	NH3	89 (90-110)	n/a	n/a	All	J-/UJ/P (nd)

Comments:

LDC #: 37212E0

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NO_3/NO_2-N was recalculated. Calibration date: 9/16/14

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NO_3/NO_2-N	s1	0.0	0	1.0000	1.0000	Y
		s2	0.1	691840			
		s3	0.5	3549901			
		s4	1	7219917			
		s5	1.5	10808832			
		s6	2	14332007			
ICV 10:24 Calibration verification	NO_3/NO_2-N	Found 1.00 mg/L	True 1 mg/L		100%R	100%R	
ICV 15:39 Calibration verification	OPO_4-P	2.36 mg/L	2.5 mg/L		94.4%R	94.3%R	Y*
ICV 14:47 Calibration verification	NH_3	1.968 mg/L	2 mg/L		98%R	98%R	Y

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37212E6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 11:27	Laboratory control sample	TSS	64.0 mg/L	68.7 mg/L	93.2% R	93.2% R	Y
MS 12:47	Matrix spike sample	Cu	(SSR-SR) 180 ug/L	200 ug/L	90% R	90% R	
DUP 15:50	Duplicate sample	Alkalinity	99.94 mg/L	97.94 mg/L	2% RPD	2% RPD	

Comments:

TOTCLC.6

LDC #: 37212E0

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JSP
2nd reviewer: CL

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (2) CN reported with a positive detect were recalculated and verified using the following equation:

Concentration = 0.0210xA - 1.35e-3 Recalculation: 0.0210 x 10.0 - 1.35e-3 = 0.209 mg/L

A = 10.0

0.209 mg/L x (1000 ug / 1 mg) = 209 ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	SO4	4620	4620	Y
	2	CN	209	209	
	3	NO3/NO2-N	1680	1680	
	4	Hardness	90000	90000	
	4	Alkalinity	86000	86000	
	4	TDS	95.0 mg/L	95.0 mg/L	
	4	TSS	11.6 mg/L	11.6 mg/L	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 19, 2016

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120053-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-002-GW	460-120053-1	Water	09/12/16
CFMW-010-GW	460-120053-2	Water	09/12/16
CFMW-019-GW	460-120053-3	Water	09/12/16
Trip Blank	460-120053-4	Water	09/12/16
CFMW-012-GW	460-120053-5	Water	09/12/16
CFMW-014-GW	460-120053-7	Water	09/12/16
CFMW-015-GW	460-120053-8	Water	09/12/16
CFMW-021-GW	460-120053-9	Water	09/12/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/08/16	Dichlorodifluoromethane	21.1	All samples in SDG 460-120053-1	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/16/16 (0042)	Dichlorodifluoromethane 1,1,2,2-Tetrachloroethane	34.7 23.5	CFMW-002-GW CFMW-010-GW CFMW-019-GW Trip Blank CFMW-012-GW	UJ (all non-detects) UJ (all non-detects)	A
09/16/16 (0042)	Bromomethane 1,1,2-Trichloro-1,2,2-trifluoroethane 1,1-Dichloroethene	29.7 21.6 20.8	CFMW-002-GW CFMW-010-GW CFMW-019-GW Trip Blank CFMW-012-GW	NA	-
09/16/16 (0042)	Tetrachloroethene	20.4	CFMW-019-GW	J+ (all detects)	A
09/16/16 (0042)	Tetrachloroethene	20.4	CFMW-002-GW CFMW-010-GW Trip Blank CFMW-012-GW	NA	-
09/16/16 (1057)	Dichlorodifluoromethane	28.5	CFMW-014-GW CFMW-015-GW CFMW-021-GW	UJ (all non-detects)	A
09/16/16 (1057)	Bromomethane Chloroethane Trichlorofluoromethane Acetone Chlorobromomethane	60.5 26.5 22.1 23.2 22.5	CFMW-014-GW CFMW-015-GW CFMW-021-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LCS 460-390868 (CFMW-002-GW CFMW-010-GW CFMW-019-GW Trip Blank CFMW-012-GW)	Bromomethane	37 (≤30)	UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D and LCS/LCSD RPD, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-120053-1

Sample	Compound	Flag	A or P	Reason
CFMW-002-GW CFMW-010-GW CFMW-019-GW Trip Blank CFMW-012-GW CFMW-014-GW CFMW-015-GW CFMW-021-GW	Dichlorodifluoromethane	UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-002-GW CFMW-010-GW CFMW-019-GW Trip Blank CFMW-012-GW	Dichlorodifluoromethane 1,1,2,2-Tetrachloroethane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-019-GW	Tetrachloroethene	J+ (all detects)	A	Continuing calibration (%D)
CFMW-014-GW CFMW-015-GW CFMW-021-GW	Dichlorodifluoromethane	UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-002-GW CFMW-010-GW CFMW-019-GW Trip Blank CFMW-012-GW	Bromomethane	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

LDC #: 37212F1

SDG #: 460-120053-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/17/16

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / Δ	
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r^2 ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	Δ	
VI.	Field blanks	ND	TB = 4
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	N	OS
IX.	Laboratory control samples	SW	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	Δ	
XII.	Compound quantitation RL/LOQ/LODs	Δ	
XIII.	Target compound identification	Δ	
XIV.	System performance	Δ	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-002-GW	460-120053-1	Water	09/12/16
2 1	CFMW-010-GW	460-120053-2	Water	09/12/16
3 1	CFMW-019-GW	460-120053-3	Water	09/12/16
4 1	Trip Blank	460-120053-4	Water	09/12/16
5 1	CFMW-012-GW	460-120053-5	Water	09/12/16
6 2	CFMW-014-GW	460-120053-7	Water	09/12/16
7 2	CFMW-015-GW	460-120053-8	Water	09/12/16
8 2	CFMW-021-GW	460-120053-9	Water	09/12/16
9				
10				

Notes:

	MB 460-390868					
	MB 460-390949					

LDC #: 37212 F 1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: G

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37212F1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1. chlorobromomethane
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37212F 1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
-	9/8/16	ICV-13	JJ	21.1	All	J-/UJ/A ND

ICVvoa.wpd

LDC #: 37212F1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	9/16/16	CCV-13	JJ	34.7		1→5,	J-/UJ/Δ ND
+	0042		B	29.7		MB 460-390868	J+ det/Δ
+			TTT	21.6			
+			H	20.8			
+			AA	20.4			#3 Det
-			BB	23.5			J-/UJ/Δ ND
			~~Y~~				
-	9/16/16	CCV-13	JJ	28.5		6→8,	J-/UJ/Δ all ND
+	1057		B	60.5		MB 460-390949	J+ det/Δ
+			D	26.5			
+			KK	22.1			
+			F	23.2			
+			Y1	22.5			

LDC #: 37212 F 1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460-	8	( )	( )	37 (30)	1→5,	J/UJ/P ND
	390868		( )	( )	( )	MB 460-390868	
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37212F1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/200std)	Recalculated (RRF 20/100/200std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	9/8/2016	M	0.2753	0.2753	0.2981	0.2981	9.3	9.3
	GCMS13		C	0.5783	0.5783	0.6188	0.6188	7.7	7.7
			HHHH	1.0894	1.0894	1.2875	1.2875	13.4	13.4
			CC	1.6519	1.6519	1.7379	1.7379	6.6	6.6
			JJJ	1.3950	1.3950	1.4540	1.4540	2.5	2.5

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37212F 1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0042	9/16/16	M (IS1)	0.2981	0.2781	0.2781	6.7	6.7
			C (IS2)	0.6188	0.5313	0.5313	14.1	14.1
			CC (IS3)	1.7379	1.736	1.736	0.1	0.1
			JJJ (IS4)	1.4540	1.498	1.498	3.0	3.0
			(IS5)					
2	CCV 10:57	9/16/16	(IS1)		0.2780	0.2780	6.7	6.7
			(IS2)		0.6370	0.6370	2.9	2.9
			(IS3)		1.714	1.714	1.4	1.4
			(IS4)		1.541	1.541	6.0	6.0
			(IS5)					
3								
4								

LDC #: 37212F 1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	48.3	97	97	0
1,2-Dichloroethane-d4	↓	47.4	95	95	↓
Toluene-d8	↓	44.4	89	89	↓
Bromofluorobenzene	↓	50.0	100	100	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37212 F 1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs10 460 - 390868

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	19.9	19.5	99	99	97	97	2	2
Trichloroethene	↓	↓	22.7	23.6	113	113	118	118	4	4
Benzene	↓	↓	18.2	18.9	91	91	95	95	4	4
Toluene	↓	↓	19.1	19.9	96	96	99	99	4	4
Chlorobenzene	↓	↓	20.2	21.2	101	101	106	106	5	5

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37212 F1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #3 . AA

Conc. = $\frac{(1594)(50)}{(455945)(0.3149)}$

= 0.56 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 19, 2016

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120053-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-002-GW	460-120053-1	Water	09/12/16
CFMW-010-GW	460-120053-2	Water	09/12/16
CFMW-019-GW	460-120053-3	Water	09/12/16
CFMW-012-GW	460-120053-5	Water	09/12/16
CFMW-014-GW	460-120053-7	Water	09/12/16
CFMW-015-GW	460-120053-8	Water	09/12/16
CFMW-021-GW	460-120053-9	Water	09/12/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
09/16/16	Caprolactam	21.9	CFMW-002-GW CFMW-010-GW CFMW-019-GW CFMW-012-GW CFMW-014-GW	NA	-
09/17/16	3&4-Methylphenol	22.5	CFMW-015-GW CFMW-021-GW	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. Surrogate recoveries (%R) were not within QC limits for sample CFMW-015-GW. Using professional judgment, no data were qualified when one base or one acid surrogate %R was outside the QC limits and the %R was greater than or equal to 10%.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-390153 (All samples in SDG 460-120053-1)	Di-n-butylphthalate	131 (64-130)	-	NA	-
	Anthracene	-	122 (70-118)		
	Pyrene	-	133 (63-129)		

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-120053-1

Sample	Compound	Flag	A or P	Reason
CFMW-015-GW CFMW-021-GW	3&4-Methylphenol	UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

LDC #: 37212F2a

SDG #: 460-120053-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 10/17/16

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-002-GW	460-120053-1	Water	09/12/16
2	CFMW-010-GW	460-120053-2	Water	09/12/16
3	CFMW-019-GW	460-120053-3	Water	09/12/16
4	CFMW-012-GW	460-120053-5	Water	09/12/16
5	CFMW-014-GW	460-120053-7	Water	09/12/16
6	CFMW-015-GW	460-120053-8	Water	09/12/16
7	CFMW-021-GW	460-120053-9	Water	09/12/16
8				
9				

Notes:

	MB 460-390753						

LDC #: 37212 F2a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: F7
2nd Reviewer: a

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?				✓
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓	✓		
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37212 F2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: C

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	T. 4-Chloroaniline	MM. 4-Chlorophenyl-phenyl ether	FFF. Di-n-octylphthalate	YYY. 2,3,5-Trimethylnaphthalene
B. Bis (2-chloroethyl) ether	U. Hexachlorobutadiene	NN. Fluorene	GGG. Benzo(b)fluoranthene	ZZZ. Perylene
C. 2-Chlorophenol	V. 4-Chloro-3-methylphenol	OO. 4-Nitroaniline	HHH. Benzo(k)fluoranthene	AAAA. Dibenzothiophene
D. 1,3-Dichlorobenzene	W. 2-Methylnaphthalene	PP. 4,6-Dinitro-2-methylphenol	III. Benzo(a)pyrene	BBBB. Benzo(a)fluoranthene
E. 1,4-Dichlorobenzene	X. Hexachlorocyclopentadiene	QQ. N-Nitrosodiphenylamine	JJJ. Indeno(1,2,3-cd)pyrene	CCCC. Benzo(b)fluorene
F. 1,2-Dichlorobenzene	Y. 2,4,6-Trichlorophenol	RR. 4-Bromophenyl-phenylether	KKK. Dibenz(a,h)anthracene	DDDD. cis/trans-Decalin
G. 2-Methylphenol	Z. 2,4,5-Trichlorophenol	SS. Hexachlorobenzene	LLL. Benzo(g,h,i)perylene	EEEE. Biphenyl
H. 2,2'-Oxybis(1-chloropropane)	AA. 2-Chloronaphthalene	TT. Pentachlorophenol	MMM. Bis(2-Chloroisopropyl)ether	FFFF. Retene
I. 4-Methylphenol	BB. 2-Nitroaniline	UU. Phenanthrene	NNN. Aniline	GGGG. C30-Hopane
J. N-Nitroso-di-n-propylamine.	CC. Dimethylphthalate	VV. Anthracene	OOO. N-Nitrosodimethylamine	HHHH. 1-Methylphenanthrene
K. Hexachloroethane	DD. Acenaphthylene	WW. Carbazole	PPP. Benzoic Acid	IIII. 1,4-Dioxane
L. Nitrobenzene	EE. 2,6-Dinitrotoluene	XX. Di-n-butylphthalate	QQQ. Benzyl alcohol	JJJJ. Acetophenone
M. Isophorone	FF. 3-Nitroaniline	YY. Fluoranthene	RRR. Pyridine	KKKK. Atrazine
N. 2-Nitrophenol	GG. Acenaphthene	ZZ. Pyrene	SSS. Benzidine	LLLL. Benzaldehyde
O. 2,4-Dimethylphenol	HH. 2,4-Dinitrophenol	AAA. Butylbenzylphthalate	TTT. 1-Methylnaphthalene	MMMM. Caprolactam
P. Bis(2-chloroethoxy)methane	II. 4-Nitrophenol	BBB. 3,3'-Dichlorobenzidine	UUU.Benzo(b)thiophene	NNNN.
Q. 2,4-Dichlorophenol	JJ. Dibenzofuran	CCC. Benzo(a)anthracene	VVV.Benzonaphthothiophene	OOOO.
R. 1,2,4-Trichlorobenzene	KK. 2,4-Dinitrotoluene	DDD. Chrysene	WWW.Benzo(e)pyrene	PPPP. 3 & 4 Methylpheno
S. Naphthalene	LL. Diethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	XXX. 2,6-Dimethylnaphthalene	QQQQ.

LDC #: 37212F2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 7
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	9/16/16	CCV-6	BB	29.8		MB 460-390753	J-/UJ/A (ND)
+	0130		~~BB~~	22.7		↓	J+ det/A
+	9/16/16 00:00	CCV-6	MMMM	21.9		~~6,7~~ 1→5	J+ det/A (ND)
-	9/17/16 1456	CCV-6	PPPP	22.5		6, 7	J-/UJ/A (ND)

CONCAL.wpd

LDC #: 37212F2a

VALIDATION FINDINGS WORKSHEET

Surrogate Recovery

Reviewer: FT

2nd Reviewer: Q

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Were percent recoveries (%R) for surrogates within QC limits?

Y N (N/A) If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?

Y N (N/A) If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Sample ID	Surrogate	%R (Limits)	Qualifications
	6	PHL	13 (14-39)	no qual
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
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			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	

(NBZ) = Nitrobenzene - d5
(FBP) = 2-Fluorobiphenyl
(TPH) = Terphenyl - d14
(2FP) = 2-Fluorophenol
(TBP) = 2,4,6 -Tribromophenol
(2CP) = 2-Chlorophenol - d4

LDC #: 37212 F2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 7
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 400 -	XX	131 (64-130)	( )	( )	All	J+ det/P (ND)
	390153	VV	( )	122 (70-118)	( )	↓	↓
		ZZ	( )	133 (63-129)	( )	↓	↓
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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LDC #: 37212 F 2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms4	9/16/2016	A	1.3044	1.3044	1.4076	1.4076	9.6	9.6
			M	0.7088	0.7088	0.8284	0.8284	16.7	16.7
			GG	1.0548	1.0548	1.0136	1.0136	7.0	7.0
			UU	0.9687	0.9687	0.9792	0.9792	18.2	18.2
			EEE	0.8710	0.8710	0.8680	0.8680	13.6	13.6
			III	1.0694	1.0694	1.0483	1.0483	5.4	5.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37212F2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	9/11/2016	A	1.4850	1.4850	1.4955	1.4955	10.4	10.4
			S	0.8404	0.8404	0.8960	0.8960	8.7	8.7
			DD	1.5289	1.5289	1.5002	1.5002	2.9	2.9
			UU	0.9460	0.9460	0.9021	0.9021	7.7	7.7
			EEE	0.6572	0.6572	0.6453	0.6453	7.0	7.0
			III	1.0087	1.0087	1.0144	1.0144	6.9	6.9

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37212 F2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 930	9/16/16	A	(1st IS)	1.4955	1.493	1.493	0.1	0.1
			S	(2nd IS)	0.8960	0.9004	0.9004	0.5	0.5
			DD	(3rd IS)	1.5002	1.494	1.494	0.4	0.4
			UU	(4th IS)	0.9021	0.8679	0.8679	3.8	3.8
			EEE	(5th IS)	0.6453	0.6661	0.6661	3.2	3.2
			III	(6th IS)	1.0144	1.015	1.015	0.0	0.0
2	CCV 2338	9/16/16		(1st IS)		1.592	1.592	6.5	6.5
				(2nd IS)		0.8588	0.8588	4.2	4.2
				(3rd IS)		1.414	1.414	5.7	5.7
				(4th IS)		0.8984	0.8984	0.4	0.4
				(5th IS)		0.6759	0.6759	4.7	4.7
				(6th IS)		1.002	1.002	1.3	1.3
3	CCV 1456	9/17/16		(1st IS)		1.472	1.472	1.6	1.6
				(2nd IS)		0.8885	0.8885	0.8	0.8
				(3rd IS)		1.590	1.590	6.0	6.0
				(4th IS)		0.8855	0.8855	1.8	1.8
				(5th IS)		0.7461	0.7461	15.6	15.6
				(6th IS)		0.9612	0.9612	5.3	5.3

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37212 F2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1456	9/17/16	A (1st IS)	1.4955	1.472	1.472	1.6	1.6
			B (2nd IS)	0.8960	0.8885	0.8885	0.8	0.8
			DD (3rd IS)	1.5002	1.590	1.590	6.0	6.0
			UU (4th IS)	0.9021	0.8855	0.8855	1.8	1.8
			EEE (5th IS)	0.6453	0.7461	0.7461	15.6	15.6
			III (6th IS)	1.0144	0.9612	0.9612	5.3	5.3
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37212 F2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #7

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10	8.17	82	82	0
2-Fluorobiphenyl		7.83	78	78.3	
Terphenyl-d14		10.2	102	102	
Phenol-d5		2.79	28	28	
2-Fluorophenol		3.81	38	38	
2,4,6-Tribromophenol		7.88	79	79	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37212F2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460-390753

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80	80	32.4	32.2	41	41	40	40	1	1
N-Nitroso-di-n-propylamine	↓	↓	75.5	76.1	94	94	95	95	1	1
4-Chloro-3-methylphenol			65.3	69.2	82	82	87	87	6	6
Acenaphthene			75.5	77.1	94	94	96	96	2	2
Pentachlorophenol	160	160	177	170	111	111	106	106	4	4
Pyrene	80	80	96.9	106	121	121	133	133	9	9

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37212 F2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-39075:3 A

$$\text{Conc.} = \frac{519343\ (8)\ 2\ (100)}{728554\ (\cancel{1.4955}\ 1.4076)\ (250)}$$

= 32.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 20, 2016

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120053-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-002-GW	460-120053-1	Water	09/12/16
CFMW-010-GW	460-120053-2	Water	09/12/16
CFMW-019-GW	460-120053-3	Water	09/12/16
CFMW-012-GW	460-120053-5	Water	09/12/16
CFMW-EB1-AQ	460-120053-6	Water	09/12/16
CFMW-014-GW	460-120053-7	Water	09/12/16
CFMW-015-GW	460-120053-8	Water	09/12/16
CFMW-021-GW	460-120053-9	Water	09/12/16
CFMW-002-GWMS	460-120053-1MS	Water	09/12/16
CFMW-002-GWDUP	460-120053-1DUP	Water	09/12/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB1-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-002-GWMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

LDC #: 37212F4a
SDG #: 460-120053-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 10/18/16
Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/12/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB=(5) (CRL)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(9) = Ba, Ca, Mg, Na > 4x
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER=(1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-002-GW	460-120053-1	Water	09/12/16
2	CFMW-010-GW	460-120053-2	Water	09/12/16
3	CFMW-019-GW	460-120053-3	Water	09/12/16
4	CFMW-012-GW	460-120053-5	Water	09/12/16
5	CFMW-EB1-AQ	460-120053-6	Water	09/12/16
6	CFMW-014-GW	460-120053-7	Water	09/12/16
7	CFMW-015-GW	460-120053-8	Water	09/12/16
8	CFMW-021-GW	460-120053-9	Water	09/12/16
9	CFMW-002-GWMS 6020	460-120053-1MS	Water	09/12/16
10	CFMW-002-GWDUP L	460-120053-1DUP	Water	09/12/16
11				
12				
13				

Notes:

LDC #: 37212F4a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: 3D
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37254a

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 32227G

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: JD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
QC:9-10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___

Comments: Mercury by CVAA if performed

LDC #: 37242F4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 00:54	ICP/MS (Initial calibration)	Cu	40.06ug/L	40ug/L	100%R	100%R	Y
ICV 17:37	CVAA (Initial calibration)	Hg	4.915ug/L	5ug/L	98%R	98%R	Y
	ICP (Continuing calibration)						
CCV 6:56	ICP/MS (Continuing calibration)	Fe	4918ug/L	5000ug/L	98%R	98%R	Y
CCV 18:01	CVAA (Contining calibration)	Hg	5.294ug/L	5ug/L	106%R	106%R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 3722 F4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 1:9	ICP interference check	Mn	186.5 ug/L	200 ug/L	93%R	93%R	Y
LCS 15:10	Laboratory control sample	Hg	1.03 ug/L	1 ug/L	103%R	103%R	
MS 1:59	Matrix spike	Tl	(SSR-SR) 8.16 ug/L	8 ug/L	102%R	102%R	
DUP 2:03	Duplicate	Na	174228 ug/L	172855 ug/L	0.8%RPD	0.8%RPD	
SER 2:13	ICP serial dilution	Mg	11356 ug/L	10921 ug/L	4.0%D	4.0%D	

Comments: _____

TOTCLC.4SW

LDC #: 37212F44

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (6) Mg were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 8406.71 ug/L x 2 = 16800 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 8406.71 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	254	254	Y
	2	As	5.2	5.2	
	3	Ca	55100	55100	
	4	Cu	12.6	12.6	
	5	Na	72.9	72.9	
	6	Mg	16800	16800	
	7	Ni	7.7	7.7	
	8	K	1000	1000	

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: October 19, 2016

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-120053-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-002-GW	460-120053-1	Water	09/12/16
CFMW-010-GW	460-120053-2	Water	09/12/16
CFMW-019-GW	460-120053-3	Water	09/12/16
CFMW-012-GW	460-120053-5	Water	09/12/16
CFMW-EB1-AQ	460-120053-6	Water	09/12/16
CFMW-014-GW	460-120053-7	Water	09/12/16
CFMW-015-GW	460-120053-8	Water	09/12/16
CFMW-021-GW	460-120053-9	Water	09/12/16
CFMW-002-GWDUP	460-120053-1DUP	Water	09/12/16
CFMW-010-GWDUP	460-120053-2DUP	Water	09/12/16
CFMW-015-GWMS	460-120053-8MS	Water	09/12/16
CFMW-015-GWMSD	460-120053-8MSD	Water	09/12/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB1-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB1-AQ	09/12/16	Chloride	181 ug/L	All samples in SDG 460-120053-1

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. For CFMW-015-GWMS/MSD, no data were qualified for Total Cyanide percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-015-GWMS/MSD (CFMW-002-GW CFMW-010-GW CFMW-019-GW CFMW-012-GW CFMW-014-GW CFMW-015-GW CFMW-021-GW)	Total cyanide	24 (≤20)	J (all detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD RPD, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-120053-1

Sample	Analyte	Flag	A or P	Reason
CFMW-002-GW CFMW-010-GW CFMW-019-GW CFMW-012-GW CFMW-014-GW CFMW-015-GW CFMW-021-GW	Total cyanide	J (all detects)	A	Matrix spike/Matrix spike duplicate (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-120053-1

No Sample Data Qualified in this SDG

LDC #: 37212F6
SDG #: 460-120053-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 10/8/16
Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ JD (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D), OPO4-P (EPA Method ~~300.0~~ 6056A) JD

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	9/12/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=(5)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D=(11,12)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFMW-002-GW		460-120053-1	Water	09/12/16
2	CFMW-010-GW		460-120053-2	Water	09/12/16
3	CFMW-019-GW		460-120053-3	Water	09/12/16
4	CFMW-012-GW		460-120053-5	Water	09/12/16
5	CFMW-EB1-AQ	NO TSS/TDS	460-120053-6	Water	09/12/16
6	CFMW-014-GW		460-120053-7	Water	09/12/16
7	CFMW-015-GW		460-120053-8	Water	09/12/16
8	CFMW-021-GW		460-120053-9	Water	09/12/16
9	CFMW-002-GWDUP	Hardness	460-120053-1DUP	Water	09/12/16
10	CFMW-010-GWDUP	TDS	460-120053-2DUP	Water	09/12/16
11	CFMW-015-GWMS	CN	460-120053-8MS	Water	09/12/16
12	CFMW-015-GWMSD	↓	460-120053-8MSD	Water	09/12/16
13					
14					

Notes:

LDC #: 37212F6

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37222F0

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: C

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37212F60

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1-4, 6-8	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 9	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 11-12	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37212F6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 09/12/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: All

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	5		No Qualifiers							
Chloride	181	1810								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37212F6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: Inorganics (See Cover)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	11/12	W	Total CN			24 (≤20)	1-4, 6-8*	J/UJ/A (det)

Comments: 11/12: Total CN > 4X
*EB not associated (different matrix)

LDC #: 37242F6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: Q

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of CN was recalculated. Calibration date: 9/15/10

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	CN	s1	0	0.0164	0.99986	0.99993	Y*
		s2	0.01	0.562			
		s3	0.025	1.27			
		s4	0.05	2.51			
		s5	0.1	4.95			
		s6	0.2	9.71			
		s7	0.4	18.8			
ICV 13:30 Calibration verification	CN	Found 0.208 mg/l	True 0.2 mg/l		104%R	104%R	Y
ICV 16:08 Calibration verification	NH_3	1.964 mg/l	2 mg/l		98%R	98%R	↓
ICV 10:21 Calibration verification	NO_3/NO_2-N	1.00 mg/l	1 mg/l		100%R	100%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 31212F6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 9:15	Laboratory control sample	TDS	358 mg/L	339 mg/L	105.6%R	105.6%R	Y
MS 13:43	Matrix spike sample	Cr	(SSR-SR) 378 ug/L	200 ug/L	190%R	180%R	Y*
D of 12:20	Duplicate sample	Hardness	140 mg/L	140 mg/L	0%RPD	0%RPD	Y

Comments: *Rounding

TOTCLC.6

LDC #: 37242F6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JS
2nd reviewer:

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (3) NO_3/NO_2-N reported with a positive detect were recalculated and verified using the following equation:

Concentration =

Recalculation: 1.4463 mg/L × 5 = 7.232 mg/L

RD = 1.4463 mg/L
Dil = 5

$7.232 \text{ mg/L} \times \frac{1000 \text{ ug}}{1 \text{ mg}} = 7230 \text{ ug/L}$

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	NH_3	93.0	93.0	Y
	2	CN	7320	7320	
	3	NO_3/NO_2-N	7230	7230	
	4	Hardness	48000	48000	
	5	Cl	181	181	
	6	Alkalinity	476000	476000	
	7	OPO_4-P	267	267	
	8	TDS	342 mg/L	342 mg/L	
	8	TSS	5.3 mg/L	5.3 mg/L	

Note:

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

January 12, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on December 13, 2016. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #37739:

SDG #	Fraction
460-124553-1, 460-124639-1 460-124726-1, 460-124783-1	Volatiles, Semivolatiles, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

EDD

LDC #37739 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		CN- (335.4/ 9012B)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		TDS (2540C)		TSS (2540D)									
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-124553-1	12/13/16	01/05/17	-	-	-	-	7	0	-	-	7	0	7	0	7	0	7	0	7	0	7	0	7	0	6	0	6	0								
B	460-124639-1	12/13/16	01/05/17	-	-	-	-	7	0	-	-	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0	7	0								
C	460-124726-1	12/13/16	01/05/17	-	-	-	-	5	0	-	-	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0								
D	460-124783-1	12/13/16	01/05/17	3	0	2	0	1	0	4	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	4	0	4	0								
Total	T/CR			3	0	2	0	20	0	4	0	24	0	24	0	24	0	24	0	24	0	24	0	24	0	22	0	22	0	0	0	0	0	0	0	0	241

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 6, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124553-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-013-SW	460-124553-1	Water	11/30/16
CFSWP-014-SW	460-124553-2	Water	11/30/16
CFSWP-015-SW	460-124553-3	Water	11/30/16
CFSWP-016-SW	460-124553-4	Water	11/30/16
CFSWP-DUP3-SW	460-124553-5	Water	11/30/16
CFSWP-FB2-AQ	460-124553-6	Water	11/30/16
CFSWP-021-SW	460-124553-7	Water	11/30/16
CFSWP-DUP3-SWMS	460-124553-5MS	Water	11/30/16
CFSWP-DUP3-SWDUP	460-124553-5DUP	Water	11/30/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFSWP-FB2-AQ was identified as a field blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFSWP-014-SW and CFSWP-DUP3-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-014-SW	CFSWP-DUP3-SW			
Aluminum	18.2U	27.4	40 (≤30)	J (all detects) UJ (all non-detects)	A
Barium	101	103	2 (≤30)	-	-
Calcium	52800	53300	1 (≤30)	-	-
Magnesium	13500	13900	3 (≤30)	-	-
Manganese	5.2	3.9	29 (≤30)	-	-
Potassium	481	486	1 (≤30)	-	-
Sodium	2590	2660	3 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-124553-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-014-SW CFSWP-DUP3-SW	Aluminum	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-124553-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-124553-1

No Sample Data Qualified in this SDG

LDC #: 37739A4a

SDG #: 460-124553-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/3/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer:

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	11/30/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	FB=(6)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS/D=CFSWP-019-SW MS/D (SDG: 460-124639-1)
VIII.	Duplicate sample analysis	A	DUP=CFSWP-019-SW DUP (SDG: 460-124639-1)
IX.	Serial Dilution	A	SER=CFSWP-019-SW (SDG: 460-124639-1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD=(2.5)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-013-SW	460-124553-1	Water	11/30/16
2	CFSWP-014-SW	460-124553-2	Water	11/30/16
3	CFSWP-015-SW	460-124553-3	Water	11/30/16
4	CFSWP-016-SW	460-124553-4	Water	11/30/16
5	CFSWP-DUP3-SW	460-124553-5	Water	11/30/16
6	CFSWP-FB2-AQ	460-124553-6	Water	11/30/16
7	CFSWP-021-SW	460-124553-7	Water	11/30/16
8	CFSWP-DUP3-SWMS	460-124553-5MS	Water	11/30/16
9	CFSWP-DUP3-SWDUP	460-124553-5DUP	Water	11/30/16
10				
11				
12				
13				
14				

Notes:

LDC #: 35733A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SB
2nd Reviewer: _____

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37739A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: _____

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37739A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: SD
2nd reviewer: _____

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-7	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC-8-9	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC#: 37739A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: JSD
2nd Reviewer:

METHOD: Metals (EPA Method 6010B/7000)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	2	5		
Aluminum	18.2U	27.4	40	J/UJ/A (det/nd)
Barium	101	103	2	
Calcium	52800	53300	1	
Magnesium	13500	13900	3	
Manganese	5.2	3.9	29	
Potassium	481	486	1	
Sodium	2590	2660	3	

LDC #: 37739A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JD
2nd Reviewer: _____

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 16:41	ICP/MS (Initial calibration)	As	40.09ug/L	40ug/L	100%R	100%R	Y
ICV 13:26	CVAA (Initial calibration)	Hg	5.01ug/L	5ug/L	100%R	100%R	↓
	ICP (Continuing calibration)						
CCV 17:45	ICP/MS (Continuing calibration)	Ba	51.75ug/L	50ug/L	104%R	104%R	Y
CCV 13:48	CVAA (Contining calibration)	Hg	4.97ug/L	5ug/L	99%R	99%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37739A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 16:53	ICP interference check	Cr	206.9 ug/L	200 ug/L	103%R	103%R	Y
LCS 17:10	Laboratory control sample	Be	26.3 ug/L	25 ug/L	105%R	105%R	↓
MS 13:41	Matrix spike	Hg	(SSR-SR) 0.956 ug/L	1 ug/L	96%R	96%R	↓
DUP=NC	Duplicate						
SER=NC	ICP serial dilution						

Comments:

Only Ag & Hg associated with MS & DUP & SER

TOTCLC.4SW

LDC #: 37739A4g

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 804.465 ug/L x 2 = 1610 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 804.465 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	1610	1610	Y
	2	Na	2590	2590	
	3	Mg	13600	13600	
	4	Ba	105	105	
	5	Ca	53300	53300	
	7	Zn	19.2	19.2	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 6, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124553-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-013-SW	460-124553-1	Water	11/30/16
CFSWP-014-SW	460-124553-2	Water	11/30/16
CFSWP-015-SW	460-124553-3	Water	11/30/16
CFSWP-016-SW	460-124553-4	Water	11/30/16
CFSWP-DUP3-SW	460-124553-5	Water	11/30/16
CFSWP-FB2-AQ	460-124553-6	Water	11/30/16
CFSWP-021-SW	460-124553-7	Water	11/30/16
CFSWP-013-SWMS	460-124553-1MS	Water	11/30/16
CFSWP-013-SWMSD	460-124553-1MSD	Water	11/30/16
CFSWP-014-SWMS	460-124553-2MS	Water	11/30/16
CFSWP-014-SWMSD	460-124553-2MSD	Water	11/30/16
CFSWP-015-SWMS	460-124553-3MS	Water	11/30/16
CFSWP-015-SWMSD	460-124553-3MSD	Water	11/30/16
CFSWP-021-SWMS	460-124553-7MS	Water	11/30/16
CFSWP-021-SWMSD	460-124553-7MSD	Water	11/30/16
CFSWP-021-SWDUP	460-124553-7DUP	Water	11/30/16
CFSWP-014-SWDUP	460-124553-2DUP	Water	11/30/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFSWP-FB2-AQ was identified as a field blank. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-019-SWMS/MSD (CFSWP-013-SW CFSWP-014-SW CFSWP-015-SW CFSWP-016-SW CFSWP-DUP3-SW CFSWP-021-SW)	Fluoride	88 (90-110)	-	J- (all detects)	A
CFSWP-019-SWMS/MSD (CFSWP-013-SW CFSWP-014-SW CFSWP-015-SW CFSWP-016-SW CFSWP-DUP3-SW)	Sulfate	-	89 (90-110)	J- (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-019-SWDLMS/MSD (CFSWP-013-SW CFSWP-014-SW CFSWP-015-SW CFSWP-016-SW CFSWP-DUP3-SW CFSWP-021-SW)	Chloride	66 (90-110)	70 (90-110)	J- (all detects)	A
CFSWP-019-SWDLMS/MSD (CFSWP-021-SW)	Sulfate	83 (90-110)	83 (90-110)	J- (all detects)	A
CFSWP-021-SWMS/MSD (CFSWP-013-SW CFSWP-014-SW CFSWP-015-SW CFSWP-016-SW CFSWP-DUP3-SW CFSWP-021-SW)	Orthophosphate as P	76 (90-110)	75 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFSWP-014-SW and CFSWP-DUP3-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFSWP-014-SW	CFSWP-DUP3-SW			
Total Cyanide	15.3 ug/L	2.0U ug/L	154 (≤30)	J (all detects) UJ (all non-detects)	A
Hardness	196000 ug/L	192000 ug/L	2 (≤30)	-	-
Alkalinity	190000 ug/L	191000 ug/L	1 (≤30)	-	-

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFSWP-014-SW	CFSWP-DUP3-SW			
TDS	172 mg/L	185 mg/L	7 (≤30)	-	-
Fluoride	117 ug/L	123 ug/L	5 (≤30)	-	-
Sulfate	2230 ug/L	2240 ug/L	0 (≤30)	-	-
Chloride	1580 ug/L	1630 ug/L	3 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and field duplicate RPD, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-124553-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-013-SW CFSWP-014-SW CFSWP-015-SW CFSWP-016-SW CFSWP-DUP3-SW CFSWP-021-SW	Fluoride Chloride	J- (all detects) J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-013-SW CFSWP-014-SW CFSWP-015-SW CFSWP-016-SW CFSWP-DUP3-SW CFSWP-021-SW	Sulfate	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-013-SW CFSWP-014-SW CFSWP-015-SW CFSWP-016-SW CFSWP-DUP3-SW CFSWP-021-SW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-014-SW CFSWP-DUP3-SW	Total Cyanide	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-124553-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-124553-1

No Sample Data Qualified in this SDG

LDC #: 37739A6

SDG #: 460-124553-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/5/17

Page: 1 of 1

Reviewer: SD

2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	11/30/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	ND	FB = (6)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = CFSWP-019-SW MS/D (SDG: 460-124639-1)
VII.	Duplicate sample analysis	A	DUP = CFSWP-019-SW DUP (SDG: 460-124639-1)
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	SW	FD = (2, 5)
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID		Lab ID	Matrix	Date
1	CFSWP-013-SW		460-124553-1	Water	11/30/16
2	CFSWP-014-SW		460-124553-2	Water	11/30/16
3	CFSWP-015-SW		460-124553-3	Water	11/30/16
4	CFSWP-016-SW		460-124553-4	Water	11/30/16
5	CFSWP-DUP3-SW		460-124553-5	Water	11/30/16
6	CFSWP-FB2-AQ	No TDS or TSS	460-124553-6	Water	11/30/16
7	CFSWP-021-SW		460-124553-7	Water	11/30/16
8	CFSWP-013-SWMS	Cl	460-124553-1MS	Water	11/30/16
9	CFSWP-013-SWMSD	↓	460-124553-1MSD	Water	11/30/16
10	CFSWP-014-SWMS	NH3	460-124553-2MS	Water	11/30/16
11	CFSWP-014-SWMSD	↓	460-124553-2MSD	Water	11/30/16
12	CFSWP-015-SWMS	353.2	460-124553-3MS	Water	11/30/16
13	CFSWP-015-SWMSD	↓	460-124553-3MSD	Water	11/30/16
14	CFSWP-021-SWMS	OPO4	460-124553-7MS	Water	11/30/16
15	CFSWP-021-SWMSD	↓	460-124553-7MSD	Water	11/30/16
16	CFSWP-021-SWDUP	↓	460-124553-7DUP	Water	11/30/16

17) #2 DUP

AIK

LDC #: 37739A6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer:

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 31739A6

VALIDATION FINDINGS CHECKLIST

Reviewer: 3rd
2nd Reviewer: _____

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37739A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: _____

All circled methods are applicable to each sample.

Sample ID	Parameter
1-5, 7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:8-9	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:10-11	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:12-13	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:14-16	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:17	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments: _____

LDC #: 37739A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: 3D
2nd Reviewer:

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	CFSWP-019-SW MS/D (SDG: 460-124639-1)	W	F	88 (90-110)			1-5, 7	J-/UJ/A (det)
			SO4		89 (90-110)		1-5	J-/UJ/A (det)
	CSFWP-019-SW MS/D DL (SDG: 460-124639-1)	W	Cl	66 (90-110)	70 (90-110)		1-5, 7	J-/UJ/A (det)
			SO4	83 (90-110)	83 (90-110)		7	J-/UJ/A (det)
	14/15	W	OPO4-P	76 (90-110)	75 (90-110)		1-5, 7	J-/UJ/A (nd)

Comments:

LDC#: 37739A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JD
2nd Reviewer:

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	2	5		
Total Cyanide	15.3 (ug/L)	2.0U (ug/L)	154	J/UJ/A (det/nd)
Hardness	196000 (ug/L)	192000 (ug/L)	2	
Alkalinity	190000 (ug/L)	191000 (ug/L)	1	
TDS	172 (mg/L)	185 (mg/L)	7	
Fluoride	117 (ug/L)	123 (ug/L)	5	
Sulfate	2230 (ug/L)	2240 (ug/L)	0	
Chloride	1580 (ug/L)	1630 (ug/L)	3	

\\LDCFILESERVER\Validation\FIELD DUPLICATES\FD_inorganic\37739A6.wpd

LDC #: 57739B6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: ____

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NH3 was recalculated. Calibration date: 12/2/10

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NH3	s1	0.0	301603	0.9997	0.9997	Y
		s2	0.1	1680726			
		s3	0.5	5439533			
		s4	1	9443712			
		s5	2	17807418			
		s6	4	34403196			
ICV 14:46 Calibration verification	NH3	Found 2.02 mg/L	True 2 mg/L		101%R	101%R	Y
ICV 23:10 Calibration verification	OPO4-P	2.38 mg/L	2.5 mg/L		95.6%R	95.5%R	Y*
ICV 22:52 Calibration verification	Cl	1.464 mg/L	1.5 mg/L		97.6%R	97.6%R	Y

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 51739HAY

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: _____

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 8:21	Laboratory control sample	TDS	308mg/L	351mg/L	87.7%R	87.7%R	Y
MS 14:03	Matrix spike sample	CN	(SSR-SR) 191ug/L	200ug/L	96%R	95%R	Y*
DUP 12:32	Duplicate sample	Alkalinity	192mg/L	190mg/L	1%RPD	1%RPD	Y

Comments: *Rounding

TOTCLC.6

LDC #: 31738AU

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd reviewer:

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (2) Total CN reported with a positive detect were recalculated and verified using the following equation:

Concentration = 0.0206xA - 1.56e-3 Recalculation: 0.0206x0.818 - 1.56e-3 = 0.0153mg/L

A = 0.818 0.0153mg/L x 1000ug/1mg = 15.3ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Hardness	170000	170000	Y
	2	Total CN	15.3	15.3	
	3	Alkalinity	193000	193000	
	4	TDS	196 mg/L	196mg/L	
	5	F	123	123	
	7	TSS	72.8mg/L	72.8mg/L	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 6, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124639-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-003-SW	460-124639-1	Water	12/01/16
CFSWP-004-SW	460-124639-2	Water	12/01/16
CFSWP-005-SW	460-124639-3	Water	12/01/16
CFSWP-006-SW	460-124639-4	Water	12/01/16
CFSWP-018-SW	460-124639-5	Water	12/01/16
CFSWP-019-SW	460-124639-6	Water	12/01/16
CFSWP-020-SW	460-124639-7	Water	12/01/16
CFSWP-019-SWMS	460-124639-6MS	Water	12/01/16
CFSWP-019-SWDUP	460-124639-6DUP	Water	12/01/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-124639-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-124639-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-124639-1

No Sample Data Qualified in this SDG

LDC #: 37739B4a

SDG #: 460-124639-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/4/17

Page: 1 of 1

Reviewer: SD

2nd Reviewer:

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/1/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS= (8)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER= (6)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-003-SW	460-124639-1	Water	12/01/16
2	CFSWP-004-SW	460-124639-2	Water	12/01/16
3	CFSWP-005-SW	460-124639-3	Water	12/01/16
4	CFSWP-006-SW	460-124639-4	Water	12/01/16
5	CFSWP-018-SW	460-124639-5	Water	12/01/16
6	CFSWP-019-SW	460-124639-6	Water	12/01/16
7	CFSWP-020-SW	460-124639-7	Water	12/01/16
8	CFSWP-019-SWMS All	460-124639-6MS	Water	12/01/16
9	CFSWP-019-SWDUP ↓	460-124639-6DUP	Water	12/01/16
10				
11				
12				
13				
14				

Notes:

LDC #: 37739B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: _____

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37739B4

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: _____

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 37739B4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: _____

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-7	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC-8-9	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37739B4a

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: JSD
2nd Reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?

Y N N/A Are all correlation coefficients ≥0.995?

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
	12/04/16	CRI (13:38)	Be	134 (70-130)	All	J+det/P (nd)

Comments:

LDC #: 37739B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JSD
2nd Reviewer: _____

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 13:31	ICP/MS (Initial calibration)	Sb	39.25ug/L	40 ug/L	98%R	98%R	Y
ICV 13:47	CVAA (Initial calibration)	Hg	5.03ug/L	5ug/L	101%R	101%R	↓
	ICP (Continuing calibration)						
CCV 16:03	ICP/MS (Continuing calibration)	As	49.3ug/L	50ug/L	99%R	99%R	Y
CCV 15:14	CVAA (Contining calibration)	Hg	4.94ug/L	5ug/L	99%R	99%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37739B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 13:43	ICP interference check	Cu	203.3 ug/L	200 ug/L	102%R	102%R	Y
LCS 16:14	Laboratory control sample	Cd	25.7 ug/L	25 ug/L	103%R	103%R	
MS 16:19	Matrix spike	Co	(SSR-SR) 25.2 ug/L	25 ug/L	101%R	101%R	
DUP 16:22	Duplicate	Ca	52810 ug/L	51044 ug/L	3%RPD	3%RPD	
SER 16:26	ICP serial dilution	Mg	16671 ug/L	16486 ug/L	1.1%D	1.1%D	

Comments:

LDC #: 37739B4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 85.795 ug/L x 2 = 172 ug/L

RD = Raw data concentration — RD = 85.795 ug/L
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G) — Dil = 2
Dil = Dilution factor

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	172	172	Y
	2	Ba	173	173	
	3	Ca	62600	62600	
	4	Mg	6750	6750	
	5	Ni	1.6	1.6	
	6	K	641	641	
	7	Na	4860	4860	

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 6, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124639-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-003-SW	460-124639-1	Water	12/01/16
CFSWP-004-SW	460-124639-2	Water	12/01/16
CFSWP-005-SW	460-124639-3	Water	12/01/16
CFSWP-006-SW	460-124639-4	Water	12/01/16
CFSWP-018-SW	460-124639-5	Water	12/01/16
CFSWP-019-SW	460-124639-6	Water	12/01/16
CFSWP-020-SW	460-124639-7	Water	12/01/16
CFSWP-019-SWMS	460-124639-6MS	Water	12/01/16
CFSWP-019-SWMSD	460-124639-6MSD	Water	12/01/16
CFSWP-019-SWDUP	460-124639-6DUP	Water	12/01/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Ammonia	92.49 ug/L	All samples in SDG 460-124639-1
ICB/CCB	Ammonia	0.0878 mg/L	All samples in SDG 460-124639-1

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-019-SWMS/MSD (All samples in SDG 460-124639-1)	Chloride	82 (90-110)	86 (90-110)	J- (all detects)	A
	Fluoride	88 (90-110)	-	J- (all detects)	
	Sulfate	-	89 (90-110)	J- (all detects)	

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-019-SWMS/MSD (All samples in SDG 460-124639-1)	Orthophosphate as P Ammonia	85 (90-110) -	82 (90-110) 81 (90-110)	UJ (all non-detects) UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
CFSWP-019-SWDUP (All samples in SDG 460-124639-1)	Total suspended solids	8 ≤(5)	-	J (all detects) UJ (all non-detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and duplicate sample analysis, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-124639-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW CFSWP-018-SW CFSWP-019-SW CFSWP-020-SW	Chloride Fluoride Sulfate	J- (all detects) J- (all detects) J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW CFSWP-018-SW CFSWP-019-SW CFSWP-020-SW	Orthophosphate as P Ammonia	UJ (all non-detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW CFSWP-018-SW CFSWP-019-SW CFSWP-020-SW	Total suspended solids	J (all detects) UJ (all non-detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-124639-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-124639-1

No Sample Data Qualified in this SDG

LDC #: 37739B6 **VALIDATION COMPLETENESS WORKSHEET** Date: 1/4/17
SDG #: 460-124639-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer: JSD
2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ JSD (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/1/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	SW	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MSD = (8.9)
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	A	LCS10 & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-003-SW	460-124639-1	Water	12/01/16
2	CFSWP-004-SW	460-124639-2	Water	12/01/16
3	CFSWP-005-SW	460-124639-3	Water	12/01/16
4	CFSWP-006-SW	460-124639-4	Water	12/01/16
5	CFSWP-018-SW	460-124639-5	Water	12/01/16
6	CFSWP-019-SW	460-124639-6	Water	12/01/16
7	CFSWP-020-SW	460-124639-7	Water	12/01/16
8	CFSWP-019-SWMS 9056 353.2 NH3 CN 300.0	460-124639-6MS	Water	12/01/16
9	CFSWP-019-SWMSD	460-124639-6MSD	Water	12/01/16
10	CFSWP-019-SWDUP TSS, Alk, Hard, TDS	460-124639-6DUP	Water	12/01/16
11				
12				
13				
14				
15				

Notes:

LDC #: 31739B6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: _____

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37739B6

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: _____

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 37739B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: _____

All circled methods are applicable to each sample.

Sample ID	Parameter
1-7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 8-9	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 TSS Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments: _____

LDC #: 37739B6

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: ug/L **Associated Samples:** All

Analyte	Blank ID	Blank ID	Blank Action Limit										
	PB (ug/L)	ICB/CCB (mg/L)		No Qualifiers									
NH3	92.49	0.0878	462.45										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 37739B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer:

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	8/9	W	Cl	82 (90-110)	86 (90-110)		All	J-/UJ/A (det)
			F	88 (90-110)				J-/UJ/A (det)
			SO4		89 (90-110)			J-/UJ/A (det)
			OPO4-P	85 (90-110)	82 (90-110)			J-/UJ/A (nd)
			NH3		81 (90-110)			J-/UJ/A (nd)

Comments:

LDC #: 37739B6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: SD
2nd Reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤ 35% for soil samples? If no, see qualifications below. A control limit of ±R.L. (±2X R.L. for soil) was used for sample values that were <5X the R.L., including the case when only one of the duplicate sample values was <5X R.L.. If field blanks were used for laboratory duplicates, note in the Overall Assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Difference (Limits)	Associated Samples	Qualifications
		10	W	TSS	8 (≤5)		All	J/UJ/A (det/nd)

Comments:

LDC #: 37739B6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer:

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of F was recalculated. Calibration date: 10/26/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	F	s1	0.1	6654	0.9991	0.9990	Y*
		s2	0.2	22153			
		s3	1	148188			
		s4	2	299498			
		s5	3	476835			
		s6	4	645687			
ICV 22:52 Calibration verification	F	Found 1.021mg/L	True 1mg/L		102.1%R	102.1%R	Y
ICV 13:59 Calibration verification	Total CN	0.189mg/L	0.2mg/L		95%R	95%R	↓
ICV 16:45 Calibration verification	NO_3/NO_2-N	1.018mg/L	1mg/L		102%R	102%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 377386

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: _____

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 18:08	Laboratory control sample	NH3	887 ug/L	1000 ug/L	89%R	89%R	Y
MS 8:05	Matrix spike sample	OPO4-P	(SSR-SR) 214 ug/L	250 ug/L	86%R	85%R	*
DUP 16:34	Duplicate sample	Hardness	212000 ug/L	208000 ug/L	2%RPD	2%RPD	

Comments: _____

*Rounding

TOTCLC.6

LDC #: 37739B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: _____

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (3) Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

Recalculation: $\frac{(6.3\,mg/L)(0.02N)(50000)}{25\,ml} \times \left(\frac{1000\,ug}{1\,mg}\right) = 252000\ ug/L$

T = 6.3 mg/L N = 0.02N
V = 25 ml

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Total CN	36.2	36.1	Y*
	2	NO3/NO2-N	1340	1340	Y
	3	Hardness	252000	252000	
	4	Alkalinity	87600	87600	
	5	TDS	210 mg/L	210 mg/L	
	6	TSS	12.4 mg/L	12.4 mg/L	
	7	SO4	3250	3250	Y

Note: * Rounding

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 9, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124726-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-001-SW	460-124726-1	Water	12/02/16
CFSWP-002-SW	460-124726-2	Water	12/02/16
CFSWP-007-SW	460-124726-3	Water	12/02/16
CFSWP-008-SW	460-124726-4	Water	12/02/16
CFSWP-017-SW	460-124726-5	Water	12/02/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
12/04/16	CRI (13:38)	Beryllium	134 (70-130)	All samples in SDG 460-124726-1	NA	-

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-124726-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-124726-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-124726-1

No Sample Data Qualified in this SDG

LDC #: 37739C4a

SDG #: 460-124726-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/4/16

Page: 1 of 1

Reviewer: JD

2nd Reviewer:

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/2/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MSD = CFSWP-019-SW MS (SDG: 460-124639-1)
VIII.	Duplicate sample analysis	A	DUP = CFSWP-019-SW DUP (SDG: 460-124639-1)
IX.	Serial Dilution	A	SER = CFSWP-019-SW (SDG: 460-124639-1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-001-SW	460-124726-1	Water	12/02/16
2	CFSWP-002-SW	460-124726-2	Water	12/02/16
3	CFSWP-007-SW	460-124726-3	Water	12/02/16
4	CFSWP-008-SW	460-124726-4	Water	12/02/16
5	CFSWP-017-SW	460-124726-5	Water	12/02/16
6				
7				
8				
9				
10				
11				
12				
13				
14				

Notes:

LDC #: 37739C4a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: SD
2nd Reviewer:

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37735C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: _____

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 37738C4G

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: _____

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-5		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___

Comments: Mercury by CVAA if performed

LDC #: 37739C4a

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: JD
2nd Reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?

Y N N/A Are all correlation coefficients ≥0.995?

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
	12/04/16	CRI (13:38)	Be	134 (70-130)	All	J+det/P (nd)

Comments:

LDC #: 37739C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer:

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 13:31	ICP/MS (Initial calibration)	Zn	38.8 ug/L	40 ug/L	97%R	97%R	Y
ICV 13:47	CVAA (Initial calibration)	Hg	5.03 ug/L	5 ug/L	101%R	101%R	↓
	ICP (Continuing calibration)						
CCV 16:34	ICP/MS (Continuing calibration)	V	50.3 ug/L	50 ug/L	101%R	101%R	Y
CCV 15:14	CVAA (Contining calibration)	Hg	4.94 ug/L	5 ug/L	99%R	99%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

LDC #: 37739L4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: 3SD
2nd Reviewer: _____

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 13:43	ICP interference check	Mn	220.8 ug/L	200 ug/L	110%R	110%R	Y
LCS 15:01	Laboratory control sample	Hg	0.959 ug/L	1 ug/L	96%R	96%R	
MS 16:19	Matrix spike	Sb	(SSR-SR) 25.3 ug/L	25 ug/L	101%R	101%R	
DUP 16:22	Duplicate	Na	8996 ug/L	8710 ug/L	3%RPD	3%RPD	
SER 16:26	ICP serial dilution	Ca	50270 ug/L	51044 ug/L	1.5%D	1.5%D	

Comments: _____

TOTCLC.4SW

LDC #: 37739C49

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: _____

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (3) Mn were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 1.926 ug/L x 2 = 3.9 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 1.926 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	25.6	25.6	Y
	2	Na	1060	1060	↓
	3	Mn	3.9	3.9	↓
	4	K	309	309	↓
	5	Ca	25400	25400	↓

Note: _____

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 6, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124726-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-001-SW	460-124726-1	Water	12/02/16
CFSWP-002-SW	460-124726-2	Water	12/02/16
CFSWP-007-SW	460-124726-3	Water	12/02/16
CFSWP-008-SW	460-124726-4	Water	12/02/16
CFSWP-017-SW	460-124726-5	Water	12/02/16
CFSWP-001-SWDUP	460-124726-1DUP	Water	12/02/16
CFSWP-017-SWMS	460-124726-5MS	Water	12/02/16
CFSWP-017-SWMSD	460-124726-5MSD	Water	12/02/16
CFSWP-017-SWDUP	460-124726-5DUP	Water	12/02/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Ammonia	92.49 ug/L	All samples in SDG 460-124726-1
ICB/CCB	Ammonia	0.0878 mg/L	All samples in SDG 460-124726-1

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFSWP-017-SW	Ammonia	257 ug/L	257U ug/L

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-019-SWMS/MSD (All samples in SDG 460-124726-1)	Ammonia	-	81 (90-110)	J- (all detects) UJ (all non-detects)	A
CFSWP-019-SWMS/MSD (All samples in SDG 460-124726-1)	Chloride Fluoride Sulfate	82 (90-110) 88 (90-110) -	86 (90-110) - 89 (90-110)	J- (all detects) J- (all detects) J- (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in five samples.

Due to laboratory blank contamination, data were qualified as not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-124726-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-001-SW CFSWP-002-SW CFSWP-007-SW CFSWP-008-SW CFSWP-017-SW	Ammonia	J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-001-SW CFSWP-002-SW CFSWP-007-SW CFSWP-008-SW CFSWP-017-SW	Chloride Fluoride Sulfate	J- (all detects) J- (all detects) J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-124726-1

Sample	Analyte	Modified Final Concentration	A or P
CFSWP-017-SW	Ammonia	257U ug/L	A

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-124726-1

No Sample Data Qualified in this SDG

LDC #: 37739C6 **VALIDATION COMPLETENESS WORKSHEET** Date: 1/4/16

SDG #: 460-124726-1 Level IV Page: 1 of 1

Laboratory: Test America, Inc. Reviewer: JD

2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/2/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	SW	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = CFSWP-09-SW MS/D (SDG: 460-124639-1)
VII.	Duplicate sample analysis	A	DUP = CFSWP-09-SW DUP (SDG: 460-124639-1)
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-001-SW	460-124726-1	Water	12/02/16
2	CFSWP-002-SW	460-124726-2	Water	12/02/16
3	CFSWP-007-SW	460-124726-3	Water	12/02/16
4	CFSWP-008-SW	460-124726-4	Water	12/02/16
5	CFSWP-017-SW	460-124726-5	Water	12/02/16
6	CFSWP-001-SWDUP Hardness	460-124726-1DUP	Water	12/02/16
7	CFSWP-017-SWMS ORTHO-P	460-124726-5MS	Water	12/02/16
8	CFSWP-017-SWMSD ↓	460-124726-5MSD	Water	12/02/16
9	CFSWP-017-SWDUP ↓	460-124726-5DUP	Water	12/02/16
10				
11				
12				
13				
14				
15				

Notes:

LDC #: 37739C6

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: JD
2nd Reviewer: _____

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37739C6

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: _____

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 37389C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: _____

All circled methods are applicable to each sample.

Sample ID	Parameter
1-5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC-6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC-79	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments: _____

LDC #: 37739C6

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer:

METHOD: Inorganics, Method See Cover

Conc. units: ug/L **Associated Samples:** All

Analyte	Blank ID	Blank ID	Blank Action Limit											
[redacted]	PB (ug/L)	ICB/CCB (mg/L)		5										
NH3	92.49	0.0878	462.45	257										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 37739C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: SD
2nd Reviewer:

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	CFSWP-019-SWMS/D (SDG: 460-124639-1)	W	NH3		81 (90-110)		All	J-/UJ/A (det/nd)
			Cl	82 (90-110)	86 (90-110)			J-/UJ/A (det)
			F	88 (90-110)				J-/UJ/A (det)
			SO4		89 (90-110)			J-/UJ/A (det)

Comments:

LDC #: 37739C6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer:

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NO_3/NO_2-N was recalculated. Calibration date: 12/06/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NO_3/NO_2-N	s1	0.0	0	0.9998	0.9998	Y
		s2	0.1	849280			
		s3	0.5	3786957			
		s4	1	7538740			
		s5	1.5	11019162			
		s6	2	14520730			
ICV 16:45 Calibration verification	NO_3/NO_2-N	Found 1.02 mg/L	True 1 mg/L		102%R	102%R	
ICV 18:04 Calibration verification	NH_3	1.90 mg/L	2 mg/L		95%R	95%R	
ICV 13:21 Calibration verification	Total CN	0.207 mg/L	0.2 mg/L		104%R	104%R	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37739C6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: _____

METHOD: Inorganics, Method Sel Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 13:00	Laboratory control sample	TSS	80 mg/L	84.9 mg/L	94.2%R	94.2%R	Y
MS 21:23	Matrix spike sample	OPO_4-P	(SSR-SR) 2245 ug/L	2500 ug/L	90%R	90%R	
DUP 17:26	Duplicate sample	Hardness	90 mg/L	90 mg/L	0%RPD	0%RPD	

Comments: _____

TOTCLC.6

LDC #: 573996

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 3D
2nd reviewer:

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (4) Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A - (-17791.868)}{109455.526}$

Recalculation: $\frac{21946 - (-17791.868)}{109455.526} \times \frac{1000ug}{1mg} \approx 363$ ug/L

A = 21946

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Hardness	90000	90000	Y
	2	Alkalinity	86900	86900	
	3	TDS	95.0mg/L	95.0mg/L	
	4	Cl	363	363	
	5	NH3	257	257	
	1	TSS	3.8mg/L	3.8mg/L	

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 11, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124783-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-026-GW	460-124783-1	Water	12/05/16
CFMW-028-GW	460-124783-2	Water	12/05/16
Trip Blank	460-124783-4	Water	12/05/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
11/11/16	1,2-Dibromo-3-chloropropane	26.2	All samples in SDG 460-124783-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/07/16	Chloroethane Methylene chloride	23.0 23.9	All samples in SDG 460-124783-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	%R (Limits)	Flag	A or P
LCS 460-408198 (All samples in SDG 460-124783-1)	Methylene chloride	125 (77-123)	NA	-

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

LDC #: 37739D1

SDG #: 460-124783-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 12/23/16

Page: 1 of 1

Reviewer: PJ

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 3
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-026-GW	4960-124783-1	Water	12/05/16
2	CFMW-028-GW	4960-124783-2	Water	12/05/16
3	Trip Blank	4960-124783-4	Water	12/05/16
4				
5				
6				
7				
8				
9				

Notes:

	MB 460-408198						

LDC #: 37739D1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer:

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?			✓	
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?			✓	
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 377390 7

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37739D1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
+	11/11/16	ICV-8	MM	26.2	All	J+ all /A ND

ICVvoa.wpd

LDC #: 37739D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	12/7/16	CCV	D	23.0		All	J+ det /A ND
+	0950		E	23.9		↓	↓

CONCAL.wpd

LDC #: 37739D1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: _____

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-408198	E	125 (77-123)	( )	( )	all	J+ / P dir ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37739P1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs
X = Mean of the RRFs

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (50/25SD)	Recalculated RRF (50/25SD)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL-8	11/11/16	M (1st internal standard)	0.3065	0.3065	0.3177	0.3177	14.8	14.8
			C (2nd internal standard)	0.3574	0.3574	0.3377	0.3377	4.4	4.4
			CC (3rd internal standard)	1.6526	1.6526	1.6655	1.6655	11.4	11.4
			JJJ (4th internal standard)	1.4626	1.4626	1.4454	1.4454	9.0	9.0
2			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						
3			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						
4			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37739D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	12/7/16 CCV 0950	12/7/16	M (IS1)	0.3177	0.3416	0.3416	7.5	7.5
			C (IS2)	0.3377	0.3733	0.3733	10.6	10.6
			CC (IS3)	1.6655	1.658	1.658	0.5	0.5
			JJJ (IS4)	1.4454	1.584	1.584	9.6	9.6
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37739D1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	63.5	127	127	0
1,2-Dichloroethane-d4	↓	57.1	114	114	↓
Toluene-d8	↓	51.8	104	104	↓
Bromofluorobenzene	↓	50.4	101	101	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37739D1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: _____

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-408198

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20	NA	21.6	NA	108	108				
Trichloroethene	↓	↓	22.6	↓	113	113				
Benzene	↓	↓	21.1	↓	106	106				
Toluene	↓	↓	20.6	↓	103	103				
Chlorobenzene	↓	↓	20.8	↓	104	104	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37739D1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: _____

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS, CC

Conc. = $\frac{(195524)(50)}{(285442)(1.6655)}$

= 20.6 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 11, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124783-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-026-GW	460-124783-1	Water	12/05/16
CFMW-028-GW	460-124783-2	Water	12/05/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/08/16	1,4-Dioxane Benzo(b)fluoranthene	20.3 22.1	All samples in SDG 460-124783-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

LDC #: 37739D2a

SDG #: 460-124783-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 12/23/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A A	% RSD ≤ 30, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-026-GW	4960-124783-1	Water	12/05/16
2	CFMW-028-GW	4960-124783-2	Water	12/05/16
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-408307						

LDC #: 37739D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: O

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37739D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37739D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	12/8/16	acN	III	20.3		all	J+ det /A (ND)
+	1206		GGG	22.1		↓	↓

CONCAL.wpd

LDC #: 37739D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs,

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Internal Standard)	Reported RRF (10/20 std)	Recalculated RRF (10/20 std)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported %RSD	Recalculated %RSD
1	ICAL-4	12/4/16	A (1st IS)	2.0399	2.0399	2.0577	2.0577	13.9	13.9
			S (2nd IS)	0.9660	0.9660	0.9790	0.9790	15.4	15.4
			GG (3rd IS)	1.1131	1.1131	1.0489	1.0489	8.8	8.8
			TT (4th IS)	0.2319	0.2319	0.2122	0.2122	8.5	8.5
			EEE (5th IS)	0.7516	0.7516	0.6532	0.6532	16.9	16.9
			III (6th IS)	1.1182	1.1182	0.9951	0.9951	10.9	10.9
2			(1st IS)						
			(2nd IS)						
			(3rd IS)						
			(4th IS)						
			(5th IS)						
			(6th IS)						
3			(1st IS)						
			(2nd IS)						
			(3rd IS)						
			(4th IS)						
			(5th IS)						
			(6th IS)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37739 D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	12/8/16 CCV 1206	12/8/16	A	(1st IS)	2.0577	1.899	1.899	7.7	7.7
			S	(2nd IS)	0.9790	0.9229	0.9229	5.7	5.7
			GG	(3rd IS)	1.0489	0.9851	0.9851	5.1	5.1
			TT	(4th IS)	0.2122	0.2270	0.2270	7.0	7.0
			EEE	(5th IS)	0.6532	0.7703	0.7703	17.9	17.9
			III	(6th IS)	0.9951	1.140	1.140	14.6	14.6
2				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37739D2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	7.46	75	75	0
2-Fluorobiphenyl	↓	6.84	68	68	↓
Terphenyl-d14	↓	9.78	98	98	↓
Phenol-d5	↓	2.25	22	22	↓
2-Fluorophenol	↓	3.47	35	35	↓
2,4,6-Tribromophenol	↓	8.44	84	84	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37739D2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460-408307

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	21.3	19.6	27	27	24	24	8	8
N-Nitroso-di-n-propylamine	↓	↓	63.8	62.5	80	80	78	78	2	2
4-Chloro-3-methylphenol			52.7	54.8	66	66	68	68	4	4
Acenaphthene	80.0		59.2	64.2	74	74	80	80	8	8
Pentachlorophenol	160	160	132	122	82	82	76	76	7	7
Pyrene	80.0	80.0	70.4	76.1	88	88	95	95	8	8
Caprolactam	160	160	34.7	35.8	22	22	22	22	3	3

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37739D2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: ✓

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. ICS 460-408307 caprolactam

Conc. = $\frac{(99550)(8.0)(2)(100L)(\quad)}{(1481370)(0.1240)(250)(\quad)(\quad)}$

= 34.7ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 11, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124783-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB9-AQ	460-124783-3	Water	12/05/16
CFMW-026-GWF	460-124783-1F	Water	12/05/16
CFMW-028-GWF	460-124783-2F	Water	12/05/16
CFMW-025a-GWF	460-124783-5F	Water	12/05/16
CFMW-057-GWF	460-124783-6F	Water	12/05/16
CFMW-057-GWFMS	460-124783-6FMS	Water	12/05/16
CFMW-057-GWFMSD	460-124783-6FMSD	Water	12/05/16

Samples appended with F were analyzed for Metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB9-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB9-AQ	12/05/16	Zinc	23.7 ug/L	No associated samples in this SDG

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

LDC #: 37739D4a

SDG #: 460-124783-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/4/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer:

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/5/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB= (1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS/D= (6,7)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	N	Not Performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB9-AQ	4960-124783-3	Water	12/05/16
2	CFMW-026-GWF	4960-124783-1F	Water	12/05/16
3	CFMW-028-GWF	4960-124783-2F	Water	12/05/16
4	CFMW-025a-GWF	4960-124783-5F	Water	12/05/16
5	CFMW-057-GWF	4960-124783-6F	Water	12/05/16
6	CFMW-057-GWFMS Hg	4960-124783-6FMS	Water	12/05/16
7	CFMW-057-GWFMSD	4960-124783-6FMSD	Water	12/05/16
8				
9				
10				
11				
12				
13				
14				

Notes:

LDC #: 37739D4G

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: _____

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37739D49

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: _____

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?			✓	
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37739D4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: SD
2nd reviewer: _____

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-5		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC-67		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37739D4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer:

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/05/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: None (Total metals analysis cancelled)

Analyte	Blank ID	Sample Identification											
	1	Action Limit	No Qual.										
Zn	23.7	118.5											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37739D4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JD
2nd Reviewer: _____

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 14:22	ICP/MS (Initial calibration)	Ag	38.8 ug/L	40 ug/L	97%R	97%R	Y
ICV 14:35	CVAA (Initial calibration)	Hg	4.76 ug/L	5 ug/L	95%R	95%R	↓
	ICP (Continuing calibration)						
CCV 15:14	ICP/MS (Continuing calibration)	K	4995 ug/L	5000 ug/L	100%R	100%R	Y
CCV 16:06	CVAA (Contining calibration)	Hg	4.94 ug/L	5 ug/L	99%R	99%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37739DX4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: _____

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 14:41	ICP interference check	As	97.1 ug/L	100 ug/L	97%R	97%R	Y
LCS 14:55	Laboratory control sample	Ni	10.1 ug/L	10 ug/L	101%R	101%R	↓
MS 15:51	Matrix spike	Hg	(SSR-SR) 0.937 ug/L	1 ug/L	94%R	94%R	↓
DUP=DC	Duplicate						
N	ICP serial dilution						

Comments: _____

TOTCLC.4SW

LDC #: 37739D4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: JD
2nd reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Zn were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 11.857 ug/L x 2 = 23.7 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 11.857 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Zn	23.7	23.7	Y
	2	Ba	289	289	
	3	Ca	48700	48700	
	4	Mn	1540	1540	
	5	Fe	2440	2440	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 11, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124783-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-026-GW	460-124783-1	Water	12/05/16
CFMW-028-GW	460-124783-2	Water	12/05/16
CFMW-EB9-AQ	460-124783-3	Water	12/05/16
CFMW-025a-GW	460-124783-5	Water	12/05/16
CFMW-057-GW	460-124783-6	Water	12/05/16
CFMW-026-GWMS	460-124783-1MS	Water	12/05/16
CFMW-026-GWMSD	460-124783-1MSD	Water	12/05/16
CFMW-057-GWMS	460-124783-6MS	Water	12/05/16
CFMW-057-GWMSD	460-124783-6MSD	Water	12/05/16
CFMW-057-GWDUP	460-124783-6DUP	Water	12/05/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Sample	Analyte	Finding	Criteria
CFMW-026-GW CFMW-028-GW CFMW-025a-GW CFMW-057-GW	Total dissolved solids Total suspended solids	The daily balance check for was not performed.	The balance check should be performed before daily use to verify calibration.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB9-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB9-AQ	12/05/16	Chloride	180 ug/L	CFMW-028-GW

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-057-GWMS/MSD (CFMW-026-GW CFMW-028-GW CFMW-057-GW)	Chloride	79 (90-110)	80 (90-110)	J- (all detects)	A
CFMW-057-GWMS/MSD (CFMW-026-GW CFMW-028-GW CFMW-025a-GW CFMW-057-GW)	Fluoride Sulfate	- -	89 (90-110) 87 (90-110)	J- (all detects) J- (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-124783-1

Sample	Analyte	Flag	A or P	Reason
CFMW-026-GW CFMW-028-GW CFMW-057-GW	Chloride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-026-GW CFMW-028-GW CFMW-025a-GW CFMW-057-GW	Fluoride Sulfate	J- (all detects) J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-124783-1

No Sample Data Qualified in this SDG

LDC #: 37739D6
SDG #: 460-124783-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 1/4/17
Page: 1 of 1
Reviewer: JD
2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/5/16
II	Initial calibration	A	
III.	Calibration verification	SD ~~A~~ SW	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = (3)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = CFSWP-019-SWMS/D (SDG: 460-124639-1)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-026-GW	4960-124783-1	Water	12/05/16
2	CFMW-028-GW	4960-124783-2	Water	12/05/16
3	CFMW-EB9-AQ No TDS & TSS	4960-124783-3	Water	12/05/16
4	CFMW-025a-GW	4960-124783-5	Water	12/05/16
5	CFMW-057-GW	4960-124783-6	Water	12/05/16
6	CFMW-026-GWMS CN	4960-124783-1MS	Water	12/05/16
7	CFMW-026-GWMSD ↓	4960-124783-1MSD	Water	12/05/16
8	CFMW-057-GWMS Gen Chem 300.0	4960-124783-6MS	Water	12/05/16
9	CFMW-057-GWMSD ↓ ↓	4960-124783-6MSD	Water	12/05/16
10	CFMW-057-GWDUP	4960-124783-6DUP	Water	12/05/16
11				
12				
13				
14				
15				

Notes:

LDC #: 37739D6

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: JD
2nd Reviewer: _____

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)		✓		
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37390U

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: _____

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37390V

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer:

All circled methods are applicable to each sample.

Sample ID	Parameter
1-5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 6-7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 8-11	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37739D6

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: JSD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?
Y N N/A Are all correlation coefficients ≥0.995?
Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
	12/09/16	Balance Check	TDS and TSS	Balance check was not performed on 12/09/16	1-2, 4-5	Text

Comments:

37739D6CAL.wpd

LDC #: 37739D6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer:

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/05/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	3		No Qualifiers							
Chloride	180	900								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37739D6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer:

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifi
	8/9	W	Cl	79 (90-110)	80 (90-110)		1-2, 5	J-/UJ/A (det)
			F		89 (90-110)		1-2, 4-5	J-/UJ/A (det)
			SO4		87 (90-110)		1-2, 4-5	J-/UJ/A (det)

Comments:

LDC #: 3773904

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: ZSD
2nd Reviewer:

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of Cl was recalculated.Calibration date: 10/26/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	Cl	s1	0.1	5667	0.9968	0.9970	Y*
		s2	0.3	19555			
		s3	1.5	137328			
		s4	3	286780			
		s5	4.5	491928			
		s6	6	639795			
ICV 22:52 Calibration verification	Cl	Found 1.464 mg/L	True 1.5 mg/L		97.6%R	97.6%R	Y
ICV 23:10 Calibration verification	OPO4-P	2.391 mg/L	2.5 mg/L		95.6%R	95.5%R	Y*
ICV 13:25 Calibration verification	CN	0.207 mg/L	0.2 mg/L		104%R	104%R	Y

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37738D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: _____

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 16:50	Laboratory control sample	NO_3/NO_2-N	1114 ug/L	1090 ug/L	102.2%R	102.2%R	Y
MS 13:42	Matrix spike sample	CN	(SSR-SR) 173 ug/L	200 ug/L	87%R	87%R	↓
MSD 13:43	Duplicate sample	CN	176 ug/L	176 ug/L	0%RPD	1%RPD	Y*

Comments: *Rounding

TOTCLC.6

LDC #: 37738D6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer:

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y/ N N/A Have results been reported and calculated correctly?
Y/N N/A Are results within the calibrated range of the instruments?
Y/N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (1) Alkalinity reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

Recalculation: $\frac{(5.8622)(0.0203N)(50000)}{25ml} \times \frac{1000ug}{1mg} = 238000$ ug/L

T = 5.8622 V = 25ml
N = 0.0203

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	NH_3	112	112	Y
	2	Total CN	195	195	
	3	Cl	180	180	
	4	NO_3/NO_2-N	221	221	
	5	Hardness	132000	132000	
	1	Alkalinity	238000	238000	
	1	TDS	259mg/L	259mg/L	
	1	TSS	15.1mg/L	15.1mg/L	

Note:

The attached zipped file contains five files:

File	Format	Description	
1) Readme_ColumbiaFalls_011017.doc	MS Word 2003	A "Readme" file (this document).	
	MS Excel 2007	A spreadsheet for the following SDG(s):	
2) 460-124553-1_TestResultsQC_v1.xlsx			
3) 460-124639-1_TestResultsQC_v1.xlsx		460-124553-1	37739A
4) 460-124726-1_TestResultsQC_v1.xlsx		460-124639-1	37739B
5) 460-124783-1_TestResultsQC_v1.xlsx		460-124726-1	37739C
		460-124783-1	37739D

No discrepancies were observed between the hardcopy data packages and the electronic data deliverables during EDD population of validation qualifiers. A 100% verification of the EDD was not performed.

Please contact Christina Rink at (760) 827-1100 if you have any questions regarding this electronic data submittal.

LDC #: 37789

EDD POPULATION COMPLETENESS WORKSHEET

Date: 1/10/17
Page: 1 of 1
2nd Reviewer: BA

The LDC job number listed above was entered by [illegible]

	EDD Process		Comments/Action
I.	EDD Completeness	-	
Ia.	- All methods present?	y	
Ib.	- All samples present/match report?	y	
Ic.	- All reported analytes present?	y	
Id.	- 10% or 100% verification of EDD?	y	
II.	EDD Preparation/Entry	-	
IIa.	- Carryover U/J?	y	
IIb.	- Reason Codes used? If so, note which codes.	N	
IIc.	- Additional Information (QC Level, Validator, Validated Y/N, etc.)	N	
III.	Reasonableness Checks	-	
IIIa.	- Do all qualified ND results have ND qualifier (e.g. UJ)?	y	
IIIb.	- Do all qualified detect results have detect qualifier (e.g. J)?	y	
IIIc.	- If reason codes are used, do all qualified results have reason code field populated, and vice versa?	—	
IIId.	-Does the detect flag require changing for blank qualifier? If so, are all U results marked ND?	y/y	
IIIe.	- Do blank concentrations in report match EDD where data was qualified due to blank contamination?	y	
IIIf.	- Were any results reported above calibration range? If so, were results qualified appropriately?	N/NA	
IIIg.	-Is the readme complete? If applicable, were edits or discrepancies listed in the readme?	y	

Notes: *see discrepancy sheet

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

January 18, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on December 23, 2016. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #37802:

SDG #	Fraction
460-124871-1, 460-124977-1 460-125105-1, 460-125196-1 460-125342-1, 460-125356-1	Volatiles, Semivolatiles, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

EDD

LDC #37802 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3 (350.1)		Cl,F SO_4 (300.0)		CN- (335.4/ 9012B)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		TDS (2540C)		TSS (2540D)									
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-124871-1	12/23/16	01/17/17	2	0	1	0	1	0	3	0	4	0	4	0	4	0	4	0	4	0	4	0	4	0	3	0	3	0								
B	460-124977-1	12/23/16	01/17/17	5	0	4	0	1	0	4	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	4	0	4	0								
C	460-125105-1	12/23/16	01/17/17	3	0	2	0	1	0	2	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	2	0	2	0								
D	460-125196-1	12/23/16	01/17/17	6	0	5	0	1	0	7	0	8	0	8	0	8	0	8	0	8	0	8	0	-	-	7	0	7	0								
E	460-125342-1	12/23/16	01/17/17	4	0	3	0	1	0	7	0	8	0	8	0	8	0	8	0	8	0	8	0	7	0	7	0	7	0								
F	460-125356-1	12/23/16	01/17/17	6	0	5	0	-	-	8	0	8	0	8	0	8	0	8	0	8	0	8	0	8	0	7	0	7	0								
Total	T/CR			26	0	20	0	5	0	31	0	36	0	36	0	36	0	36	0	36	0	36	0	27	0	30	0	30	0	0	0	0	0	0	0	0	385

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124871-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-033-GW	460-124871-1	Water	12/06/16
TRIP BLANK	460-124871-5	Water	12/06/16
CFMW-033-GWMS	460-124871-1MS	Water	12/06/16
CFMW-033-GWMSD	460-124871-1MSD	Water	12/06/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
11/11/16	1,2-Dibromo-3-chloropropane	26.2	All samples in SDG 460-124871-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/10/16	Bromomethane Chloroethane Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane	45.0 27.5 34.9 20.4	TRIP BLANK	NA	-
12/10/16	Methyl acetate 1,1,2,2-Tetrachloroethane	26.1 34.4	TRIP BLANK	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Compound	Flag	A or P
CFMW-033-GW	Dibromofluoromethane	134 (72-134)	All compounds	NA	-

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	%R (Limits)	Flag	A or P
LCS 460-408845 (TRIP BLANK)	1,1,2,2-Tetrachloroethane	69 (74-120)	UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS %R, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-124871-1

Sample	Compound	Flag	A or P	Reason
TRIP BLANK	Methyl acetate 1,1,2,2-Tetrachloroethane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
TRIP BLANK	1,1,2,2-Tetrachloroethane	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-124871-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-124871-1

No Sample Data Qualified in this SDG

LDC #: 37802A1

SDG #: 460-124871-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/6/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/20, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 2
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates F1	~~SW~~ A	
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-033-GW	460-124871-1	Water	12/06/16
2 2	TRIP BLANK	460-124871-5	Water	12/06/16
3 1	CFMW-033-GWMS	460-124871-1MS	Water	12/06/16
4 1	CFMW-033-GWMSD	460-124871-1MSD	Water	12/06/16
5				
6				
7				
8				
9				

Notes:

1	MB 460-408564						
2	- 408845						

LDC #: 37802A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?		✓		
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?		✓		

LDC #: 37802A1

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37802 A 1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
+	11/11/16 0059	ICV-8	MM	26.2	All	J+ det / A ND

ICVvoa.wpd

LDC #: 37802A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	12/10/16	CCVB-J49246	B	45.0		2, MB 460-40884 5	J+ all/A all ND
+			D	27.5			
+			KK	34.9			
+			TTT	20.4			
−			QQQQ	26.1			J-/UJ/A
−			BB	34.4			
−			F1 ~~YY~~	~~20.6~~			
−			~~XX~~	~~20.2~~			

CONCAL.wpd

LDC #: 37802A1

VALIDATION FINDINGS WORKSHEET
Surrogate Spikes

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all surrogate %R within QC limits?

Y N N/A If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R out of outside of criteria?

#	Sample ID	Surrogate	%Recovery (Limits)	Qualifications
	1	DFM	134 (72-131)	J+ all / P (NP)
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	

SMC1 (TOL) = Toluene-d8
SMC2 (BFB) = Bromofluorobenzene
SMC3 (DCE) = 1,2-Dichloroethane-d4
SMC4 (DFM) = Dibromofluoromethane

LDC #: 37802A /

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-	BB	69 (74-120)	( )	( )	2, MB 460-408845	J/UJ/P (ND)
	408845		( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37802A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	11/11/2016	M	0.3048	0.3048	0.3177	0.3177	14.8	14.8
	GCMS8		C	0.3511	0.3511	0.3377	0.3377	4.4	4.4
			CC	1.6119	1.6119	1.6655	1.6655	11.4	11.4
			JJJ	1.4869	1.4869	1.4454	1.4454	9.0	9.0

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1736 J49200	12/8/16	M (IS1)	0.3177	0.3054	0.3054	3.9	3.9
			a (IS2)	0.3377	0.3909	0.3909	15.8	15.8
			cc (IS3)	1.6655	1.577	1.577	5.3	5.3
			JJJ (IS4)	1.4454	1.500	1.500	3.8	3.8
			(IS5)					
2	CCV 1033 J49246	12/10/16	(IS1)		0.2999	0.2999	5.6	5.6
			(IS2)		0.4049	0.4049	19.9	19.9
			(IS3)		1.378	1.378	17.3	17.3
			(IS4)		1.335	1.335	7.7	7.7
			(IS5)					
3								
4								

LDC #: 37802A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	67.1	134	134	0
1,2-Dichloroethane-d4		56.2	112	112	
Toluene-d8		50.0	100	100	
Bromofluorobenzene		61.4	123	123	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37802A 1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 34

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	ND	21.0	21.4 ~~20.6~~	105	105	107	107	2	2
Trichloroethene				20.7	FT ~~20.0~~ 20.3	103	103	101	101	2	2
Benzene				19.5	19.8	97	97	99	99	1	1
Toluene				19.2	19.1	96	96	95	95	1	1
Chlorobenzene				19.3	19.4	97	97	97	97	0	0

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460 - 408564

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20	NA	20.8	NA	104	104				
Trichloroethene			19.8		99	99				
Benzene			20.1		100	100				
Toluene			18.9		94	94				
Chlorobenzene			19.4		97	97	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-408564 CC

Conc. = $\frac{(151048)(50.0)(\quad)}{(240418)(1.6655)(\quad)(\quad)}$

= 18.9 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 12, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124871-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-033-GW	460-124871-1	Water	12/06/16
CFMW-033-GWMS	460-124871-1MS	Water	12/06/16
CFMW-033-GWMSD	460-124871-1MSD	Water	12/06/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/09/16	2,2'-Oxybis(1-chloropropane) 3&4-Methylphenol 4-Nitrophenol	20.3 20.2 20.8	All samples in SDG 460-124871-1	UJ (all non-detects) UJ (all non-detects)	A
12/09/16	Hexachlorocyclopentadiene	39.0	All samples in SDG 460-124871-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-033-GWMS/MSD (CFMW-033-GW)	2-Methylphenol Bis(2-chloroethyl) ether Chrysene	41 (43-80) 62 (63-106) 71 (73-121)	- - -	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
CFMW-033-GWMS/MSD (CFMW-033-GW)	Hexachlorocyclopentadiene	-	104 (18-99)	NA	-

Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
LCS 460-408513	2-Methylphenol Bis(2-chloroethyl) ether Chrysene	39 (43-80) 58 (63-106) 71 (73-121)	All samples in SDG 460-124871-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, MS/MSD %R, and LCS %R, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-124871-1

Sample	Compound	Flag	A or P	Reason
CFMW-033-GW	2,2'-Oxybis(1-chloropropane) 3&4-Methylphenol 4-Nitrophenol	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-033-GW	2-Methylphenol Bis(2-chloroethyl) ether Chrysene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-033-GW	2-Methylphenol Bis(2-chloroethyl) ether Chrysene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-124871-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-124871-1

No Sample Data Qualified in this SDG

LDC #: 37802A2a

SDG #: 460-124871-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/6/17

Page: 1 of 7

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-033-GW	460-124871-1	Water	12/06/16
2	CFMW-033-GWMS	460-124871-1MS	Water	12/06/16
3	CFMW-033-GWMSD	460-124871-1MSD	Water	12/06/16
4				
5				
6				
7				
8				

Notes:

	MB 460-408513						

LDC #: 37802A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37803A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37802 Ada

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	12/9/16	CCV6-M236080	H	20.3		All	J-/UJ/A NP
-	0045		QQQQ	20.2			↓
+			X	39.0		↓	J+ det/A
-			II	20.8			J-/UJ/A

CONCAL.wpd

LDC #: 37802 A2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	2+3	G	41 (43-80)	( )	( )	#1	J- /UJ/A NP
		B	62 (63-106)	( )	( )		
		DDD	71 (73-121)	( )			
		X	( )	104 (18-99)	( )		J+/UJ/A
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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LDC #: 37802Ada

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-	G	39 (43-80)	( )	( )	All	J-/UJ/P NO
	408513	B	58 (63-106)	( )	( )	↓	↓
		DDD	71 (73-121)	( )	( )	↓	↓
			( )	( )	( )		
			( )	( )	( )		
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LDC #: 37802A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	12/2/2016	A	2.1672	2.1672	1.9958	1.9958	14.7	14.7
			S	0.9169	0.9169	1.0463	1.0463	19.8	19.8
			DD	1.5459	1.5459	1.6628	1.6628	16.4	16.4
			UU	0.8865	0.8865	0.9847	0.9847	16.7	16.7
			DDD	0.8861	0.8861	0.9716	0.9716	10.9	10.9
			III	0.9789	0.9789	0.9908	0.9908	6.8	6.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 Ada

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV6 0045 M236080	12/9/16	A (1st IS)	1.9958	1.836	1.836	8.0	8.0
			S (2nd IS)	1.0463	0.8712	0.8712	16.7	16.7
			DD (3rd IS)	1.6628 FT	~~0.8870~~ 1.509	1.509	~~8.7~~ 9.2	9.2
			UU (4th IS)	0.9847	0.8794	0.8794	10.7	10.7
			DDD (5th IS)	0.9716	0.8870	0.8870	8.7	8.7
			III (6th IS)	0.9908	1.067	1.067	7.6	7.6
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [signature]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	7.78	78	78	0
2-Fluorobiphenyl	↓	7.04	70	70	↓
Terphenyl-d14	↓	8.66	87	87	↓
Phenol-d5	↓	2.08	21	21	↓
2-Fluorophenol	↓	3.54	35	35	↓
2,4,6-Tribromophenol	↓	8.59	86	86	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37802A29

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 2 + 3

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	80.0	80.0	ND	19.6	21.0	25	25	26	26	7	7
N-Nitroso-di-n-propylamine	↓	↓	↓	52.4	55.6	65	65	69	69	6	6
4-Chloro-3-methylphenol	↓	↓	↓	48.6	52.5	61	61	66	66	8	8
Acenaphthene	↓	↓	↓	59.5	65.6	74	74	82	82	10	10
Pentachlorophenol	160	160	↓	124	133	77	77	83	83	7	7
Pyrene	80.0	80.0	↓	59.3	66.3	74	74	83	83	11	11

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460-408513

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80	NA	20.6	NA	26	26				
N-Nitroso-di-n-propylamine	↓	↓	46.8	↓	59	59				
4-Chloro-3-methylphenol	80.0	↓	50.3	↓	63	63				
Acenaphthene	80	↓	57.1	↓	71	71				
Pentachlorophenol	160	↓	124	↓	77	77				
Pyrene	80	↓	59.1	↓	74	74	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 A2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-408513 A

Conc. = $\frac{184222\ (8)\ (2)\ (1000)}{2868893\ (1.9958)\ (250)}$

= 20.6 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124871-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-033-GWF	460-124871-1F	Water	12/06/16
CFMW-056a-GWF	460-124871-2F	Water	12/06/16
CFMW-EB10-AQ	460-124871-3	Water	12/06/16
CFMW-DUP4-GWF	460-124871-4F	Water	12/06/16
CFMW-033-GWFMS	460-124871-1FMS	Water	12/06/16
CFMW-033-GWFDUP	460-124871-1FDUP	Water	12/06/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB10-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB10-AQ	12/06/16	Calcium Sodium	402 ug/L 386 ug/L	No associated samples in this SDG

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-033-GWFMS, no data were qualified for Calcium and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits with the following exceptions:

Diluted Sample	Analyte	%D (Limits)	Associated Samples	Flag	A or P
CFMW-033-GWF	Magnesium	24 (≤10)	CFMW-033-GWF CFMW-056a-GWF CFMW-DUP4-GWF	J (all detects)	A

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-056a-GWF and CFMW-DUP4-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-056a-GWF	CFMW-DUP4-GWF			
Aluminum	21.4	24.6	14 (≤30)	-	-
Arsenic	2.2	2.3	4 (≤30)	-	-
Barium	111	116	4 (≤30)	-	-
Calcium	26400	27000	2 (≤30)	-	-
Magnesium	10400	10800	4 (≤30)	-	-
Manganese	241	248	3 (≤30)	-	-
Potassium	6160	6500	5 (≤30)	-	-
Sodium	18300	18200	1 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to serial dilution %D, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-124871-1

Sample	Analyte	Flag	A or P	Reason
CFMW-033-GWF CFMW-056a-GWF CFMW-DUP4-GWF	Magnesium	J (all detects)	A	Serial Dilution (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-124871-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-124871-1

No Sample Data Qualified in this SDG

LDC #: 37802A4a

SDG #: 460-124871-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/10/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: ~~Dissolved~~ Metals (EPA SW 846 Method 6020A/7470A)

JD

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/10/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=(3)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(5)=Ca, Na 4X
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	SW	SER=(1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD=(2,4)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

F = Dissolved

	Client ID	Lab ID	Matrix	Date
1	CFMW-033-GW F	460-124871-1 F	Water	12/06/16
2	CFMW-056a-GW F	460-124871-2 F	Water	12/06/16
3	CFMW-EB10-AQ	460-124871-3	Water	12/06/16
4	CFMW-DUP4-GW F	460-124871-4 F	Water	12/06/16
5	CFMW-033-GWMS ~~F~~ E JD All	460-124871-1MS E JD	Water	12/06/16
6	CFMW-033-GWDUP E ↓	460-124871-1DUP E	Water	12/06/16
7				
8				
9				
10				
11				
12				
13				
14				

Notes:

LDC #: 37802A1Ka

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37802A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: C

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?		✓		
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37852A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-4	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
RC-5-6	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___

Comments: Mercury by CVAA if performed

LDC #: 37802A4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/06/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: None

Analyte	Blank ID	Sample Identification											
	3	Action Limit	No Qual.										
Ca	402	4020											
Na	386	3860											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37802A4a

VALIDATION FINDINGS WORKSHEET
ICP Serial Dilution

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010C/6020A/7471B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A If analyte concentrations were > 50X the MDL (ICP) ,or >100X the MDL (ICP/MS), was a serial dilution analyzed?
Y N N/A Were ICP serial dilution percent differences (%D) ≤10%?
Y N N/A Is there evidence of negative interference? If yes, professional judgement will be used to qualify the data.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Diluted Sample ID	Matrix	Analyte	%D (Limits)	Associated Samples	Qualifications
	1	W	Mg	24	1-2, 4	J/UJ/A (det)

Comments: EB not associated

LDC#: 37802A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6010B/7000)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	2	4		
Aluminum	21.4	24.6	14	
Arsenic	2.2	2.3	4	
Barium	111	116	4	
Calcium	26400	27000	2	
Magnesium	10400	10800	4	
Manganese	241	248	3	
Potassium	6160	6500	5	
Sodium	18300	18200	1	

LDC #: 38024A1a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 21:54	ICP/MS (Initial calibration)	Mn	431.3ug/L	400 ug/L	109%R	109%R	Y
ICV 13:18	CVAA (Initial calibration)	Hg	5.102 ug/L	5 ug/L	102%R	102%R	Y
	ICP (Continuing calibration)						
CCV 22:35	ICP/MS (Continuing calibration)	Ni	49.8ug/L	50 ug/L	100%R	100%R	Y
CCV 13:48	CVAA (Contining calibration)	Hg	5.38ug/L	5 ug/L	106%R	106%R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

LDC #: 37802A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 22:09	ICP interference check	As	106.8 ug/L	100 ug/L	107%R	107%R	Y
LCS 13:31	Laboratory control sample	Hg	0.937 ug/L	1 ug/L	94%R	94%R	
MS 22:50	Matrix spike	Be	(SSR-SR) 9.7 ug/L	10 ug/L	97%R	97%R	
DUP 22:53	Duplicate	Ba	175.9 ug/L	172.3 ug/L	2%RPD	2%RPD	
SER 23:00	ICP serial dilution	Mg	19364 ug/L	15000 ug/L	22%RPD	24%D	*

Comments: *Rounding

TOTCLC.4SW

LDC #: 37802A49

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 3D
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (3) Na were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 193.048 ug/L x 2 = 386 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 193.048 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ba	172	172	Y
	2	Ca	26400	26400	
	3	Na	386	386	
	4	V	3.6	3.6	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 12, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124871-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-033-GW	460-124871-1	Water	12/06/16
CFMW-056a-GW	460-124871-2	Water	12/06/16
CFMW-EB10-AQ	460-124871-3	Water	12/06/16
CFMW-DUP4-GW	460-124871-4	Water	12/06/16
CFMW-033-GWMS	460-124871-1MS	Water	12/06/16
CFMW-033-GWMSD	460-124871-1MSD	Water	12/06/16
CFMW-033-GWDUP	460-124871-1DUP	Water	12/06/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Sample	Analyte	Finding	Criteria
CFMW-033-GW CFMW-056a-GW CFMW-DUP4-GW	Total dissolved solids Total suspended solids	The daily balance check for was not performed.	The balance check should be performed before daily use to verify calibration.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB10-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB10-AQ	12/06/16	Chloride Sulfate	202 ug/L 821 ug/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-033-GWMS/MSD (CFMW-033-GW CFMW-056a-GW CFMW-DUP4-GW)	Fluoride Orthophosphate as P	86 (90-110) 51 (90-110)	82 (90-110) 57 (90-110)	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A
CFMW-033-GWMS/MSD (CFMW-033-GW CFMW-056a-GW CFMW-DUP4-GW)	Sulfate	75 (90-110)	176 (90-110)	J (all detects)	A

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-033-GWMS/MSD (CFMW-033-GW CFMW-056a-GW CFMW-DUP4-GW)	Sulfate	27 (≤20)	J (all detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFMW-056a-GW and CFMW-DUP4-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-056a-GW	CFMW-DUP4-GW			
Total cyanide	3.3 ug/L	2.0U ug/L	49 (≤30)	J (all detects) UJ (all non-detects)	A
Ammonia	117 ug/L	89.0 ug/L	27 (≤30)	-	-

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-056a-GW	CFMW-DUP4-GW			
Hardness	124000 ug/L	116000 ug/L	7 (≤30)	-	-
Alkalinity	121000 ug/L	125000 ug/L	3 (≤30)	-	-
Total dissolved solids	179 mg/L	163 mg/L	9 (≤30)	-	-
Total suspended solids	224 mg/L	140 mg/L	46 (≤30)	J (all detects)	A
Fluoride	400 ug/L	394 ug/L	2 (≤30)	-	-
Sulfate	3470 ug/L	3360 ug/L	3 (≤30)	-	-
Chloride	21700 ug/L	21600 ug/L	0 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and RPD and field duplicate RPD, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-124871-1

Sample	Analyte	Flag	A or P	Reason
CFMW-033-GW CFMW-056a-GW CFMW-DUP4-GW	Fluoride Orthophosphate as P	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-033-GW CFMW-056a-GW CFMW-DUP4-GW	Sulfate	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R) (RPD)
CFMW-056a-GW CFMW-DUP4-GW	Total cyanide	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)
CFMW-056a-GW CFMW-DUP4-GW	Total suspended solids	J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-124871-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-124871-1

No Sample Data Qualified in this SDG

LDC #: 37802A6

SDG #: 460-124871-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/10/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/6/16
II	Initial calibration	A	
III.	Calibration verification	~~A~~ SW	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=(3)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MSD= (5.6)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/Spk, SRM
IX.	Field duplicates	SW	FD=(2.4)
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-033-GW	460-124871-1	Water	12/06/16
2	CFMW-056a-GW	460-124871-2	Water	12/06/16
3	CFMW-EB10-AQ	460-124871-3	Water	12/06/16
4	CFMW-DUP4-GW	460-124871-4	Water	12/06/16
5	CFMW-033-GWMS 9056 300.0 353.2 NH3 CN	460-124871-1MS	Water	12/06/16
6	CFMW-033-GWMSD ↓ ↓ ↓ ↓ ↓	460-124871-1MSD	Water	12/06/16
7	CFMW-033-GWDUP ↓ ↓ Alk, Hard, TDS, TSS	460-124871-1DUP	Water	12/06/16
8				
9				
10				
11				
12				
13				
14				
15				

Notes:

LDC #: 37802A6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)		✓		
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 31852A6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

DLDC #: 37802A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer:

All circled methods are applicable to each sample.

Sample ID	Parameter
1-2,4	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
3	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
RC:5-6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
RC:7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37802A6

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?
Y N N/A Are all correlation coefficients ≥0.995?
Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
	12/09/16	Balance Check	TDS and TSS	Balance check was not performed on 12/09/16	1-2, 4	Text

Comments:

LDC #: 37802A6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/06/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: None

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	3		No Qualifiers							
Chloride	202	2020								
Sulfate	821	8210								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37802A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	5/6	W	F	86 (90-110)	82 (90-110)		1-2, 4	J-/UJ/A (det)
			SO4	75 (90-110)	176 (90-110)			J/UJ/A ~~J+det~~/A (det)
			OPO4-P	51 (90-110)	57 (90-110)			J-/UJ/A (nd)
	5/6	W	SO4			27 (≤20)	1-2, 4	J/UJ/A (det)

Comments: EB not associated

LDC#: 37802A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: TSD
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	2	4		
Total Cyanide	3.3 (ug/L)	2.0U (ug/L)	49	J/UJ/A (det/nd)
Ammonia	117 (ug/L)	89.0 (ug/L)	27	
Hardness	124000 (ug/L)	116000 (ug/L)	7	
Alkalinity	121000 (ug/L)	125000 (ug/L)	3	
TDS	179 (mg/L)	163 (mg/L)	9	
TSS	224 (mg/L)	140 (mg/L)	46	Jdet/A (det)
Fluoride	400 (ug/L)	394 (ug/L)	2	
Sulfate	3470 (ug/L)	3360 (ug/L)	3	
Chloride	21700 (ug/L)	21600 (ug/L)	0	

\\LDCFILESERVER\Validation\FIELD DUPLICATES\FD_inorganic\37802A6.wpd

LDC #: 35852A6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of F was recalculated.Calibration date: 10/26/10

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	F	s1	0.1	6654	0.9991	0.9990	Y*
		s2	0.2	22153			
		s3	1	148188			
		s4	2	299498			
		s5	3	476835			
		s6	4	645687			
ICV 22:52 Calibration verification	F	Found 1.021 mg/L	True 1 mg/L		102.1%R	102.1%R	Y
ICV 22:52 Calibration verification	OPO4-P	2.391 mg/L	2.5 mg/L		95.6%R	95.5%R	*
ICV 10:50 Calibration verification	CN	0.210 mg/L	0.2 mg/L		105%R	105%R	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37802A0

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 23:28	Laboratory control sample	OPO4-P	2496 ug/L	2500 ug/L	100%R	100%R	Y
MS 14:53	Matrix spike sample	NH3	(SSR-SR) 1065 ug/L	1000 ug/L	107%R	106%R	Y*
DUP 15:46	Duplicate sample	TDS	309 mg/L	303 mg/L	2%RPD	2%RPD	Y

Comments:

TOTCLC.6

LDC #: 37802A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JSD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (1) Total CN reported with a positive detect were recalculated and verified using the following equation:

Concentration = 0.0235xA - 3.42e-4 Recalculation: 0.0235x 2.07 - 3.42e-4 = 0.0483mg/L

0.0483mg/L x 10 x 1000ug/1mg ≈ 483ug/L

A=2.07
Dil=10

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Total CN	483	483	Y
	2	NH3	117	117	
	3	Cl	202	202	
	4	Hardness	116000	116000	
	4	Alkalinity	125000	125000	
	4	TDS	163mg/L	163 mg/L	
	4	TSS	140	140mg/L	
	1	NO3/NO2-N	3140	3140	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124977-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-0256-GW	460-124977-1	Water	12/07/16
CFMW-061-GW	460-124977-3	Water	12/07/16
CFMW-DUP5-GW	460-124977-4	Water	12/07/16
CFMW-064-GW	460-124977-5	Water	12/07/16
Trip Blank	460-124977-6	Water	12/07/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
11/11/16	1,2-Dibromo-3-chloropropane	26.2	All samples in SDG 460-124977-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/10/16	Bromomethane Chloroethane Trichlorofluoromethane 1,1,2-Trichloro-1,2,2-trifluoroethane	45.0 27.5 34.9 20.4	CFMW-061-GW CFMW-DUP5-GW	NA	-
12/10/16	Methyl acetate 1,1,2,2-Tetrachloroethane	26.1 34.4	CFMW-061-GW CFMW-DUP5-GW	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	%R (Limits)	Flag	A or P
LCS 460-408845 (CFMW-061-GW CFMW-DUP5-GW)	1,1,2,2-Tetrachloroethane	69 (74-120)	UJ (all non-detects)	P

X. Field Duplicates

Samples CFMW-061-GW and CFMW-DUP5-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS %R, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-124977-1

Sample	Compound	Flag	A or P	Reason
CFMW-061-GW CFMW-DUP5-GW	Methyl acetate 1,1,2,2-Tetrachloroethane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-061-GW CFMW-DUP5-GW	1,1,2,2-Tetrachloroethane	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-124977-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-124977-1

No Sample Data Qualified in this SDG

LDC #: 37802B1

SDG #: 460-124977-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/6/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 5
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	460-12471-1 MS/D
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	ND	D = 2,3
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-0256-GW	460-124977-1	Water	12/07/16
2 2	CFMW-061-GW D	460-124977-3	Water	12/07/16
3 2	CFMW-DUP5-GW D	460-124977-4	Water	12/07/16
4 1	CFMW-064-GW	460-124977-5	Water	12/07/16
5 1	Trip Blank	460-124977-6	Water	12/07/16
6				
7				
8				
9				

Notes:

1	MB 460-408564						
2	- 408845						

LDC #: 37802

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37802B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37802 B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
+	11/11/16 0059	ICV-8	MM	26.2	All	J+ det / A ND

ICVvoa.wpd

LDC #: 37802B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
+	12/10/16	CCVB-J49246	B	45.0		2,3, MB 460-408845	J+ all/A all ND
+			D	27.5			
+			KK	34.9			
+			TTT	20.4			
-			QQQQ	26.1			J-/UJ/A
-			BB	34.4			
-			FT ~~YY~~	~~20.6~~			
-			~~XX~~	~~20.2~~			

CONCAL.wpd

LDC #: 37802B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-408845	BB	69 (74-124)	( )	( )	2,3,MB 460-408845	J/UJ/P (ND)
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37802B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	11/11/2016	M	0.3048	0.3048	0.3177	0.3177	14.8	14.8
	GCMS8		C	0.3511	0.3511	0.3377	0.3377	4.4	4.4
			CC	1.6119	1.6119	1.6655	1.6655	11.4	11.4
			JJJ	1.4869	1.4869	1.4454	1.4454	9.0	9.0

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1736 J49200	12/8/16	M (IS1)	0.3177	0.3054	0.3054	3.9	3.9
			C (IS2)	0.3377	0.3909	0.3909	15.8	15.8
			CC (IS3)	1.6655	1.577	1.577	5.3	5.3
			JJJ (IS4)	1.4454	1.500	1.500	3.8	3.8
			(IS5)					
2	CCV 1033 J49246	12/10/16	(IS1)		0.2999	0.2999	5.6	5.6
			(IS2)		0.4049	0.4049	19.9	19.9
			(IS3)		1.378	1.378	17.3	17.3
			(IS4)		1.335	1.335	7.7	7.7
			(IS5)					
3								
4								

LDC #: 37802 B 1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	65.3	131	131	0
1,2-Dichloroethane-d4	↓	56.1	112	112	↓
Toluene-d8	↓	50.2	100	100	↓
Bromofluorobenzene	↓	61.8	124	124	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37802B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: 9

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460 - 408564

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20	NA	20.8	NA	104	104				
Trichloroethene			19.8		99	99				
Benzene			20.1		100	100				
Toluene			18.9		94	94				
Chlorobenzene			19.4		97	97	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. ICS 460-408564 CC

Conc. = $\frac{(151048)(50.0)(\quad)(\quad)}{(240418)(1.6655)(\quad)(\quad)}$

= 18.9 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124977-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-0256-GW	460-124977-1	Water	12/07/16
CFMW-061-GW	460-124977-3	Water	12/07/16
CFMW-DUP5-GW	460-124977-4	Water	12/07/16
CFMW-064-GW	460-124977-5	Water	12/07/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/09/16	1,4-Dioxane 2,4-Dinitrophenol Di-n-octylphthalate	49.3 24.6 24.7	All samples in SDG 460-124977-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-408562 (All samples in SDG 460-124977-1)	1,4-Dioxane	70 (25-66)	-	NA	-
	2,4-Dinitrotoluene	126 (70-123)	132 (70-123)		
	4-Chlorophenyl-phenyl ether	115 (60-114)	117 (60-114)		
	Benzo(b)fluoranthene	128 (78-123)	-		
	Dibenzofuran	-	109 (67-108)		
	Hexachlorocyclopentadiene	-	105 (18-99)		

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-124977-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-124977-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-124977-1

No Sample Data Qualified in this SDG

LDC #: 37802B2a

SDG #: 460-124977-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/6/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	Lab ID
X.	Field duplicates	ND	D = 2, 3
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-0256-GW	460-124977-1	Water	12/07/16
2	CFMW-061-GW D	460-124977-3	Water	12/07/16
3	CFMW-DUP5-GW D	460-124977-4	Water	12/07/16
4	CFMW-064-GW	460-124977-5	Water	12/07/16
5				
6				
7				
8				

Notes:

	MB 460-408562						

LDC #: 37802B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?			✓	
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37802 13 2a

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37802 B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	12/9/16	CCV4-U33048	III	49.3		all	J+ all / A NP
+	11:59		HH	24.6		↓	↓
+			FFF	24.7			

CONCAL.wpd

LDC #: 37802 B2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a LCS required?
Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS ID 460-	III	~~55.8~~ 10 F1 (25-66)	( )	( )	All	J+ all ND / P all ND
	408562	KK	126 (70-123)	132 (70-123)	( )	↓	↓
		MM	115 (60-114)	117 (60-114)	( )		
		GGG	128 (78-123	( )	( )		
		JJ	( )	109 (67-108)	( )		
		X	( )	105 (18-99)	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37802B2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms4	12/4/2016	A	2.0399	2.0399	2.0577	2.0577	13.9	13.9
			S	0.9660	0.9660	0.9790	0.9790	15.4	15.4
			DD	1.6843	1.6843	1.6846	1.6846	12.0	12.0
			UU	0.9965	0.9965	0.9514	0.9514	10.1	10.1
			DDD	0.9359	0.9359	0.9152	0.9152	8.5	8.5
			III	1.1182	1.1182	0.9951	0.9951	10.9	10.9

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 11:59	12/9/16	A (1st IS)	2.0977	2.071	2.071	0.6	0.6
	433048		S (2nd IS)	0.9790	1.006	1.006	2.8	2.8
			DD (3rd IS)	1.6846	1.670	1.670	0.9	0.9
			UU (4th IS)	0.9514	0.9813	0.9813	3.1	3.1
			DDD (5th IS)	0.9152	0.9585	0.9585	4.7	4.7
			III (6th IS)	0.9951	1.125	1.125	13.1	13.1
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802B2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [signature]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.71	97	97	0
2-Fluorobiphenyl	↓	10.1	101	101	↓
Terphenyl-d14	↓	9.51	95	95	↓
Phenol-d5	↓	3.17	32	32	↓
2-Fluorophenol	↓	5.13	51	51	↓
2,4,6-Tribromophenol	↓	12.9	129	129	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37802 B2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460-408562

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	25.2	25.3	32	32	32	32	0	0
N-Nitroso-di-n-propylamine	↓	↓	72.2	70.3	90	90	88	88	3	3
4-Chloro-3-methylphenol	↓	↓	69.6	66.4	87	87	83	83	5	5
Acenaphthene	↓	↓	82.6	77.4	103	103	97	97	6	6
Pentachlorophenol	160	160	170	163	106	106	102	102	4	4
Pyrene	80.0	80.0	85.4	79.4	107	107	99	99	7	7

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 B29

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-408562 A

Conc. = $\frac{2639999}{325525} \frac{(8.0)}{(2.0577)} \frac{(2)(1000)}{(250)}$

= 25.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124977-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-025b-GWF	460-124977-1F	Water	12/07/16
CFMW-EB11-AQ	460-124977-2	Water	12/07/16
CFMW-061-GWF	460-124977-3F	Water	12/07/16
CFMW-DUP5-GWF	460-124977-4F	Water	12/07/16
CFMW-064-GWF	460-124977-5F	Water	12/07/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples CFMW-EB10-AQ (from SDG 460-124871-1) and CFMW-EB11-AQ were identified as equipment blanks. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB11-AQ	12/07/16	Calcium Sodium	510 ug/L 306 ug/L	CFMW-061-GWF
CFMW-EB10-AQ	12/06/16	Calcium Sodium	402 ug/L 386 ug/L	CFMW-025b-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-061-GWF and CFMW-DUP5-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-061-GWF	CFMW-DUP5-GWF			
Barium	300	297	1 (≤30)	-	-
Calcium	60700	60600	0 (≤30)	-	-
Magnesium	20600	20100	2 (≤30)	-	-
Manganese	15.6	15.3	2 (≤30)	-	-
Potassium	871	861	1 (≤30)	-	-
Sodium	11400	11100	3 (≤30)	-	-
Zinc	7.0U	18.2	89 (≤30)	J (all detects) UJ (all non-detects)	A

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-124977-1

Sample	Analyte	Flag	A or P	Reason
CFMW-061-GWF CFMW-DUP5-GWF	Zinc	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-124977-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-124977-1

No Sample Data Qualified in this SDG

LDC #: 37802B4a

SDG #: 460-124977-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/10/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: ~~Dissolved~~ Metals (EPA SW 846 Method 6020A/7470A)

JD

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/7/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB = (2); CFMW-EB10-AQ (SDG: 460-124871-1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS = CFMW-033-GW MS (SDG: 460-124871-1)
VIII.	Duplicate sample analysis	A	DUP = CFMW-033-GW DUP (SDG: 460-124871-1) *See Below
IX.	Serial Dilution	A	SER = CFMW-011-GW (SDG: 460-125105-1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD = (3,4)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

F = Dissolved

	Client ID	Lab ID	Matrix	Date
1	CFMW-025~~5~~b-GW F	460-124977-1 F	Water	12/07/16
2	CFMW-EB11-AQ	460-124977-2	Water	12/07/16
3	CFMW-061-GW F	460-124977-3 F	Water	12/07/16
4	CFMW-DUP5-GW F	460-124977-4 F	Water	12/07/16
5	CFMW-064-GW F	460-124977-5 F	Water	12/07/16
6				
7				
8				
9				
10				
11				
12				
13				
14				

Notes:

MS = CFMW-011-GW MS (SDG: 460-125105-1)

DUP = CFMW-011-GW DUP (SDG: 460-125105-1)

LDC #: 37828A2

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 31802BA-

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: SD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-5	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37802B4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/7/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 3

Analyte	Blank ID	Sample Identification											
[redacted]	2	Action Limit	No Qual.										
Ca	510	5100											
Na	306	3060											

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/06/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 1

Analyte	Blank ID	Sample Identification											
[redacted]	CFMW-EB10-AQ (SDG: 460-124871-1)	Action Limit	No Qual.										
Ca	402	4020											
Na	386	3860											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 37802B4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6010B/7000)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	3	4		
Barium	300	297	1	
Calcium	60700	60600	0	
Magnesium	20600	20100	2	
Manganese	15.6	15.3	2	
Potassium	871	861	1	
Sodium	11400	11100	3	
Zinc	7.0U	18.2	89	J/UJ/A (nd)

dot/ND

LDC #: 37802B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: SD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 17:13	ICP/MS (Initial calibration)	Se	40.29 ug/L	40 ug/L	101%R	101%R	Y
ICV 13:35	CVAA (Initial calibration)	Hg	5.09 ug/L	5 ug/L	102%R	102%R	↓
	ICP (Continuing calibration)						
CCV 18:00	ICP/MS (Continuing calibration)	Ag	52.82 ug/L	50 ug/L	106%R	106%R	Y
CCV 14:06	CVAA (Contining calibration)	Hg	4.60 ug/L	5 ug/L	92%R	92%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37802B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 17:25	ICP interference check	Cd	102.3 ug/L	100 ug/L	102%R	102%R	Y
LCS 15:11	Laboratory control sample	Cr	49.7 ug/L	50 ug/L	99%R	99%R	
MS 15:43	Matrix spike	Hg	(SSR-SR) 0.90 ug/L	1 ug/L	90%R	90%R	
DUP 15:07	Duplicate	Na	10901 ug/L	11210 ug/L	3%RPD	3%RPD	
SER 19:12	ICP serial dilution	Mg	16430 ug/L	15981 ug/L	2.8%D	2.8%D	

Comments: _____

TOTCLC.4SW

LDC #: 37802B4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (2) Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 254.853 ug/L x 2 = 510 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 254.853 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ba	314	314	Y
	2	Ca	510	510	
	3	Mg	20600	20600	
	4	K	861	861	
	5	Na	10400	10400	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 12, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-124977-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-025b-GW	460-124977-1	Water	12/07/16
CFMW-EB11-AQ	460-124977-2	Water	12/07/16
CFMW-061-GW	460-124977-3	Water	12/07/16
CFMW-DUP5-GW	460-124977-4	Water	12/07/16
CFMW-064-GW	460-124977-5	Water	12/07/16
CFMW-061-GWMS	460-124977-3MS	Water	12/07/16
CFMW-061-GWMSD	460-124977-3MSD	Water	12/07/16
CFMW-061-GWDUP	460-124977-3DUP	Water	12/07/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Samples CFMW-EB10-AQ (from SDG 460-124871-1) and CFMW-EB11-AQ were identified as equipment blanks. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB10-AQ	12/06/16	Chloride Sulfate	202 ug/L 821 ug/L	CFMW-025b-GW
CFMW-EB11-AQ	12/07/16	Nitrate/Nitrite as N Chloride	110 ug/L 181 ug/L	CFMW-061-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-025b-GW	Chloride	1960 ug/L	1960J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-061-GWMS/MSD (CFMW-025b-GW CFMW-061-GW CFMW-DUP5-GW CFMW-064-GW)	Chloride Fluoride Sulfate Orthophosphate as P	- 87 (90-110) - 61 (90-110)	73 (90-110) 81 (90-110) 87 (90-110) 66 (90-110)	J- (all detects) UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFMW-061-GW and CFMW-DUP5-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-061-GW	CFMW-DUP5-GW			
Total cyanide	4.0	3.8	5 (≤30)	-	-
Nitrate/Nitrite as N	100U	134	29 (≤30)	-	-
Hardness	264000	260000	2 (≤30)	-	-
Alkalinity	267000	266000	0 (≤30)	-	-

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-061-GW	CFMW-DUP5-GW			
Total dissolved solids	296	266	11 (≤30)	-	-
Total suspended solids	30.3	40.8	30 (≤30)	-	-
Fluoride	669	640	4 (≤30)	-	-
Sulfate	5410	5440	1 (≤30)	-	-
Chloride	2150	2120	1 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in four samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-124977-1

Sample	Analyte	Flag	A or P	Reason
CFMW-025b-GW CFMW-061-GW CFMW-DUP5-GW CFMW-064-GW	Chloride Fluoride Sulfate Orthophosphate as P	J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-124977-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-124977-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-025b-GW	Chloride	1960J+ ug/L	A

LDC #: 37802B6
SDG #: 460-124977-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 1/10/17
Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ JD (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D) a

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/07/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=(2); CFMW-EB10-AQ (500-460-124871-1)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D=CFMW-033-GWMS/D (500-460-124871-1)
VII.	Duplicate sample analysis	A	DUP=CFMW-033-GWDUP (500-460-124871-1)
VIII.	Laboratory control samples	A	LCS/LCSD: SRM
IX.	Field duplicates	SW	FD=(3,4)
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-025~~8~~b-GW	460-124977-1	Water	12/07/16
2	CFMW-EB11-AQ No TDS & TSS	460-124977-2	Water	12/07/16
3	CFMW-061-GW	460-124977-3	Water	12/07/16
4	CFMW-DUP5-GW	460-124977-4	Water	12/07/16
5	CFMW-064-GW	460-124977-5	Water	12/07/16
6	CFMW-061-GWMS 9056 300.0	460-124977-3MS	Water	12/07/16
7	CFMW-061-GWMSD ↓ ↓	460-124977-3MSD	Water	12/07/16
8	CFMW-061-GWDUP	460-124977-3DUP	Water	12/07/16
9				
10				
11				
12				
13				
14				
15				

Notes:

LDC #: 37802B6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38028X0

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

DLDC #: 3802840

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1,3-5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
2	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
RC:6-8	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37802B6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/06/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 1

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	CFMW-EB10-AQ (SDG: 460-124871-1)		1							
Chloride	202	2020	1960J+							
Sulfate	821	8210								

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/07/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 3

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	2		No Qualifiers							
NO3/NO2-N	110	1100								
Chloride	181	1810								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37802B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	6/7	W	Cl		73 (90-110)		1, 3-5	J-/UJ/A (det)
			F	87 (90-110)	81 (90-110)			J-/UJ/A (det)
			SO4		87 (90-110)			J-/UJ/A (det)
			OPO4-P	61 (90-110)	66 (90-110)			J-/UJ/A (nd)

Comments: EB not associated

LDC#: 37802B6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: 3SD
2nd Reviewer: C

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	3	4		
Total Cyanide	4.0	3.8	5	
Nitrate/Nitrite-N	100U	134	29	
Hardness	264000	260000	2	
Alkalinity	267000	266000	0	
TDS	296	266	11	
TSS	30.3	40.8	30	
Fluoride	669	640	4	
Sulfate	5410	5440	1	
Chloride	2150	2120	1	

\\LDCFILESERVER\Validation\FIELD DUPLICATES\FD_inorganic\37802B6.wpd

LDC #: 37802B60

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of Total CN was recalculated. Calibration date: 12/12/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	Total CN	s1	0	-0.00803	0.99922	0.99991	Y*
		s2	0.01	0.438			
		s3	0.025	1.09			
		s4	0.05	2.19			
		s5	0.1	4.39			
		s6	0.2	8.76			
		s7	0.4	16.6			
ICV 10:50 Calibration verification	Total CN	Found 0.210 mg/L	True 0.2 mg/L		105%R	105%R	Y
ICV 13:34 Calibration verification	NH3	2.028 mg/L	2 mg/L		101%R	101%R	↓
ICV 11:49 Calibration verification	NO3/NO2	1.019 mg/L	1 mg/L		102%R	102%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37802F40

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SR
2nd Reviewer: 2

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 13:39	Laboratory control sample	NH3	976 ug/L	1000 ug/L	98%R	98%R	Y
MS 22:26	Matrix spike sample	F	(SSR-SR) 872 ug/L	1000 ug/L	87%R	87%R	
DUP 16:02	Duplicate sample	Hardness	224 mg/L	228 mg/L	2%RPD	2%RPD	

Comments:

TOTCLC.6

LDC #: 37802B4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (4) Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

V = 25 ml
T = 6.5 ml
N = 0.02N

Recalculation: $\frac{(6.5\,ml)(0.02N)(50000)}{25\,ml} \times \frac{1000\,ug}{1\,mg} = 26000\,ug/L$

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	NO3/NO2-N	241	241	Y
	2	Cl	181	182	Y*
	3	Total CN	4.0	4.0	Y
	4	Hardness	260000	260000	
	5	Alkalinity	268000	268000	
	5	TDS	183 mg/L	183 mg/L	
	5	TSS	181 mg/L	181 mg/L	

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125105-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-011-GW	460-125105-2	Water	12/08/16
CFMW-037-GW	460-125105-3	Water	12/08/16
Trip Blank	460-125105-4	Water	12/08/16
CFMW-011-GWMS	460-125105-2MS	Water	12/08/16
CFMW-011-GWMSD	460-125105-2MSD	Water	12/08/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

LDC #: 37802C1
SDG #: 460-125105-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 1/6/17
Page: 1 of 1
Reviewer: P
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 3
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-011-GW	460-125105-2	Water	12/08/16
2	CFMW-037-GW	460-125105-3	Water	12/08/16
3	Trip Blank	460-125105-4	Water	12/08/16
4	CFMW-011-GWMS	460-125105-2MS	Water	12/08/16
5	CFMW-011-GWMSD	460-125105-2MSD	Water	12/08/16
6				
7				
8				
9				

Notes:

1	MB 460-40926 1						

LDC #: 37802C1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37802C1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37802C1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	12/13/2016	M	0.3005	0.3005	0.3220	0.3220	11.9	11.9
	GCMS8		C	0.2596	0.2596	0.2534	0.2534	3.2	3.2
			CC	1.5000	1.5000	1.5438	1.5438	10.0	10.0
			JJJ	1.4137	1.4137	1.4509	1.4509	9.6	9.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 C /

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0821 J49322	12/13/16	M (IS1)	0.3220	0.3034	0.3034	5.8	5.8
			C (IS2)	0.2534	0.2607	0.2607	2.9	2.9
			CC (IS3)	1.5438	1.4703 F1	1.473	4.6	4.6
			JJJ (IS4)	1.4509	1.473	1.473	1.5	1.5
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37802C1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	50.2	100	100	0
1,2-Dichloroethane-d4	↓	48.0	96	96	↓
Toluene-d8	↓	48.2	96	96	↓
Bromofluorobenzene	↓	49.1	98	98	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37802 C1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 4 5

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	ND	19.6	20.2	98	98	101	101	3	3
Trichloroethene	↓	↓	↓	19.5	19.6	98	98	98	98	0	0
Benzene	↓	↓	↓	20.1	20.2	101	101	101	101	0	0
Toluene	↓	↓	↓	20.3	20.0	102	102	100	100	2	2
Chlorobenzene	↓	↓	↓	20.6	20.0	103	103	100	100	3	3

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 C/

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-409261

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	18.3	NA	91	91				
Trichloroethene	↓	↓	19.6	↓	98	98				
Benzene	↓	↓	19.9	↓	100	100				
Toluene	↓	↓	19.7	↓	99	99				
Chlorobenzene	↓	↓	20.5	↓	102	102	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 a/

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-409261 CC

Conc. = $\frac{219825\ (50.0)}{360638\ (1.5438)}$

= 19.7 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125105-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-011-GW	460-125105-2	Water	12/08/16
CFMW-037-GW	460-125105-3	Water	12/08/16
CFMW-011-GWMS	460-125105-2MS	Water	12/08/16
CFMW-011-GWMSD	460-125105-2MSD	Water	12/08/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-011-GWMS/MSD (CFMW-011-GW)	Acenaphthylene	118 (61-106)	-	NA	-

Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
LCS 460-408958	Acenaphthene	110 (61-106)	All samples in SDG 460-125105-1	NA	-
LCS 460-408958	Bis(2-chloroethyl) ether	62 (63-106)	All samples in SDG 460-125105-1	UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to LCS %R, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-125105-1

Sample	Compound	Flag	A or P	Reason
CFMW-011-GW CFMW-037-GW	Bis(2-chloroethyl) ether	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

LDC #: 37802C2a

SDG #: 460-125105-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/6/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-011-GW	460-125105-2	Water	12/08/16
2	CFMW-037-GW	460-125105-3	Water	12/08/16
3	CFMW-011-GWMS	460-125105-2MS	Water	12/08/16
4	CFMW-011-GWMSD	460-125105-2MSD	Water	12/08/16
5				
6				
7				
8				

Notes:

	MB 460-408958						

LDC #: 37802 C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37802 C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37802 cda

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	3+4	DD	118 (61-106)	( )	( )	1	J+dnt / A (ND)
			( )	( )	( )		
			( )	( )			
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37802C02

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-	GG	110 (61-106)	( )	( )	All	J+ut/P
	408958	B	62 (63-106)	( )	( )	↓	J-/NJ/P
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37802Cda

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	12/13/2016	A	1.6862	1.6862	1.8237	1.8237	18.4	18.4
			S	0.9080	0.9080	1.0152	1.0152	20.0	20.0
			GG	1.4750	1.4750	1.5349	1.5349	6.2	6.2
			UU	0.9379	0.9379	0.9826	0.9826	11.7	11.7
			DDD	0.9307	0.9307	0.9364	0.9364	11.2	11.2
			III	0.9887	0.9887	0.9969	0.9969	6.8	6.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802c2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	ccv 1949 M236197	12/13/16	A	(1st IS)	1.8237	1.850	1.850	1.5	1.5
			S	(2nd IS)	1.0152	0.9816	0.9816	3.3	3.3
			GG	(3rd IS)	1.5349	1.341	1.341	12.6	12.6
			HH	(4th IS)	0.9826	0.9137	0.9137	7.0	7.0
			DDD	(5th IS)	0.9364	0.8804	0.8804	6.0	6.0
			III	(6th IS)	0.9969	0.9402	0.9402	5.7	5.7
2	ccv 0529 M236222	12/14/16		(1st IS)		1.590	1.590	12.8	12.8
				(2nd IS)		0.8713	0.8713	14.2	14.2
				(3rd IS)		1.474	1.474	4.0	4.0
				(4th IS)		0.9825	0.9825	0.0	0.0
				(5th IS)		0.8788	0.8788	6.2	6.2
				(6th IS)		1.023	1.023	2.6	2.6
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802C2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	7.82	78	78	0
2-Fluorobiphenyl	↓	8.31	83	83	↓
Terphenyl-d14		9.92	99	99	
Phenol-d5		2.65	27	27	
2-Fluorophenol		3.70	37	37	
2,4,6-Tribromophenol	↓	9.16	92	92	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37802C2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 3 + 4

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
[redacted]	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	80.0	80.0	ND	25.2	26.2	31	31	33	33	4	4
N-Nitroso-di-n-propylamine	↓	↓	↓	60.4	65.0	76	76	81	81	7	7
4-Chloro-3-methylphenol	↓	↓	↓	55.2	57.0	69	69	71	71	3	3
Acenaphthene	↓	↓	ND	77.0	73.7	96	96	92	92	4	4
Pentachlorophenol	160	160	↓	140.0	143	88	88	89	89	2	2
Pyrene	80	80	↓	80.3	79.7	100	100	100	100	1	1

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 c2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 408958

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	29.1	NA	36	36				
N-Nitroso-di-n-propylamine			58.7		73	73				
4-Chloro-3-methylphenol			55.7		70	70				
Acenaphthene			75.4		94	94				
Pentachlorophenol	160.0		144		90	90				
Pyrene	80.0		74.9		94	94	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802c2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. VES 460-408958 A

Conc. = $\frac{332437\ (8.0)\ (2)\ (1000)}{400286\ (1.8237)\ (250)}$

= 29.1 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125105-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB12-AQ	460-125105-1	Water	12/08/16
CFMW-011-GWF	460-125105-2F	Water	12/08/16
CFMW-037-GWF	460-125105-3F	Water	12/08/16
CFMW-011-GWFMS	460-125105-2FMS	Water	12/08/16
CFMW-011-GWFDUP	460-125105-2FDUP	Water	12/08/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB12-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB12-AQ	12/08/16	Calcium Sodium	469 ug/L 450 ug/L	CFMW-011-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

LDC #: 37802C4a

SDG #: 460-125105-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/10/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/8/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=(1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(4)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER=(2)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB12-AQ	460-125105-1	Water	12/08/16
2	CFMW-011-GWF	460-125105-2F	Water	12/08/16
3	CFMW-037-GWF	460-125105-3F	Water	12/08/16
4	CFMW-011-GWFMS All	460-125105-2FMS	Water	12/08/16
5	CFMW-011-GWFDUP	460-125105-2FDUP	Water	12/08/16
6				
7				
8				
9				
10				
11				
12				
13				

Notes:

LDC #: 37802C4a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37826

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 3802 C4

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: SD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-3		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC4-5		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37802C4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: 3D
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/8/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Sample Identification											
	1	Action Limit	No Qual.										
Ca	469	4690											
Na	450	4500											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37802C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 17:18	ICP/MS (Initial calibration)	Zn	40.88ug/L	40ug/L	102%R	102%R	Y
ICV 14:07	CVAA (Initial calibration)	Hg	5.15ug/L	5ug/L	103%R	103%R	↓
	ICP (Continuing calibration)						
CCV 18:53	ICP/MS (Continuing calibration)	V	51.21ug/L	50ug/L	102%R	102%R	Y
CCV 15:22	CVAA (Contining calibration)	Hg	5.05ug/L	5ug/L	101%R	101%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

calcic.4sw.wpd

LDC #: 57802C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: CL

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICSAB 17:30	ICP interference check	Cr	211.1 ug/L	200 ug/L	106%R	106%R	Y
LCS 19:02	Laboratory control sample	Ag	5.65 ug/L	5 ug/L	113%R	113%R	
MS 15:20	Matrix spike	Hg	(SSR-SR) 0.97 ug/L	1 ug/L	97%R	97%R	
DUP 19:07	Duplicate	Ba	204.3 ug/L	208.5 ug/L	2%RPD	2%RPD	
SER 19:12	ICP serial dilution	Ca	52390 ug/L	52391 ug/L	0.002%D	0.002%D	Y

Comments: _____

TOTCLC.4SW

LDC #: 37802C4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: 3D
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 234.25 ug/L x 2 = 469 ug/L

RD = Raw data concentration RD = 234.25 ug/L
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G) Dil = 2
Dil = Dilution factor

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ca	469	469	Y
	2	Mg	16000	16000	↓
	3	Na	9580	9580	↓

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 12, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125105-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB12-AQ	460-125105-1	Water	12/08/16
CFMW-011-GW	460-125105-2	Water	12/08/16
CFMW-037-GW	460-125105-3	Water	12/08/16
CFMW-011-GWMS	460-125105-2MS	Water	12/08/16
CFMW-011-GWMSD	460-125105-2MSD	Water	12/08/16
CFMW-011-GWDUP	460-125105-2DUP	Water	12/08/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Sample	Analyte	Finding	Criteria
CFMW-011-GW CFMW-037-GW	Total dissolved solids	The daily balance check for was not performed.	The balance check should be performed before daily use to verify calibration.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB12-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB12-AQ	12/08/16	Chloride	183 ug/L	CFMW-011-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-011-GW	Chloride	681 ug/L	681J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-011-GWMS/MSD (CFMW-037-GW)	Ammonia	111 (90-110)	-	J+ (all detects)	A
CFMW-011-GWMS/MSD (CFMW-011-GW)	Ammonia	111 (90-110)	-	NA	-
CFMW-011-GWMS/MSD (CFMW-037-GW CFMW-011-GW)	Sulfate Chloride Orthophosphate as P	80 (90-110) 87 (90-110) 59 (90-110)	- 86 (90-110) 82 (90-110)	J- (all detects) UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-011-GWMS/MSD (CFMW-037-GW CFMW-011-GW)	Orthophosphate as P	32 (≤20)	UJ (all non-detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	Difference (Limits)	Flag	A or P
CFMW-011-GWDUP (CFMW-037-GW) CFMW-011-GW)	Fluoride	142 mg/L (≤80.0)	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and RPD and DUP difference, data were qualified as estimated in two samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125105-1

Sample	Analyte	Flag	A or P	Reason
CFMW-037-GW	Ammonia	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-037-GW CFMW-011-GW	Sulfate Chloride Orthophosphate as P	J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-037-GW CFMW-011-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (RPD)
CFMW-037-GW CFMW-011-GW	Fluoride	J (all detects)	A	Duplicate sample analysis (Difference)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125105-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125105-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-011-GW	Chloride	681J+ ug/L	A

LDC #: 37802C6

SDG #: 460-125105-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/11/17 SD

Page: 1 of 1

Reviewer: SD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ SD (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/8/16
II	Initial calibration	A	
III.	Calibration verification	SW	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = (1)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = (4, 5)
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB12-AQ	460-125105-1	Water	12/08/16
2	CFMW-011-GW	460-125105-2	Water	12/08/16
3	CFMW-037-GW	460-125105-3	Water	12/08/16
4	CFMW-011-GWMS 9056 300.0 353.2 NH3 CN	460-125105-2MS	Water	12/08/16
5	CFMW-011-GWMSD ↓ ↓ ↓ ↓ ↓	460-125105-2MSD	Water	12/08/16
6	CFMW-011-GWDUP ↓ ↓ Alk, Hardn, TDS, TSS	460-125105-2DUP	Water	12/08/16
7				
8				
9				
10				
11				
12				
13				
14				
15				

Notes:

LDC #: 37802C6

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)		✓		
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 378266

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: CL

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37802C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
2-3	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:4-5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37802C6

VALIDATION FINDINGS WORKSHEET
Calibration

Reviewer: JD
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?

Y N N/A Are all correlation coefficients ≥0.995?

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
	12/14/16	Balance Check	TDS	Balance check was not performed on 12/14/16	2-3	Text

Comments:

LDC #: 37802C6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/08/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	1		2							
Chloride	183	1830	681J+							

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37802C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	4/5	W	NH3	111 (90-110)			2-3	J+det/A (det = 3)
			SO4	80 (90-110)				J-/UJ/A (det)
			Cl	87 (90-110)	86 (90-110)			J-/UJ/A (det)
			OPO4-P	59 (90-110)	82 (90-110)			J-/UJ/A (nd)
	4/5	W	OPO4			32 (≤20)	2-3	J/UJ/A (nd)

Comments: EB not associated

LDC #: 37802C6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤ 35% for soil samples? If no, see qualifications below. A control limit of ±R.L. (±2X R.L. for soil) was used for sample values that were <5X the R.L., including the case when only one of the duplicate sample values was <5X R.L.. If field blanks were used for laboratory duplicates, note in the Overall Assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Difference (Limits)	Associated Samples	Qualifications
		6	W	F		142 (≤80.0)	2-3	J/UJ/A (det)

Comments: EB not associated

LDC #: 31852C6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of ORPO4-P was recalculated. Calibration date: 10/26/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	ORPO4-P	s1	0.2	6401	0.9993	0.9990	y*
		s2	0.5	34171			
		s3	2.5	226775			
		s4	5	444853			
		s5	7.5	709665			
		s6	10	955401			
ICV 23:10 Calibration verification	ORPO4-P	Found 2.39 mg/L	True 2.5 mg/L		95.6%R	95.5%R	y*
ICV 22:52 Calibration verification	Cl	1.484 mg/L	1.5 mg/L		97.6%R	97.6%R	y
ICV 15:00 Calibration verification	CN	0.203 mg/L	0.2 mg/L		102%R	102%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37802C6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: G

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 7:17	Laboratory control sample	TSS	82.0 mg/L	84.9 mg/L	96.6%R	96.6%R	Y
MS 14:13	Matrix spike sample	NH_3	(SSR-SR) 1107 ug/L	1000 ug/L	111%R	111%R	↓
DUP 11:30	Duplicate sample	Hardness	208 mg/L	210 mg/L	1%RPD	1%RPD	↓

Comments:

TOTCLC.6

LDC #: 37802Cp

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (3) TSS reported with a positive detect were recalculated and verified using the following equation:

Concentration = $W_1 - W_2$

$W_1 = 0.1266 g/L$
$W_2 = 0.1158 g/L$

Recalculation: $0.1266 g/L - 0.1158 g/L \times \frac{1000 mg}{1 g} \approx 10.8 mg/L$ 30

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Cl	183	183	Y
	2	Total CN	132	132	
	3	NO_3/NO_2-N	781	781	
	3	Hardness	196000	196000	
	3	Alkalinity	199000	199000	
	3	TDS	193 mg/L	193 mg/L	
	3	TSS	10.8 mg/L	10.8 mg/L	

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125196-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-044-GW	460-125196-2	Water	12/09/16
CFMW-003-GW	460-125196-3	Water	12/09/16
CFMW-031-GW	460-125196-4	Water	12/09/16
TRIP BLANK	460-125196-6	Water	12/09/16
CFMW-022-GW	460-125196-7	Water	12/09/16
CFMW-038-GW	460-125196-8	Water	12/09/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

LDC #: 37802D1

SDG #: 460-125196-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/6/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 4
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	460-125105-2 MS/MSD
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-044-GW	460-125196-2	Water	12/09/16
2	CFMW-003-GW	460-125196-3	Water	12/09/16
3	CFMW-031-GW	460-125196-4	Water	12/09/16
4	TRIP BLANK	460-125196-6	Water	12/09/16
5	CFMW-022-GW	460-125196-7	Water	12/09/16
6	CFMW-038-GW	460-125196-8	Water	12/09/16
7				
8				
9				

Notes:

	MB 460-409261						

LDC #: 37802D1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: G

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37802 D1

VALIDATION FINDINGS CHECKLIST

Reviewer: P1
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification	✓			
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37802Q1 D

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	12/13/2016	M	0.3005	0.3005	0.3220	0.3220	11.9	11.9
	GCMS8		C	0.2596	0.2596	0.2534	0.2534	3.2	3.2
			CC	1.5000	1.5000	1.5438	1.5438	10.0	10.0
			JJJ	1.4137	1.4137	1.4509	1.4509	9.6	9.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 R1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0821 J49322	12/13/16	M (IS1)	0.3220	0.3034	0.3034	5.8	5.8
			C (IS2)	0.2534	0.2607	0.2607	2.9	2.9
			CC (IS3)	1.5438	1.4703 F1	1.473	4.6	4.6
			JJJ (IS4)	1.4509	1.473	1.473	1.5	1.5
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37802D1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	50.0	100	100	0
1,2-Dichloroethane-d4	↓	48.1	96	96	↓
Toluene-d8		49.0	98	98	
Bromofluorobenzene		49.2	98	98	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37802D/

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: Q

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-409261

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	18.3	NA	91	91				
Trichloroethene	↓	↓	19.6	↓	98	98				
Benzene	↓	↓	19.9	↓	100	100				
Toluene	↓	↓	19.7	↓	99	99				
Chlorobenzene	↓	↓	20.5	↓	102	102	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 D1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [signature]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #2 , 1,1,1-trichloroethane

Conc. = $\frac{(11816)(50.0)(\quad)(\quad)}{(465658)(0.3983)(\quad)(\quad)}$

= 3.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125196-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-044-GW	460-125196-2	Water	12/09/16
CFMW-003-GW	460-125196-3	Water	12/09/16
CFMW-031-GW	460-125196-4	Water	12/09/16
CFMW-022-GW	460-125196-7	Water	12/09/16
CFMW-038-GW	460-125196-8	Water	12/09/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/15/16 (11:10)	Bis(2-chloroethyl) ether Pentachlorophenol	27.0 30.6	CFMW-003-GW CFMW-031-GW CFMW-022-GW	UJ (all non-detects) UJ (all non-detects)	A
12/16/16 (13:32)	Bis(2-chloroethyl) ether Acenaphthene	21.9 32.2	CFMW-044-GW CFMW-038-GW	UJ (all non-detects) UJ (all non-detects)	A
12/16/16 (13:32)	2,4-Dinitrophenol	25.3	CFMW-044-GW CFMW-038-GW	NA	-

Date	Compound	%D	Associated Samples	Flag	A or P
12/16/16 (14:02)	Benzaldehyde	21.1	CFMW-044-GW CFMW-038-GW	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. Surrogate recoveries (%R) were not within QC limits for samples CFMW-003-GW and CFMW-022-GW. Using professional judgment, no data were qualified when one base or one acid surrogate %R was outside the QC limits and the %R was greater than or equal to 10%.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-409454 (All samples in SDG 460-125196-1)	4-Nitrophenol	-	48 (11-47)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-125196-1

Sample	Compound	Flag	A or P	Reason
CFMW-003-GW CFMW-031-GW CFMW-022-GW	Bis(2-chloroethyl) ether Pentachlorophenol	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-044-GW CFMW-038-GW	Bis(2-chloroethyl) ether Acenaphthene Benzaldehyde	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

LDC #: 37802D2a

SDG #: 460-125196-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/6/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS LD
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-044-GW	460-125196-2	Water	12/09/16
2	CFMW-003-GW	460-125196-3	Water	12/09/16
3	CFMW-031-GW	460-125196-4	Water	12/09/16
4	CFMW-022-GW	460-125196-7	Water	12/09/16
5	CFMW-038-GW	460-125196-8	Water	12/09/16
6				
7				
8				

Notes:

	MB 460 - 409454						

LDC #: 37802D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: O

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?		✓		
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37802 D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37802 D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	12/15/16	CCV6-M236300	B	27.0		1 ~~-4~~ 2→4	J-/UJ/A (ND)
-	11:10		TT	30.6		↓	↓
-	12/16/16	CCV6-M236364	B	21.9		1, 5	J-/UJ/A (ND)
-	13:32		GG	32.2		↓	↓
+			HH	25.3		↓	J+ det/A
-	12/16/16	CCV6-M236365	LLLL	21.1		1, 5	J-/UJ/A ND
	14:02						

CONCAL.wpd

LDC #: 37802 D2a

VALIDATION FINDINGS WORKSHEET

Surrogate Recovery

Reviewer: FT
2nd Reviewer: Q

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A	Were percent recoveries (%R) for surrogates within QC limits?
Y N (N/A)	If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?
Y N (N/A)	If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Sample ID	Surrogate	%R (Limits)	Qualifications
	2	PHL	40 (14-39)	no qual
			( )	
			( )	
	4	↓	↓ (↓)	↓
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
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			( )	
			( )	
			( )	

(NBZ) = Nitrobenzene - d5
(FBP) = 2-Fluorobiphenyl
(TPH) = Terphenyl - d14
(2FP) = 2-Fluorophenol
(TBP) = 2,4,6 -Tribromophenol
(2CP) = 2-Chlorophenol - d4

LDC #: 37802 D2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	lcs/D 460-	II	( )	48 (11-47)	( )	All P1	~~J- / UJ / P~~ (ND)
	409454		( )	( )	( )		J+ det / P
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		

LDC #: 37802 D2e

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	12/13/2016	A	1.6862	1.6862	1.8237	1.8237	18.4	18.4
			S	0.9080	0.9080	1.0152	1.0152	20.0	20.0
			GG	1.4750	1.4750	1.5349	1.5349	6.2	6.2
			UU	0.9379	0.9379	0.9826	0.9826	11.7	11.7
			DDD	0.9307	0.9307	0.9364	0.9364	11.2	11.2
			III	0.9887	0.9887	0.9969	0.9969	6.8	6.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV6 11:10 M236300	12/15/16	A (1st IS)	1.8237	1.732	1.732	27.0	27.0
			S (2nd IS)	1.0152	0.8369	0.8369	17.6	17.6
			GG (3rd IS)	1.5349	1.256	1.256	18.2	18.2
			UU (4th IS)	0.9826	0.8895	0.8895	9.5	9.5
			DDD (5th IS)	0.9364	0.996	0.996	6.4	6.4
			III (6th IS)	0.9969	1.018	1.018	2.1	2.1
2	CCV6 1332 M236364	12/16/16	(1st IS)		1.731	1.731	5.1	5.1
			(2nd IS)		0.9003	0.9003	11.3	11.3
			(3rd IS)		1.040	1.040	32.2	32.2
			(4th IS)		0.9639	0.9639	1.9	1.9
			(5th IS)		0.9686	0.9686	3.4	3.4
			(6th IS)		1.091	1.091	9.5	9.5
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802D2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.45	84	84	0
2-Fluorobiphenyl	↓	8.12	81	81	↓
Terphenyl-d14	↓	9.65	97	97	↓
Phenol-d5	↓	3.47	35	35	↓
2-Fluorophenol	↓	4.68	47	47	↓
2,4,6-Tribromophenol	↓	11.0	110	110	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37802Daa

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460-409454

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	30.5	30.0	38	38	38	38	1	1
N-Nitroso-di-n-propylamine			62.6	65.5	78	78	82	82	5	5
4-Chloro-3-methylphenol			71.1	72.5	89	89	91	91	2	2
Acenaphthene			75.4	74.5	94	94	93	93	1	1
Pentachlorophenol	160	160	167	163	104	104	102	102	3	3
Pyrene	80.0	80.0	78.1	72.0	98	98	90	90	8	8

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802D2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

2/250

Sample I.D. #1, A:

Conc. = $\frac{205\,991\ (8.0)\ (2)\ (1000)}{44\,9879\ (1.82377)\ (250)}$

= 1.6 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125196-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB13-AQ	460-125196-1	Water	12/09/16
CFMW-044-GWF	460-125196-2F	Water	12/09/16
CFMW-003-GWF	460-125196-3F	Water	12/09/16
CFMW-031-GWF	460-125196-4F	Water	12/09/16
CFMW-028a-GWF	460-125196-5F	Water	12/09/16
CFMW-022-GWF	460-125196-7F	Water	12/09/16
CFMW-038-GWF	460-125196-8F	Water	12/09/16
CFMW-045a-GWF	460-125196-9F	Water	12/09/16
CFMW-028a-GWFMS	460-125196-5FMS	Water	12/09/16
CFMW-028a-GWFDUP	460-125196-5FDUP	Water	12/09/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB13-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

LDC #: 37802D4a

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/11/17

SDG #: 460-125196-1

Page: 1 of 1

Laboratory: Test America, Inc.

Reviewer: JS

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/9/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB= (1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(9)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER= (3)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID		Lab ID	Matrix	Date
1	CFMW-EB13-AQ		460-125196-1	Water	12/09/16
2	CFMW-044-GWF		460-125196-2F	Water	12/09/16
3	CFMW-003-GWF		460-125196-3F	Water	12/09/16
4	CFMW-031-GWF		460-125196-4F	Water	12/09/16
5	CFMW-028a-GWF		460-125196-5F	Water	12/09/16
6	CFMW-022-GWF		460-125196-7F	Water	12/09/16
7	CFMW-038-GWF		460-125196-8F	Water	12/09/16
8	CFMW-045a-GWF		460-125196-9F	Water	12/09/16
9	CFMW-028a-GWFMS	6020	460-125196-5FMS	Water	12/09/16
10	CFMW-028a-GWFDUP	↓	460-125196-5FDUP	Water	12/09/16
11					
12					
13					

Notes:

LDC #: 37802D4G

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38602D4g

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37802D4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: [illegible]
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-8		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC 9-10		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37802946

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JD
2nd Reviewer: a

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 13:02	ICP/MS (Initial calibration)	Tl	8.09ug/L	8ug/L	101%R	101%R	Y
ICV 13:12	CVAA (Initial calibration)	Hg	4.86ug/L	5 ug/L	97%R	97%R	↓
	ICP (Continuing calibration)						
CCV 16:41	ICP/MS (Continuing calibration)	Se	51.8ug/L	50ug/L	104%R	104%R	Y
CCV 13:42	CVAA (Contining calibration)	Hg	4.53ug/L	5ug/L	91%R	91%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37802D4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: DP
2nd Reviewer: CA

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 13:14	ICP interference check	Cr	209.2 ug/L	200 ug/L	105%R	105%R	Y
LCS 13:25	Laboratory control sample	Hg	0.915 ug/L	1 ug/L	92%R	92%R	
MS 16:27	Matrix spike	Ba	(SSR-SR) 20.17 ug/L	20 ug/L	101%R	101%R	
DUP 16:30	Duplicate	Al	312.1 ug/L	310.2 ug/L	0.6%RPD	0.6%RPD	
SER 16:37	ICP serial dilution	Ca	42316 ug/L	43212 ug/L	2.1%D	2.1%D	

Comments: _____

TOTCLC.4SW

LDC #: 31852D4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (5) Mg were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 141.144 ug/L x 2 = 282 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 141.144 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Na	142	142	Y
	2	Ba	119	119	
	3	Ca	184000	184000	
	4	Fe	300	300	
	5	Mg	282	282	
	6	K	685	685	
	7	Na	36500	36500	
	8	V	4.0	4.0	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 12, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125196-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB13-AQ	460-125196-1	Water	12/09/16
CFMW-044-GW	460-125196-2	Water	12/09/16
CFMW-003-GW	460-125196-3	Water	12/09/16
CFMW-031-GW	460-125196-4	Water	12/09/16
CFMW-028a-GW	460-125196-5	Water	12/09/16
CFMW-022-GW	460-125196-7	Water	12/09/16
CFMW-038-GW	460-125196-8	Water	12/09/16
CFMW-045a-GW	460-125196-9	Water	12/09/16
CFMW-003-GWDUP	460-125196-3DUP	Water	12/09/16
CFMW-028a-GWMS	460-125196-5MS	Water	12/09/16
CFMW-028a-GWMSD	460-125196-5MSD	Water	12/09/16
CFMW-028a-GWDUP	460-125196-5DUP	Water	12/09/16
CFMW-045a-GWMS	460-125196-9MS	Water	12/09/16
CFMW-045a-GWMSD	460-125196-9MSD	Water	12/09/16
CFMW-045a-GWDUP	460-125196-9DUP	Water	12/09/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB13-AQ was identified as an equipment blank. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-028a-GWMS/MSD (CFMW-003-GW CFMW-028a-GW)	Sulfate	87 (90-110)	116 (90-110)	J (all detects)	A
CFMW-045a-GWMS/MSD (CFMW-044-GW CFMW-003-GW CFMW-031-GW CFMW-028a-GW CFMW-022-GW CFMW-038-GW CFMW-045a-GW)	Fluoride	-	85 (90-110)	J- (all detects)	A
CFMW-045a-GWMS/MSD (CFMW-044-GW CFMW-031-GW CFMW-022-GW CFMW-038-GW CFMW-045a-GW)	Sulfate	68 (90-110)	71 (90-110)	J- (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-003-GWDUP (CFMW-044-GW CFMW-003-GW CFMW-031-GW CFMW-028a-GW CFMW-022-GW CFMW-038-GW CFMW-045a-GW)	Total dissolved solids	6 (≤5)	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125196-1

Sample	Analyte	Flag	A or P	Reason
CFMW-003-GW CFMW-028a-GW	Sulfate	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-044-GW CFMW-003-GW CFMW-031-GW CFMW-028a-GW CFMW-022-GW CFMW-038-GW CFMW-045a-GW	Fluoride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-044-GW CFMW-031-GW CFMW-022-GW CFMW-038-GW CFMW-045a-GW	Sulfate	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-044-GW CFMW-003-GW CFMW-031-GW CFMW-028a-GW CFMW-022-GW CFMW-038-GW CFMW-045a-GW	Total dissolved solids	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125196-1

No Sample Data Qualified in this SDG

LDC #: 37802D6

SDG #: 460-125196-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/11/17

Page: 1 of 1

Reviewer: ZSD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ 3D (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/9/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	ND	EB = (1)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = CFMW-033-GW MS/D (SDG: 460-124871-1)
VII.	Duplicate sample analysis	SW	DUP: CFMW-011-GW DUP (SDG: 460-125105-1)
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB13-AQ No TDS & TSS	460-125196-1	Water	12/09/16
2	CFMW-044-GW	460-125196-2	Water	12/09/16
3	CFMW-003-GW	460-125196-3	Water	12/09/16
4	CFMW-031-GW	460-125196-4	Water	12/09/16
5	CFMW-028a-GW	460-125196-5	Water	12/09/16
6	CFMW-022-GW	460-125196-7	Water	12/09/16
7	CFMW-038-GW	460-125196-8	Water	12/09/16
8	CFMW-045a-GW No NH3, 353.2	460-125196-9	Water	12/09/16
9	CFMW-003-GWDUP TDS	460-125196-3DUP	Water	12/09/16
10	CFMW-028a-GWMS 300.0 Cl	460-125196-5MS	Water	12/09/16
11	CFMW-028a-GWMSD ↓ ↓	460-125196-5MSD	Water	12/09/16
12	CFMW-028a-GWDUP ↓	460-125196-5DUP	Water	12/09/16
13	CFMW-045a-GWMS F, SO4	460-125196-9MS	Water	12/09/16
14	CFMW-045a-GWMSD ↓	460-125196-9MSD	Water	12/09/16
15	CFMW-045a-GWDUP Alk	460-125196-9DUP	Water	12/09/16
16				

350.4 cancelled

LDC #: 37852D6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer:

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37882D6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37802D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
2-7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
8	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:9	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:10-11	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 12	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:13-14	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:15	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37802D6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: 3D
2nd Reviewer: G

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	10/11	W	SO4	87 (90-110)	116 (90-110)		3, 5	J/UJ/A (det)
	13/14	W	F		85 (90-110)		2-8	J-/UJ/A (det)
			SO4	68 (90-110)	71 (90-110)		2, 4, 6-8	J-/UJ/A (det)

Comments:

LDC #:37802D6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: JD
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤ 35% for soil samples? If no, see qualifications below. A control limit of ±R.L. (±2X R.L. for soil) was used for sample values that were <5X the R.L., including the case when only one of the duplicate sample values was <5X R.L.. If field blanks were used for laboratory duplicates, note in the Overall Assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Difference (Limits)	Associated Samples	Qualifications
		9	W	TDS	6 (≤5)		2-8	J/UJ/A (det)

Comments:

LDC #: 38820

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of CN was recalculated.Calibration date: 12/15/10

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	CN	s1	0	-0.011	0.99976	0.99995	Y*
		s2	0.01	0.474			
		s3	0.025	1.07			
		s4	0.05	2.21			
		s5	0.1	4.41			
		s6	0.2	8.75			
		s7	0.4	17			
ICV 14:40 Calibration verification	CN	Found 0.196mg/L	True 0.2mg/L		98%R	99%R	Y*
ICV 17:58 Calibration verification	NH_3	2.017mg/L	2mg/L		101%R	101%R	Y
ICV 11:49 Calibration verification	NO_3/NO_2-N	1.019mg/L	1mg/L		102%R	102%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37802D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: G

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 11:30	Laboratory control sample	Hardness	296000 ug/L	280000 ug/L	105.7%R	105.7%R	Y
MS 14:58	Matrix spike sample	CN	(SSR-SR) 209 ug/L	200 ug/L	105%R	105%R	
DUP 10:23	Duplicate sample	TDS	1880 mg/L	1764 mg/L	6%RPD	6%RPD	

Comments:

TOTCLC.6

LDC #: 35802D6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JSD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (2) F reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A-(-12649.690)}{162929.294}$

Recalculation: $\frac{259814-(-12649.690)}{162929.294} \times \frac{1000ug}{1mg} \approx 1670$ ug/L

A = 259814

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	2	NH3	7520	7520	Y
	3	Total CN	19.1	19.1	
	4	NO3 (NO2-N)	3260	3260	
	5	Hardness	138000	138000	
	6	Alkalinity	250000	250000	
	7	TDS	308 mg/L	308 mg/L	
	8	TSS	22.6 mg/L	22.6 mg/L	
	2	F	1670	1670	

Note:

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125342-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-053-GW	460-125342-3	Water	12/12/16
CFMW-054-GW	460-125342-4	Water	12/12/16
Trip Blank	460-125342-5	Water	12/12/16
CFMW-007-GW	460-125342-9	Water	12/12/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

LDC #: 37802E1

SDG #: 460-125342-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/7/16

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 3
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-053-GW	460-125342-3	Water	12/12/16
2	CFMW-054-GW	460-125342-4	Water	12/12/16
3	Trip Blank	460-125342-5	Water	12/12/16
4	CFMW-007-GW	460-125342-9	Water	12/12/16
5				
6				
7				
8				
9				

Notes:

	MB 460-410575						

LDC #: 37802E

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: G

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37802E1

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37802 E 1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: C

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	12/13/2016	M	0.3005	0.3005	0.3220	0.3220	11.9	11.9
	GCMS8		C	0.2596	0.2596	0.2534	0.2534	3.2	3.2
			CC	1.5000	1.5000	1.5438	1.5438	10.0	10.0
			JJJ	1.4137	1.4137	1.4509	1.4509	9.6	9.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 8080B3	12/19/16	M (IS1)	0.3220	0.3034	0.3034	5.8	5.8
	J49628		C (IS2)	0.2534	0.2772	0.2772	9.4	9.4
			CC (IS3)	1.5438	1.467	1.467	5.0	5.0
			JJJ (IS4)	1.4509	1.463	1.463	0.8	0.8
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37802E1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	51.8	104	104	0
1,2-Dichloroethane-d4	↓	51.0	102	102	↓
Toluene-d8		50.0	100	100	
Bromofluorobenzene		45.7	91	91	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37802E1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS10 460-410575

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	18.8	17.7	94	94	89	89	6	6
Trichloroethene	↓	↓	19.6	17.9	98	98	90	90	9	9
Benzene	↓	↓	20.1	19.7	100	100	98	98	2	2
Toluene	↓	↓	19.4	19.4	97	97	97	97	0	0
Chlorobenzene	↓	↓	20.0	20.2	100	100	101	101	1	1

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802E1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-410575 CC

$$\text{Conc.} = \frac{237347\ (50.0)}{396134\ (1.5438)}$$

= 19.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125342-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-053-GW	460-125342-3	Water	12/12/16
CFMW-054-GW	460-125342-4	Water	12/12/16
CFMW-007-GW	460-125342-9	Water	12/12/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/19/16 (12:50)	2,4-Dimethylphenol 4-Nitrophenol Diethylphthalate Pentachlorophenol Butylbenzylphthalate Di-n-octylphthalate	20.1 43.9 20.2 23.6 21.7 29.9	CFMW-007-GW	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
12/19/16 (13:20)	Caprolactam	21.7	CFMW-007-GW	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-125342-1

Sample	Compound	Flag	A or P	Reason
CFMW-007-GW	2,4-Dimethylphenol 4-Nitrophenol Diethylphthalate Pentachlorophenol Butylbenzylphthalate Di-n-octylphthalate Caprolactam	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

LDC #: 37802E2a

SDG #: 460-125342-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 01/6/17

Page: 1 of 1

Reviewer: M

2nd Reviewer: G

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-053-GW	460-125342-3	Water	12/12/16
2	CFMW-054-GW	460-125342-4	Water	12/12/16
3	CFMW-007-GW	460-125342-9	Water	12/12/16
4				
5				
6				
7				
8				

Notes:

	MB 460-409633					

LDC #: 37802 E2a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria? FT	~~✓~~	✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37802 E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37802E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	12/19/16	CCV14-N120512	O	20.1		3	J/UJ/A ND
	12:50		II	43.9			
			LL	20.2			
			TT	23.6			
			AAA	21.7			
			FFF	29.9			
	12/19/16	CCV14-N120513	MMMM	21.7		3	J/UJ/A ND
	13:20						

CONCAL.wpd

LDC #: 37802 E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms14	12/15/2016	A	1.7390	1.7390	1.6832	1.6832	5.1	5.1
			S	1.0053	1.0053	1.0358	1.0358	12.9	12.9
			GG	1.1962	1.1962	1.1778	1.1778	14.0	14.0
			UU	1.1395	1.1395	1.1391	1.1391	10.8	10.8
			DDD	1.0767	1.0767	1.0869	1.0869	7.3	7.3
			III	1.1255	1.1255	1.0050	1.0050	15.0	15.0

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802Eda

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms14	12/18/2016	A	1.6419	1.6419	1.6065	1.6065	11.6	11.6
			S	0.9920	0.9920	1.0212	1.0212	18.1	18.1
			DD	1.7689	1.7689	1.7929	1.7929	14.3	14.3
			UU	1.1454	1.1454	1.1488	1.1488	13.8	13.8
			DDD	1.0591	1.0591	1.0303	1.0303	8.3	8.3
			III	1.0427	1.0427	0.8992	0.8992	14.4	14.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV14 0052 N11999	12/16/16	A	(1st IS)	1.6832	1.782	1.782	5.8	5.8
			S	(2nd IS)	1.0358	1.012	1.012	2.3	2.3
			GG	(3rd IS)	1.1778	1.220	1.220	3.5	3.5
			UU	(4th IS)	1.1391	1.133	1.133	0.6	0.6
			DDD	(5th IS)	1.0869	1.077	1.077	0.9	0.9
			III	(6th IS)	1.0050	1.088	1.088	8.3	8.3
2	CCV14 1250 N120512	12/19/16	A	(1st IS)	1.6065	1.695	1.695	5.5	5.5
			S	(2nd IS)	1.0212	0.9727	0.9727	4.7	4.7
			DD	(3rd IS)	1.7929	1.731	1.731	3.5	3.5
			UU	(4th IS)	1.1488	1.108	1.108	3.6	3.6
			DDD	(5th IS)	1.0303	1.039	1.039	0.9	0.9
			III	(6th IS)	0.8992	1.070	1.070	18.9	18.9
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802E2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	7.58	76	76	0
2-Fluorobiphenyl		7.06	71	71	
Terphenyl-d14		9.39	94	94	
Phenol-d5		2.71	27	27	
2-Fluorophenol		3.59	36	36	
2,4,6-Tribromophenol		7.07	71	71	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37802 E2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS/D 460 - 409633

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	23.3	21.3	29	29	27	27	9	9
N-Nitroso-di-n-propylamine	↓	↓	61.5	58.5	77	77	73	73	5	5
4-Chloro-3-methylphenol			64.3	60.2	80	80	75	75	7	7
Acenaphthene			72.7	71.5	91	91	89	89	2	2
Pentachlorophenol	160.0	160.0	147	138	92	92	86	86	6	6
Pyrene	80.0	80.0	69.4	66.2	87	87	83	83	5	5

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 E2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS, A

$$\text{Conc.} = \frac{174364\ (8.0)\ (2)\ (1000)}{284776\ (1.6832)\ (250)}$$

= 23.3 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125342-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-059-GWF	460-125342-1F	Water	12/12/16
CFMW-056b-GWF	460-125342-2F	Water	12/12/16
CFMW-053-GWF	460-125342-3F	Water	12/12/16
CFMW-054-GWF	460-125342-4F	Water	12/12/16
CFMW-001-GWF	460-125342-6F	Water	12/12/16
CFMW-003a-GWF	460-125342-7F	Water	12/12/16
CFMW-EB14-AQ	460-125342-8	Water	12/12/16
CFMW-007-GWF	460-125342-9F	Water	12/12/16
CFMW-059-GWFMS	460-125342-1FMS	Water	12/12/16
CFMW-059-GWFDUP	460-125342-1FDUP	Water	12/12/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB14-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB14-AQ	12/12/16	Calcium Sodium	405 ug/L 437 ug/L	CFMW-007-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-059-GWFMS, no data were qualified for Calcium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

LDC #: 37802E4a

SDG #: 460-125342-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/11/16

Page: 1 of 1

Reviewer: SD

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/12/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=(7)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(9) = (9)74x *See Below
VIII.	Duplicate sample analysis	A	DUP = CFMW-032-GWDUP (SDG: 460-125356-1)
IX.	Serial Dilution	A	SER=(1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification		
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1	CFMW-059-GW F	460-125342-1 F	Water	12/12/16
2	CFMW-056b-GW F	460-125342-2 F	Water	12/12/16
3	CFMW-053-GW F	460-125342-3 F	Water	12/12/16
4	CFMW-054-GW F	460-125342-4 F	Water	12/12/16
5	CFMW-001-GW F	460-125342-6 F	Water	12/12/16
6	CFMW-003a-GW F	460-125342-7 F	Water	12/12/16
7	CFMW-EB14-AQ	460-125342-8	Water	12/12/16
8	CFMW-007-GW F	460-125342-9 F	Water	12/12/16
9	CFMW-059-GW F MS	460-125342-1 F MS	Water	12/12/16
10	CFMW-059-GW F DUP	460-125342-1 F DUP	Water	12/12/16
11				
12				
13				

Notes:

MS = CFMW-032-GWMS (SDG: 460-125356-1)

LDC #: 37802E46

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anayized for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37802EMa

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37802E4G

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: SD
2nd reviewer:

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
AC:9-10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti,

Comments: Mercury by CVAA if performed

LDC #: 37802E4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/12/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 8

Analyte	Blank ID	Sample Identification										
[redacted]	7	Action Limit	No Qual.									
Ca	405	4050										
Na	437	4370										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37802E4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 1:16	ICP/MS (Initial calibration)	Sb	39.24 ug/L	40 ug/L	98% R	98% R	Y
ICV 11:12	CVAA (Initial calibration)	Hg	5.02 ug/L	5 ug/L	100% R	100% R	
	ICP (Continuing calibration)						
CCV 3:15	ICP/MS (Continuing calibration)	Ni	49.87 ug/L	50 ug/L	100% R	100% R	Y
CCV 18:49	CVAA (Contining calibration)	Hg	4.98 ug/L	5 ug/L	100% R	100% R	
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

LDC #: 37802E4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 1:33	ICP interference check	Mn	180.2 ug/L	200 ug/L	90%R	90%R	Y
LCS 3:28	Laboratory control sample	Ni	9.77 ug/L	10 ug/L	98%R	98%R	
MS 3:32	Matrix spike	Co	(SSR-SR) 9.2 ug/L	10 ug/L	92%R	92%R	
DUP 3:35	Duplicate	Na	15142 ug/L	15179 ug/L	0.2%RPD	0.2%RPD	
SER 21:38	ICP serial dilution	All-NC					

Comments: _____

TOTCLC.4SW

LDC #: 35802EDa

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer:

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Ba were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 77.16 ug/L x 2 = 154 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 77.16 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ba	154	154	Y
	2	Ca	64900	64900	
	3	Fe	135	135	
	4	Mg	15600	15600	
	5	Mn	15.7	15.7	
	6	K	4960	4960	
	7	JD ~~Ag~~ Ca	JD ~~1.3~~405	405	
	8	Na	5970	5970	

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 12, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125342-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-059-GW	460-125342-1	Water	12/12/16
CFMW-056b-GW	460-125342-2	Water	12/12/16
CFMW-053-GW	460-125342-3	Water	12/12/16
CFMW-054-GW	460-125342-4	Water	12/12/16
CFMW-001-GW	460-125342-6	Water	12/12/16
CFMW-003a-GW	460-125342-7	Water	12/12/16
CFMW-EB14-AQ	460-125342-8	Water	12/12/16
CFMW-007-GW	460-125342-9	Water	12/12/16
CFMW-059-GWMS	460-125342-1MS	Water	12/12/16
CFMW-059-GWMSD	460-125342-1MSD	Water	12/12/16
CFMW-056b-GWMS	460-125342-2MS	Water	12/12/16
CFMW-056b-GWMSD	460-125342-2MSD	Water	12/12/16
CFMW-003a-GWMS	460-125342-7MS	Water	12/12/16
CFMW-003a-GWMSD	460-125342-7MSD	Water	12/12/16
CFMW-003a-GWDUP	460-125342-7DUP	Water	12/12/16
CFMW-007-GWMS	460-125342-9MS	Water	12/12/16
CFMW-007-GWMSD	460-125342-9MSD	Water	12/12/16
CFMW-007-GWDUP	460-125342-9DUP	Water	12/12/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB14-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB14-AQ	12/12/16	Nitrate/Nitrite as N	101 ug/L	CFMW-007-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-032-GWMS/MSD (CFMW-003a-GW CFMW-007-GW)	Ammonia	112 (90-110)	-	J+ (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-032-GWMS/MSD (CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-001-GW CFMW-059-GW)	Ammonia	112 (90-110)	-	NA	-
CFMW-056b-GWMS/MSD (CFMW-059-GW CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-001-GW CFMW-003a-GW CFMW-007-GW)	Nitrate/Nitrite as N	74 (90-110)	74 (90-110)	J- (all detects) UJ (all non-detects)	A
CFMW-003a-GWMS/MSD (CFMW-003a-GW)	Sulfate	87 (90-110)	-	J- (all detects)	A
CFMW-007-GWMS/MSD (CFMW-001-GW)	Chloride	128 (90-110)	115 (90-110)	J+ (all detects)	A
CFMW-007-GWMS/MSD (CFMW-059-GW CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-001-GW CFMW-007-GW)	Sulfate	80 (90-110)	80 (90-110)	J- (all detects)	A
CFMW-007-GWMS/MSD (CFMW-059-GW CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-003a-GW CFMW-007-GW)	Orthophosphate as P	72 (90-110)	65 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-003-GWDUP (CFMW-059-GW CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-001-GW CFMW-003a-GW CFMW-007-GW)	Total dissolved solids	6 (≤5)	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125342-1

Sample	Analyte	Flag	A or P	Reason
CFMW-003a-GW CFMW-007-GW	Ammonia	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-059-GW CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-001-GW CFMW-003a-GW CFMW-007-GW	Nitrate/Nitrite as N	J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-003a-GW CFMW-059-GW CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-001-GW CFMW-007-GW	Sulfate	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-001-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-059-GW CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-003a-GW CFMW-007-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-059-GW CFMW-056b-GW CFMW-053-GW CFMW-054-GW CFMW-001-GW CFMW-003a-GW CFMW-007-GW	Total dissolved solids	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125342-1

No Sample Data Qualified in this SDG

LDC #: 37802E6 **VALIDATION COMPLETENESS WORKSHEET** Date: 1/11/17
SDG #: 460-125342-1 Level IV Page: 1 of 2
Laboratory: Test America, Inc. Reviewer: ZD
2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/12/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB= (-)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = CFMW-032-GW MS/D (SDG: 460-125356)
VII.	Duplicate sample analysis	SW	DUP = CFMW-003-GW DUP (SDG: 460-125196-1)
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-059-GW	460-125342-1	Water	12/12/16
2	CFMW-056b-GW	460-125342-2	Water	12/12/16
3	CFMW-053-GW	460-125342-3	Water	12/12/16
4	CFMW-054-GW	460-125342-4	Water	12/12/16
5	CFMW-001-GW PO4 canceled	460-125342-6	Water	12/12/16
6	CFMW-003a-GW	460-125342-7	Water	12/12/16
7	CFMW-EB14-AQ No TDS & TSS	460-125342-8	Water	12/12/16
8	CFMW-007-GW	460-125342-9	Water	12/12/16
9	CFMW-059-GWMS CN	460-125342-1MS	Water	12/12/16
10	CFMW-059-GWMSD ↓	460-125342-1MSD	Water	12/12/16
11	CFMW-056b-GWMS 353.2	460-125342-2MS	Water	12/12/16
12	CFMW-056b-GWMSD ↓	460-125342-2MSD	Water	12/12/16
13	CFMW-003a-GWMS 300.0	460-125342-7MS	Water	12/12/16
14	CFMW-003a-GWMSD ↓	460-125342-7MSD	Water	12/12/16
15	CFMW-003a-GWDUP ↓	460-125342-7DUP	Water	12/12/16
16	CFMW-007-GWMS ORO4-P 300.0	460-125342-9MS	Water	12/12/16

LDC #: 37802E6

SDG #: 460-125342-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/11/17

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

	Client ID		Lab ID	Matrix	Date
17	CFMW-007-GWMSD	OPO4-P 300.0	460-125342-9MSD	Water	12/12/16
18	CFMW-007-GWDUP	↓ ↓	460-125342-9DUP	Water	12/12/16
19					
20					
21					
22					
23					

Notes:

LDC #: 37802E60

VALIDATION FINDINGS CHECKLIST

Reviewer: 3SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37802EV0

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: C

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 31802F6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer:

All circled methods are applicable to each sample.

Sample ID	Parameter
1-4, 6, 8	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 9-10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 11-12	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 13-15	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 16-18	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37802E6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: JD
2nd Reviewer: a

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/12/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 8

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	7		No Qualifiers							
Nitrate/Nitrite-N	101	1010								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37802E6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	CFMW-032-GWMS/D (SDG: 460-125356-1)	W	NH3	112 (90-110)			1-6, 8	J+det/A (det = 6, 8)
	11/12	W	NO3/NO2-N	74 (90-110)	74 (90-110)		1-6, 8	J-/UJ/A (det/nd)
	13/14	W	SO4	87 (90-110)			6	J-/UJ/A (det)
	16/17	W	Cl	128 (90-110)	115 (90-110)		5	J+det/A (det)
			SO4	80 (90-110)	80 (90-110)		1-5, 8	J-/UJ/A (det)
			OPO4-P	72 (90-110)	65 (90-110)		1-4, 6, 8	J-/UJ/A (nd)

Comments:

LDC #:37802E6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤ 35% for soil samples? If no, see qualifications below. A control limit of ±R.L. (±2X R.L. for soil) was used for sample values that were <5X the R.L., including the case when only one of the duplicate sample values was <5X R.L.. If field blanks were used for laboratory duplicates, note in the Overall Assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Difference (Limits)	Associated Samples	Qualifications
		CFMW-003-GWDUP (SDG: 460-125196-1)	W	TDS	6 (≤5)		1-6, 8	J/UJ/A (det)

Comments:

LDC #: 37802F6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NH_3 was recalculated. Calibration date: 12/20/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NH_3	s1	0.0	248230	0.9998	0.9998	Y
		s2	0.1	1208611			
		s3	0.5	4641549			
		s4	1	8844794			
		s5	2	17471840			
		s6	4	33363750			
ICV 14:00 Calibration verification	NH_3	Found 2.089 mg/L	True 2 mg/L		104 %R	104 %R	Y
ICV 10:19 Calibration verification	CN	0.205 mg/L	0.2 mg/L		103 %R	103 %R	↓
ICV 10:32 Calibration verification	NO_3/NO_2-N	0.999 mg/L	1 mg/L		100 %R	100 %R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 3780E6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 1:46	Laboratory control sample	Cl	1412 ug/L	1500 ug/L	94%R	94%R	Y
MS 12:55	Matrix spike sample	OPO4-P	(SSR-SR) 1846 ug/L	2500 ug/L	73%R	72%R	Y*
DUP 10:23	Duplicate sample	TDS	1880 mg/L	1764 mg/L	6%RPD	6%RPD	Y

Comments: * Rounding

TOTCLC.6

LDC #: S1802E6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: SD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (4) Alkalinity reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

Recalculation: $\frac{(6.516ml)(0.0203N)(50000)}{25ml} \times \frac{1000ug}{1mg} = 265000$ ug/L

T= 6.516ml N=0.0203
V=25ml

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	SO4	4610	4600	Y*
	2	Hardness	240000	240000	Y
	3	Total CN	386	385	Y*
	4	Alkalinity	265000	265000	Y
	5	TDS	202mg/L	202mg/L	
	6	NH3	99.0	99.0	
	7	NO2/NO2-N	101	101	
	8	TSS	38.3mg/L	38.3mg/L	

Note: * Rounding

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125356-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-032-GW	460-125356-1	Water	12/13/16
CFMW-034-GW	460-125356-2	Water	12/13/16
CFMW-035-GW	460-125356-3	Water	12/13/16
CFMW-040-GW	460-125356-4	Water	12/13/16
Trip Blank	460-125356-5	Water	12/13/16
CFMW-020-GW	460-125356-9	Water	12/13/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

LDC #: 37802F1 **VALIDATION COMPLETENESS WORKSHEET** Date: 1/6/16

SDG #: 460-125356-1 Level IV Page: 1 of 1

Laboratory: Test America, Inc. Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	A	CW ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 5
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-032-GW	460-125356-1	Water	12/13/16
2	CFMW-034-GW	460-125356-2	Water	12/13/16
3	CFMW-035-GW	460-125356-3	Water	12/13/16
4	CFMW-040-GW	460-125356-4	Water	12/13/16
5	Trip Blank	460-125356-5	Water	12/13/16
6	CFMW-020-GW	460-125356-9	Water	12/13/16
7				
8				
9				

Notes:

	MB 460-410575						

LDC #: 37802F1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37802 F1

VALIDATION FINDINGS CHECKLIST

Reviewer: F1
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37802F1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	12/13/2016	M	0.3005	0.3005	0.3220	0.3220	11.9	11.9
	GCMS8		C	0.2596	0.2596	0.2534	0.2534	3.2	3.2
			CC	1.5000	1.5000	1.5438	1.5438	10.0	10.0
			JJJ	1.4137	1.4137	1.4509	1.4509	9.6	9.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 F1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 8/08/13	12/19/16	M (IS1)	0.3220	0.3034	0.3034	5.8	5.8
	149628		C (IS2)	0.2534	0.2772	0.2772	9.4	9.4
			CC (IS3)	1.5438	1.467	1.467	5.0	5.0
			JJJ (IS4)	1.4509	1.463	1.463	0.8	0.8
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37802F1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #6

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.4	107	107	0
1,2-Dichloroethane-d4	↓	50.8	102	102	↓
Toluene-d8	↓	50.5	101	101	↓
Bromofluorobenzene	↓	47.1	94	94	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37802F1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs ID 460-410575

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	18.8	17.7	94	94	89	89	6	6
Trichloroethene	↓	↓	19.6	17.9	98	98	90	90	9	9
Benzene	↓	↓	20.1	19.7	100	100	98	98	2	2
Toluene	↓	↓	19.4	19.4	97	97	97	97	0	0
Chlorobenzene	↓	↓	20.0	20.2	100	100	101	101	1	1

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802F1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-410575 CC

Conc. = $\frac{237347 \ (50.0)}{396134 \ (1.5438)}$

= 19.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125356-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-032-GW	460-125356-1	Water	12/13/16
CFMW-034-GW	460-125356-2	Water	12/13/16
CFMW-035-GW	460-125356-3	Water	12/13/16
CFMW-040-GW	460-125356-4	Water	12/13/16
CFMW-020-GW	460-125356-9	Water	12/13/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/19/16 (12:50)	2,4-Dimethylphenol 4-Nitrophenol Diethylphthalate Pentachlorophenol Butylbenzylphthalate Di-n-octylphthalate	20.1 43.9 20.2 23.6 21.7 29.9	All samples in SDG 460-125356-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
12/19/16 (13:20)	Caprolactam	21.7	All samples in SDG 460-125356-1	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-409666 (All samples in SDG 460-125356-1)	Pentachlorophenol Bis(2-chloroethyl) ether	53 (54-120) -	- 60 (63-106)	UJ (all non-detects) UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LCS/D 460-409666 (All samples in SDG 460-125356-1)	Acenaphthene	34 (≤30)	UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, LCS/LCSD %R, and RPD, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-125356-1

Sample	Compound	Flag	A or P	Reason
CFMW-032-GW CFMW-034-GW CFMW-035-GW CFMW-040-GW CFMW-020-GW	2,4-Dimethylphenol 4-Nitrophenol Diethylphthalate Pentachlorophenol Butylbenzylphthalate Di-n-octylphthalate Caprolactam	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-032-GW CFMW-034-GW CFMW-035-GW CFMW-040-GW CFMW-020-GW	Pentachlorophenol Bis(2-chloroethyl) ether	UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)
CFMW-032-GW CFMW-034-GW CFMW-035-GW CFMW-040-GW CFMW-020-GW	Acenaphthene	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

LDC #: 37802F2a
SDG #: 460-125356-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 1/9/17
Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-032-GW	460-125356-1	Water	12/13/16
2	CFMW-034-GW	460-125356-2	Water	12/13/16
3	CFMW-035-GW	460-125356-3	Water	12/13/16
4	CFMW-040-GW	460-125356-4	Water	12/13/16
5	CFMW-020-GW	460-125356-9	Water	12/13/16
6				
7				
8				

Notes:

	MB 460-409666						

LDC #: 37802 F2a

VALIDATION FINDINGS CHECKLIST

Reviewer: F7
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37802 Fda

VALIDATION FINDINGS CHECKLIST

Reviewer: FJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within + 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37802Fda

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	12/16/16	CCV6 - M236334	B	29.5		MB 460-409666	J-/UJ/A ND
-	0055		TT	36.3		↓	↓

LDC #: 37802 F2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	12/19/16	CCV14-N120512	O	20.1		All - MB	J/UJ/A ND
	12:50		II	43.9			
			LL	20.2			
			TT	23.6			
			AAA	21.7			
			FFF	29.9			
	12/19/16	CCV14-N120513	MMMM	21.7			J/UJ/A ND
	13:20						

CONCAL.wpd

LDC #: 37802 Fda

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCSD 460 -	TT	53 (54-120)	( )	( )	All	J-/UJ/P and ND
	409666	GG	( )	( )	34 (30)	↓	J/UJ/P
		B	( )	60 (63-106)	( )	↓	J-/UJ/P
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37802 F2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	12/13/2016	A	1.6862	1.6862	1.8237	1.8237	18.4	18.4
			S	0.9080	0.9080	1.0152	1.0152	20.0	20.0
			GG	1.4750	1.4750	1.5349	1.5349	6.2	6.2
			UU	0.9379	0.9379	0.9826	0.9826	11.7	11.7
			DDD	0.9307	0.9307	0.9364	0.9364	11.2	11.2
			III	0.9887	0.9887	0.9969	0.9969	6.8	6.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802Fd2

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms14	12/18/2016	A	1.6419	1.6419	1.6065	1.6065	11.6	11.6
			S	0.9920	0.9920	1.0212	1.0212	18.1	18.1
			DD	1.7689	1.7689	1.7929	1.7929	14.3	14.3
			UU	1.1454	1.1454	1.1488	1.1488	13.8	13.8
			DDD	1.0591	1.0591	1.0303	1.0303	8.3	8.3
			III	1.0427	1.0427	0.8992	0.8992	14.4	14.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 Fda

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0055 M236334	12/16/16	Δ (1st IS)	1.8237	1.730	1.730	5.2	5.2
			S (2nd IS)	1.0152	0.9467	0.9467	6.8	6.8
			GG (3rd IS)	1.5349	1.673	1.673	9.0	9.0
			UU (4th IS)	0.9826	0.8915	0.8915	9.3	9.3
			DPD (5th IS)	0.9364	0.9515	0.9515	1.6	1.6
			III (6th IS)	0.9969	1.002	1.002	0.5	0.5
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 ~~2~~ 2a
F

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 14 0052 N11999	12/16/16	A (1st IS)	1.6832	1.782	1.782	5.8	5.8
			S (2nd IS)	1.0358	1.012	1.012	2.3	2.3
			GG (3rd IS)	1.1778	1.220	1.220	3.5	3.5
			UU (4th IS)	1.1391	1.133	1.133	0.6	0.6
			DDD (5th IS)	1.0869	1.077	1.077	0.9	0.9
			III (6th IS)	1.0050	1.088	1.088	8.3	8.3
2	CCV 14 1250 N120512	12/19/16	A (1st IS)	1.6065	1.695	1.695	5.5	5.5
			S (2nd IS)	1.0212	0.9727	0.9727	4.7	4.7
			DD (3rd IS)	1.7929	1.731	1.731	3.5	3.5
			UU (4th IS)	1.1488	1.108	1.108	3.6	3.6
			DDD (5th IS)	1.0303	1.039	1.039	0.9	0.9
			III (6th IS)	0.8992	1.070	1.070	18.9	18.9
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802F2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #5

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.41	84	84	0
2-Fluorobiphenyl	↓	7.17	72	72	↓
Terphenyl-d14	↓	10.4	104	104	↓
Phenol-d5	↓	3.34	33	33	↓
2-Fluorophenol	↓	4.53	45	45	↓
2,4,6-Tribromophenol	↓	10.4	104	104	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37802Fde

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460-409666

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80	80	31.4	32.3	39	39	40	40	3	3
N-Nitroso-di-n-propylamine	↓	↓	67.9	64.5	85	85	81	81	5	5
4-Chloro-3-methylphenol	↓	↓	64.7	69.8	81	81	75	75	8	8
Acenaphthene	↓	↓	52.5	74.1	66	66	93	93	34	34
Pentachlorophenol	160	160	84.6	75.2	53	53	47	47	12	12
Pyrene	80	80	78.8	74.7	99	99	93	93	5	5

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37802 F2e

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-409666 TT

Conc. = $\frac{334778\ (8.0)\ (2)\ (1000)}{374497\ (1.8237)\ (250)}$

= 31.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 13, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125356-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-032-GW	460-125356-1	Water	12/13/16
CFMW-034-GW	460-125356-2	Water	12/13/16
CFMW-035-GW	460-125356-3	Water	12/13/16
CFMW-040-GW	460-125356-4	Water	12/13/16
CFMW-EB15-AQ	460-125356-6	Water	12/13/16
CFMW-012a-GW	460-125356-7	Water	12/13/16
CFMW-056-GW	460-125356-8	Water	12/13/16
CFMW-020-GW	460-125356-9	Water	12/13/16
CFMW-032-GWMS	460-125356-1MS	Water	12/13/16
CFMW-032-GWDUP	460-125356-1DUP	Water	12/13/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB15-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB15-AQ	12/13/16	Calcium Sodium	298 ug/L 417 ug/L	CFMW-012a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-032-GWMS, no data were qualified for Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

LDC #: 37802F4a

SDG #: 460-125356-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/11/16

Page: 1 of 1

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/13/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=(5)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS= (9) = Na74X
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER=(1)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification		
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1	CFMW-032-GW	460-125356-1	Water	12/13/16
2	CFMW-034-GW	460-125356-2	Water	12/13/16
3	CFMW-035-GW	460-125356-3	Water	12/13/16
4	CFMW-040-GW	460-125356-4	Water	12/13/16
5	CFMW-EB15-AQ	460-125356-6	Water	12/13/16
6	CFMW-012a-GW	460-125356-7	Water	12/13/16
7	CFMW-056-GW	460-125356-8	Water	12/13/16
8	CFMW-020-GW	460-125356-9	Water	12/13/16
9	CFMW-032-GWMS All	460-125356-1MS	Water	12/13/16
10	CFMW-032-GWDUP	460-125356-1DUP	Water	12/13/16
11				
12				
13				

Notes:

LDC #: 37802F4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37802549

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 31802F4q

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: JSD
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC9-10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37802F4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer: Q

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/13/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 6

Analyte	Blank ID	Sample Identification											
[redacted]	5	Action Limit	No Qual.										
Ca	298	2980											
Na	417	4170											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37802F4c

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 1:16	ICP/MS (Initial calibration)	Pb	36.24 ug/L	40ug/L	91%R	91%R	Y
ICV 13:36	CVAA (Initial calibration)	Hg	4.98ug/L	5ug/L	100%R	100%R	
	ICP (Continuing calibration)						
CCV 4:28	ICP/MS (Continuing calibration)	Ni	48.76ug/L	50ug/L	98%R	98%R	Y
CCV 14:07	CVAA (Contining calibration)	Hg	4.89ug/L	5ug/L	98%R	98%R	
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: _____

calclc.4sw.wpd

LDC #: 37852F4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 1:33	ICP interference check	Zn	95.7 ug/L	100 ug/L	96%R	96%R	Y
LCS 4:41	Laboratory control sample	V	9.69 ug/L	10 ug/L	97%R	97%R	
MS 4:44	Matrix spike	Sb	(SSR-SR) 9.76 ug/L	10 ug/L	98%R	98%R	
DUP 4:48	Duplicate	Ba	299.1 ug/L	296.9 ug/L	0.7%RPD	0.7%RPD	
SER 4:58	ICP serial dilution	Mg	23844 ug/L	22105 ug/L	7.9%D	7.9%D	

Comments:

TOTCLC.4SW

LDC #: 37802F49

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: 3D
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Ba were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 148.43ug/L x 2 = 297 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 148.43ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ba	297	297	Y
	2	Ca	82500	82500	↓
	3	As	10.4	10.4	↓
	4	Fe	96.4	96.4	↓
	5	Na	417	417	Y
	6	Zn	7.6	7.6	Y
	7	Mn	15.6	15.6	↓
	8	K	676	676	↓

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 12, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125356-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-032-GW	460-125356-1	Water	12/13/16
CFMW-034-GW	460-125356-2	Water	12/13/16
CFMW-035-GW	460-125356-3	Water	12/13/16
CFMW-040-GW	460-125356-4	Water	12/13/16
CFMW-EB15-AQ	460-125356-6	Water	12/13/16
CFMW-012a-GW	460-125356-7	Water	12/13/16
CFMW-056-GW	460-125356-8	Water	12/13/16
CFMW-020-GW	460-125356-9	Water	12/13/16
CFMW-032-GWMS	460-125356-1MS	Water	12/13/16
CFMW-032-GWMSD	460-125356-1MSD	Water	12/13/16
CFMW-032-GWDUP	460-125356-1DUP	Water	12/13/16
CFMW-034-GWMS	460-125356-2MS	Water	12/13/16
CFMW-034-GWMSD	460-125356-2MSD	Water	12/13/16
CFMW-035-GWMS	460-125356-3MS	Water	12/13/16
CFMW-035-GWMSD	460-125356-3MSD	Water	12/13/16
CFMW-020-GWMS	460-125356-9MS	Water	12/13/16
CFMW-020-GWMSD	460-125356-9MSD	Water	12/13/16
CFMW-020-GWDUP	460-125356-9DUP	Water	12/13/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB15-AQ was identified as an equipment blank. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-032-GWMS/MSD (CFMW-032-GW CFMW-034-GW CFMW-035-GW CFMW-040-GW CFMW-012a-GW CFMW-056-GW CFMW-020-GW)	Ammonia	112 (90-110)	-	NA	-
CFMW-035-GWMS/MSD (CFMW-032-GW CFMW-034-GW CFMW-035-GW CFMW-040-GW CFMW-012a-GW CFMW-056-GW CFMW-020-GW)	Nitrate/Nitrite as N	73 (90-110)	74 (90-110)	J- (all detects) UJ (all non-detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-020-GWMS/MSD (CFMW-056-GW)	Chloride	56 (90-110)	54 (90-110)	J- (all detects)	A
CFMW-020-GWMS/MSD (CFMW-032-GW CFMW-034-GW CFMW-035-GW CFMW-040-GW CFMW-012a-GW CFMW-056-GW CFMW-020-GW)	Sulfate Orthophosphate as P	79 (90-110) 69 (90-110)	71 (90-110) 74 (90-110)	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125356-1

Sample	Analyte	Flag	A or P	Reason
CFMW-032-GW CFMW-034-GW CFMW-035-GW CFMW-040-GW CFMW-012a-GW CFMW-056-GW CFMW-020-GW	Nitrate/Nitrite as N	J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-056-GW	Chloride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-032-GW CFMW-034-GW CFMW-035-GW CFMW-040-GW CFMW-012a-GW CFMW-056-GW CFMW-020-GW	Sulfate Orthophosphate as P	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125356-1

No Sample Data Qualified in this SDG

LDC #: 37802F6

SDG #: 460-125356-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/11/17

Page: 1 of 2

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrate-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/13/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	ND	EB = (5)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = (CFMW-028a-GW MS/D (SDG: 460-125196-1))
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-032-GW	460-125356-1	Water	12/13/16
2	CFMW-034-GW	460-125356-2	Water	12/13/16
3	CFMW-035-GW	460-125356-3	Water	12/13/16
4	CFMW-040-GW	460-125356-4	Water	12/13/16
5	CFMW-EB15-AQ NO TDS & TSS	460-125356-6	Water	12/13/16
6	CFMW-012a-GW	460-125356-7	Water	12/13/16
7	CFMW-056-GW	460-125356-8	Water	12/13/16
8	CFMW-020-GW	460-125356-9	Water	12/13/16
9	CFMW-032-GWMS NH3	460-125356-1MS	Water	12/13/16
10	CFMW-032-GWMSD ↓	460-125356-1MSD	Water	12/13/16
11	CFMW-032-GWDUP TDS	460-125356-1DUP	Water	12/13/16
12	CFMW-034-GWMS CN	460-125356-2MS	Water	12/13/16
13	CFMW-034-GWMSD ↓	460-125356-2MSD	Water	12/13/16
14	CFMW-035-GWMS 353.2	460-125356-3MS	Water	12/13/16
15	CFMW-035-GWMSD ↓	460-125356-3MSD	Water	12/13/16
16	CFMW-020-GWMS 9056 300.0	460-125356-9MS	Water	12/13/16

LDC #: 37802F6

SDG #: 460-125356-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/11/17

Reviewer: JD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

	Client ID			Lab ID	Matrix	Date
17	CFMW-020-GWMSD	9056	300.0	460-125356-9MSD	Water	12/13/16
18	CFMW-020-GWDUP	↓	↓	460-125356-9DUP	Water	12/13/16
19						
20						
21						
22						
23						

Notes:

LDC #: 37882F-10

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37882F6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 57882F4

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer:

All circled methods are applicable to each sample.

Sample ID	Parameter
1-4,6-8	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:9-10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:11	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:12-13	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:14-15	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:16-18	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37802F6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	9/10	W	NH3	112 (90-110)			1-4, 6-8	J+det/A (nd)
	14/15	W	NO3/NO2-N	73 (90-110)	74 (90-110)		1-4, 6-8	J-/UJ/A (det/nd)
	16/17	W	Cl	56 (90-110)	54 (90-110)		7	J-/UJ/A (det)
			SO4	79 (90-110)	71 (90-110)		1-4, 6-8	J-/UJ/A (det)
			OPO4-P	69 (90-110)	74 (90-110)		1-4, 6-8	

Comments: EB not associated

LDC #: 37802F6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: C

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NO_3/NO_2-N was recalculated. Calibration date: 12/20/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NO_3/NO_2-N	s1	0.0	0	0.9994	0.9994	Y
		s2	0.1	836864			
		s3	0.5	4026010			
		s4	1	7470695			
		s5	1.5	10766541			
		s6	2	14194125			
ICV 14:00 Calibration verification	NH_3	Found 2.08 mg/L	True 2 mg/L		104%R	104%R	Y
ICV 10:19 Calibration verification	CN	0.205 mg/L	0.2 mg/L		103%R	103%R	↓
ICV 15:08 Calibration verification	NO_3/NO_2-N	1.018 mg/L	1 mg/L		102%R	102%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37882F6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: SD
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 21:17	Laboratory control sample	OPO4-P	2633 ug/L	2500 ug/L	105%R	105%R	Y
MS 14:07	Matrix spike sample	NH3	(SSR-SR) 1116 ug/L	1000 ug/L	112%R	112%R	
DUP 11:54	Duplicate sample	TDS	690 mg/L	662 mg/L	4%RPD	4%RPD	

Comments:

TOTCLC.6

LDC #: 31802F6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (8) SO4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A - (-65849.324)}{86244.1497}$

Recalculation: $\frac{405958 - (-65849.324)}{86244.1497} \times \frac{1000ug}{1mg} = 5470$ ug/L

A = 405958

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	CN	152	152	
	2	NO3/NO2-N	1050	1050	
	3	Hardness	640000	640000	
	4	Alkalinity	248000	248000	
	6	TDS	206mg/L	206mg/L	
	7	TSS	11.3 mg/L	11.3 mg/L	
	8	SO4	5470	5470	

Note:

LDC #: 37802

EDD POPULATION COMPLETENESS WORKSHEET

Date: 1/17/17
Page: 1 of 1
2nd Reviewer: [illegible]

The LDC job number listed above was entered by BA.

	EDD Process		Comments/Action
I.	EDD Completeness	-	
Ia.	- All methods present?	Y	
Ib.	- All samples present/match report?	Y	
Ic.	- All reported analytes present?	Y	
Id.	- 10% or 100% verification of EDD?	Y	
II.	EDD Preparation/Entry	-	
IIa.	- Carryover U/J?	Y	
IIb.	- Reason Codes used? If so, note which codes.	N	
IIc.	- Additional Information (QC Level, Validator, Validated Y/N, etc.)	N	
III.	Reasonableness Checks	-	
IIIa.	- Do all qualified ND results have ND qualifier (e.g. UJ)?	Y	
IIIb.	- Do all qualified detect results have detect qualifier (e.g. J)?	Y	
IIIc.	- If reason codes are used, do all qualified results have reason code field populated, and vice versa?	N/A	
IIId.	-Does the detect flag require changing for blank qualifier? If so, are all U results marked ND?	Y/Y	
IIIe.	- Do blank concentrations in report match EDD where data was qualified due to blank contamination?	Y	
IIIf.	- Were any results reported above calibration range? If so, were results qualified appropriately?	Y/Y	
IIIg.	-Is the readme complete? If applicable, were edits or discrepancies listed in the readme?	Y	

Notes: *see discrepancy sheet

The attached zipped file contains seven files:

File	Format	Description	
1) Readme_ColumbiaFalls_011717.doc	MS Word 2003	A "Readme" file (this document).	
	MS Excel 2003	A spreadsheet for the following SDG(s):	
2) 460-124871-1_TestResultsQC_v1.xlsx		460-124871-1	37802A
460-124977-1_TestResultsQC_v1.xlsx		460-124977-1	37802B
460-125105-1_TestResultsQC_v1.xlsx		460-125105-1	37802C
460-125196-1_TestResultsQC_v1.xlsx		460-125196-1	37802D
460-125342-1_TestResultsQC_v1.xlsx		460-125342-1	37802E
460-125356-1_TestResultsQC_v1.xlsx		460-125356-1	37802F

No discrepancies were observed between the hardcopy data packages and the electronic data deliverables during EDD population of validation qualifiers. A 100% verification of the EDD was not performed.

Please contact Christina Rink at (760) 827-1100 if you have any questions regarding this electronic data submittal.

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

January 24, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on January 3, 2017. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #37837:

SDG #	Fraction
460-125477-1, 460-125567-1 460-125644-1, 460-125747-1 460-125810-1	Volatiles, Semivolatiles, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

Level IV 6,770 pages-DL

Attachment 1

EDD

LDC #37837 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		CN- (335.4)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		TDS (2540C)		TSS (2540D)									
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-125477-1	01/03/17	01/24/17	7	0	6	0	1	0	9	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	9	0	9	0								
B	460-125567-1	01/03/17	01/24/17	9	0	8	0	1	0	9	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	9	0	9	0								
C	460-125644-1	01/03/17	01/24/17	2	0	1	0	1	0	5	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	5	0	5	0								
D	460-125747-1	01/03/17	01/24/17	3	0	2	0	1	0	4	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	4	0	4	0								
E	460-125810-1	01/03/17	01/24/17	-	-	-	-	2	0	-	-	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0								
Total	T/CR			21	0	17	0	6	0	27	0	33	0	33	0	33	0	33	0	33	0	33	0	33	0	29	0	29	0	0	0	0	0	0	0	0	360

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

L:\Roux Associates\Columbia Falls\37837ST.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125477-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-021-GW	460-125477-1	Water	12/14/16
CFMW-029-GW	460-125477-2	Water	12/14/16
CFMW-027-GW	460-125477-3	Water	12/14/16
CFMW-012-GW	460-125477-4	Water	12/14/16
CFMW-043-GW	460-125477-5	Water	12/14/16
Trip Blank	460-125477-6	Water	12/14/16
CFMW-045-GW	460-125477-11	Water	12/14/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
11/29/16 (ICV-13)	Bromomethane Chloroethane	50.7 34.9	All samples in SDG 460-125477-1	NA	-
11/29/16 (ICV-13)	Methyl acetate 1,2-Dibromo-3-chloropropane	21.5 23.6	All samples in SDG 460-125477-1	UJ (all non-detects) UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/21/16 (09:46)	Chloroethane	36.3	CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-043-GW Trip Blank CFMW-045-GW	NA	-
12/21/16 (09:46)	Trichlorofluoromethane Acetone	26.0 22.3	CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-043-GW Trip Blank CFMW-045-GW	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A
12/21/16 (22:37)	Bromomethane Chloroethane	63.5 96.6	CFMW-012-GW	NA	-
12/21/16 (22:37)	Trichlorofluoromethane Methyl acetate 1,2-Dibromo-3-chloropropane	20.2 21.9 27.6	CFMW-012-GW	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-411091 (CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-043-GW Trip Blank CFMW-045-GW)	Trichlorofluoromethane	62 (71-143)	54 (71-143)	UJ (all non-detects)	P
LCS/D 460-411230 (CFMW-029-GW)	Chloroethane	180 (52-150)	170 (52-150)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D and LCS/LCSD %R, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-125477-1

Sample	Compound	Flag	A or P	Reason
CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW Trip Blank CFMW-045-GW	Methyl acetate 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-043-GW Trip Blank CFMW-045-GW	Trichlorofluoromethane Acetone	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-012-GW	Trichlorofluoromethane Methyl acetate 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-043-GW Trip Blank CFMW-045-GW	Trichlorofluoromethane	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-125477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-125477-1

No Sample Data Qualified in this SDG

LDC #: 37837A1 **VALIDATION COMPLETENESS WORKSHEET** Date: 1/5/17
SDG #: 460-125477-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer: [illegible]
2nd Reviewer: KK

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A ~~SW~~, SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	A ~~SW~~	TB = 6 < RL
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	cs
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-021-GW	460-125477-1	Water	12/14/16
2	CFMW-029-GW	460-125477-2	Water	12/14/16
3	CFMW-027-GW	460-125477-3	Water	12/14/16
4	CFMW-012-GW	460-125477-4	Water	12/14/16
5	CFMW-043-GW	460-125477-5	Water	12/14/16
6	Trip Blank	460-125477-6	Water	12/14/16
7	CFMW-045-GW	460-125477-11	Water	12/14/16
8				
9				

Notes:

1	MB 460-411091						
2	MB 460-411230						

LDC #: 37837A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: KR

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?	✓			< RL
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37837A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37837A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
+	11/29/16	ICV-13	B	50.7	All	J+ all /A all ND
+			D	34.9		↓
-			QQQQ	21.5		J-/UJ/A
-			MM	23.6		↓

LDC #: 37837A /

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	12/21/16	CCV13_P21921	D	36.3		1→3, 5→7,	J+ det/Δ all ND
−	0946		KK	26.0		MB 460-411091	J-/UJ/Δ ND + Det
−			F	22.3		↓	↓ ↓
+	12/21/16	CCV13-P21947	B	63.5		4, MB 460-411230	J+ det/Δ all ND
+	2237		D	96.6			↓
−			KK	20.2			J-/UJ/Δ
−			QQQQ	21.9			↓
−			MM	27.6		↓	↓

LDC #: 37837A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: ✓ GC ___ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a laboratory control samples (LCS) and laboratory control sample duplicate (LCSD) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent differences (RPD) within the QC limits?

Level IV/D Only

Y N N/A Was an LCS analyzed every 20 samples for each matrix or whenever a sample extraction was performed?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460-411091	KK	62 (71-143)	54 (71-143)	( )	1→3, 5→7, MB460-411091	J/UJ/P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
	LCS/D 460-411230	D	180 (52-150)	170 (52-150)	( )	2, MB460-411230	J+/UJ/P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37837A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	11/29/2016	F	0.8072	0.8072	0.8610	0.8610	8.5	8.5
	GCMS13		C	0.2985	0.2985	0.3025	0.3025	5.7	5.7
			CC	1.6163	1.6163	1.6134	1.6134	7.3	7.3
			JJJ	1.4631	1.4631	1.4492	1.4492	5.8	5.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KR

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0946	12/21/16	F (IS1)	0.8610	0.6690	0.6690	22.3	22.3
			C (IS2)	0.3025	0.2845	0.2845	6.0	6.0
			CC (IS3)	1.6134	1.655	1.655	2.5	2.5
			JJJ (IS4)	1.4492	1.489	1.489	2.7	2.7
			(IS5)					
2	CCV 2237	12/21/16	F (IS1)		0.7753	0.7753	10.0	10.0
			C (IS2)		0.2964	0.2964	2.0	2.0
			CC (IS3)		1.607	1.607	0.4	0.4
			JJJ (IS4)		1.446	1.446	0.2	0.2
			(IS5)					
3								
4								

LDC #: 37837A /

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: KF

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 7

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	45.9	92	92	0
1,2-Dichloroethane-d4		45.7	91	91	
Toluene-d8		46.2	92	92	
Bromofluorobenzene		44.4	89	89	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37837A /

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-411230

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	20.4	19.0	102	102	95	95	7	7
Trichloroethene	↓	↓	18.3	18.2	92	92	91	91	1	1
Benzene	↓	↓	19.7	19.8	99	99	99	91	1	1
Toluene	↓	↓	20.0	19.5	100	100	97	97	2	2
Chlorobenzene	↓	↓	19.6	19.5	98	98	98	98	0	0

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #7, E:

Conc. = $\frac{1875 \quad (50.0)}{657002 \quad (0.2805)}$

= 0.51 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125477-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-021-GW	460-125477-1	Water	12/14/16
CFMW-029-GW	460-125477-2	Water	12/14/16
CFMW-027-GW	460-125477-3	Water	12/14/16
CFMW-012-GW	460-125477-4	Water	12/14/16
CFMW-043-GW	460-125477-5	Water	12/14/16
CFMW-045-GW	460-125477-11	Water	12/14/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/17/16 (01:54)	Bis(2-chloroethyl) ether Acenaphthene Pentachlorophenol	21.9 30.4 23.1	All samples in SDG 460-125477-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
LCS 460-410062	1,4-Dioxane Acenaphthene Bis(2-chloroethyl) ether N-Nitrosodiphenylamine	22 (25-66) 56 (58-107) 57 (63-106) 67 (69-118)	All samples in SDG 460-125477-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS %R, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-125477-1

Sample	Compound	Flag	A or P	Reason
CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW CFMW-045-GW	Bis(2-chloroethyl) ether Acenaphthene Pentachlorophenol	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW CFMW-045-GW	1,4-Dioxane Acenaphthene Bis(2-chloroethyl) ether N-Nitrosodiphenylamine	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-125477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-125477-1

No Sample Data Qualified in this SDG

LDC #: 37837A2a

SDG #: 460-125477-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/5/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r^2 ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-021-GW	460-125477-1	Water	12/14/16
2	CFMW-029-GW	460-125477-2	Water	12/14/16
3	CFMW-027-GW	460-125477-3	Water	12/14/16
4	CFMW-012-GW	460-125477-4	Water	12/14/16
5	CFMW-043-GW	460-125477-5	Water	12/14/16
6	CFMW-045-GW	460-125477-11	Water	12/14/16
7				
8				
9				
10				

Notes:

	MB 460-410062						

LDC #: 37837A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: KK

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37837A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: VK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37837A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: LK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	12/17/16	CCV06-M236397	B	21.9		All	J-/UJ/A (all ND)
-	0152		GG	30.4		↓	↓
-			TT	23.1			

LDC #: 37837A2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-	III	22 (25-66)	( )	( )	All	J-/UJ/P (All ND)
	410062	GG	56 (58-107)	( )	( )		
		B	57 (63-106)	( )	( )		
		QQ	67 (69-118)	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		

LDC #: 37837 A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	12/13/2016	A	1.6862	1.6862	1.8237	1.8237	18.4	18.4
			S	0.9080	0.9080	1.0152	1.0152	20.0	20.0
			GG	1.4750	1.4750	1.5349	1.5349	6.2	6.2
			UU	0.9379	0.9379	0.9826	0.9826	11.7	11.7
			DDD	0.9307	0.9307	0.9364	0.9364	11.2	11.2
			III	0.9887	0.9887	0.9969	0.9969	6.8	6.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 01:54 M236397	12/17/16	A	(1st IS)	1.8237	1.705	1.705	6.5	6.5
			S	(2nd IS)	1.0152	0.9776	0.9776	3.7	3.7
			GG	(3rd IS)	1.5349	1.068	1.068	30.4	30.4
			UU	(4th IS)	0.9826	0.9351	0.9351	4.8	4.8
			DDD	(5th IS)	0.9364	0.9455	0.9455	1.0	1.0
			III	(6th IS)	0.9969	1.014	1.014	1.7	1.7
2				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: RF

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #6

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	6.71	67	67	0
2-Fluorobiphenyl	↓	6.31	63	63	↓
Terphenyl-d14	↓	7.43	74	74	↓
Phenol-d5	↓	2.35	23	23	↓
2-Fluorophenol	↓	3.23	32	32	↓
2,4,6-Tribromophenol	↓	7.66	77	77	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37837A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460-410062

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	22.2	NA	28	28				
N-Nitroso-di-n-propylamine	↓	↓	56.4	↓	71	71				
4-Chloro-3-methylphenol			50.4		63	63				
Acenaphthene			44.9		56	56				
Pentachlorophenol			87.0		54	54				
Pyrene			70.1		88	88	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837A2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KY

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS, A:

Conc. = $\frac{186622}{294972} \frac{(8.0)}{(1.8237)} \frac{(2)}{(250)} \frac{(1000)}{}$

= 22.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125477-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB16-AQ	460-125477-7	Water	12/14/16
CFMW-021-GWF	460-125477-1F	Water	12/14/16
CFMW-029-GWF	460-125477-2F	Water	12/14/16
CFMW-027-GWF	460-125477-3F	Water	12/14/16
CFMW-012-GWF	460-125477-4F	Water	12/14/16
CFMW-043-GWF	460-125477-5F	Water	12/14/16
CFMW-011a-GWF	460-125477-8F	Water	12/14/16
CFMW-016a-GWF	460-125477-9F	Water	12/14/16
CFMW-019a-GWF	460-125477-10F	Water	12/14/16
CFMW-045-GWF	460-125477-11F	Water	12/14/16
CFMW-021-GWFMS	460-125477-1MS	Water	12/14/16
CFMW-021-GWFDUP	460-125477-1DUP	Water	12/14/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB16-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-021-GWFMS, no data were qualified for Magnesium and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125477-1

No Sample Data Qualified in this SDG

LDC #: 37837A4a

SDG #: 460-125477-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/16/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer: KK

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/14/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB=(1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS= (11) = Mg, Na 74X *See Below
VIII.	Duplicate sample analysis	A	DUP=CFMW-015-GWDUP (SDG:460-125567-1)
IX.	Serial Dilution	A	SER=(2)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB16-AQ	460-125477-7	Water	12/14/16
2	CFMW-021-GWF	460-125477-1F	Water	12/14/16
3	CFMW-029-GWF	460-125477-2F	Water	12/14/16
4	CFMW-027-GWF	460-125477-3F	Water	12/14/16
5	CFMW-012-GWF	460-125477-4F	Water	12/14/16
6	CFMW-043-GWF	460-125477-5F	Water	12/14/16
7	CFMW-011a-GWF	460-125477-8F	Water	12/14/16
8	CFMW-016a-GWF	460-125477-9F	Water	12/14/16
9	CFMW-019a-GWF	460-125477-10F	Water	12/14/16
10	CFMW-045-GWF	460-125477-11F	Water	12/14/16
11	CFMW-021-GWFMS 6020	460-125477-1MS	Water	12/14/16
12	CFMW-021-GWFDUP ↓	460-125477-1DUP	Water	12/14/16
13				
14				
15				

*MS=CFMW-015-GW MS (SDG:460-125567-1)

LDC #: 37837A4c

VALIDATION FINDINGS CHECKLIST

Reviewer: JO
2nd Reviewer: KP

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) ≤ 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37837A4g

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: JD
2nd reviewer: KK

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC:11-12	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37857A4

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KR

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 12:45	ICP/MS (Initial calibration)	Cr	39.8 ug/L	40 ug/L	100%R	99%R	Y*
ICV 14:02	CVAA (Initial calibration)	Hg	4.85 ug/L	5 ug/L	97%R	97%R	Y
	ICP (Continuing calibration)						
CCV 14:18	ICP/MS (Continuing calibration)	Cu	47.96 ug/L	50 ug/L	96%R	96%R	Y
CCV 14:32	CVAA (Contining calibration)	Hg	5.29 ug/L	5 ug/L	106%R	106%R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: *Rounding

calclc.4sw.wpd

LDC #: 37837A4

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: RK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 13:02	ICP interference check	Ag	189.9 ug/L	200 ug/L	95%R	95%R	Y
LCS 14:15	Laboratory control sample	Hg	0.959 ug/L	1 ug/L	96%R	96%R	
MS 13:55	Matrix spike	Pb	(SSR-SR) 9.76 ug/L	10 ug/L	98%R	98%R	
DUP 13:58	Duplicate	Na	139993 ug/L	141654 ug/L	1%RPD	1%RPD	
SER 14:11	ICP serial dilution	Mg	14451 ug/L	13988 ug/L	3.3%D	3.3%D	

Comments: _____

TOTCLC.4SW

LDC #: 37837A4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: DD
2nd reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (2) As were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 0.40 ug/L x 2 = 0.80 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 0.40 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	2	As	0.81	0.80	Y
	3	Ca	52800	52800	
	4	Co	2.0	2.0	
	5	Cu	4.6	4.6	
	6	Mg	15600	15600	
	7	K	3120	3120	
	8	Na	13100	13100	
	9	Al	29.5	29.5	
	10	Ba	155	155	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125477-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-021-GW	460-125477-1	Water	12/14/16
CFMW-029-GW	460-125477-2	Water	12/14/16
CFMW-027-GW	460-125477-3	Water	12/14/16
CFMW-012-GW	460-125477-4	Water	12/14/16
CFMW-043-GW	460-125477-5	Water	12/14/16
CFMW-EB16-AQ	460-125477-7	Water	12/14/16
CFMW-011a-GW	460-125477-8	Water	12/14/16
CFMW-016a-GW	460-125477-9	Water	12/14/16
CFMW-019a-GW	460-125477-10	Water	12/14/16
CFMW-045-GW	460-125477-11	Water	12/14/16
CFMW-021-GWMS	460-125477-1MS	Water	12/14/16
CFMW-021-GWMSD	460-125477-1MSD	Water	12/14/16
CFMW-021-GWDUP	460-125477-1DUP	Water	12/14/16
CFMW-029-GWMS	460-125477-2MS	Water	12/14/16
CFMW-029-GWMSD	460-125477-2MSD	Water	12/14/16
CFMW-029-GWDUP	460-125477-2DUP	Water	12/14/16
CFMW-012-GWMS	460-125477-4MS	Water	12/14/16
CFMW-012-GWMSD	460-125477-4MSD	Water	12/14/16
CFMW-016a-GWMS	460-125477-9MS	Water	12/14/16
CFMW-016a-GWMSD	460-125477-9MSD	Water	12/14/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB16-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB16-AQ	12/14/16	Chloride	180 ug/L	CFMW-011a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-011a-GW	Chloride	1130 ug/L	1130J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-021-GWMS/MSD (CFMW-011a-GW CFMW-016a-GW)	Chloride	66 (90-110)	56 (90-110)	J- (all detects)	A
CFMW-021-GWMS/MSD (CFMW-021-GW CFMW-027-GW CFMW-043-GW CFMW-011a-GW CFMW-016a-GW CFMW-019a-GW CFMW-045-GW)	Fluoride	42 (90-110)	33 (90-110)	J- (all detects)	A
CFMW-021-GWMS/MSD (CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW CFMW-011a-GW CFMW-016a-GW CFMW-019a-GW CFMW-045-GW)	Orthophosphate as P	-	80 (90-110)	UJ (all non-detects)	A
CFMW-029-GWMS/MSD (CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW CFMW-019a-GW CFMW-045-GW)	Chloride	66 (90-110)	65 (90-110)	J- (all detects)	A
CFMW-029-GWMS/MSD (CFMW-029-GW CFMW-012-GW)	Fluoride	65 (90-110)	69 (90-110)	J- (all detects)	A
CFMW-029-GWMS/MSD (CFMW-021-GW)	Sulfate	23 (90-110)	25 (90-110)	J- (all detects)	A

For CFMW-021-GWMS/MSD, no data were qualified for Sulfate percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFMW-012-GWMS/MSD, no data were qualified for Cyanide percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-021-GWMS/MSD (CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW CFMW-011a-GW CFMW-016a-GW CFMW-019a-GW CFMW-045-GW)	Orthophosphate as P	26 (≤15)	UJ (all non-detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-029-GWDUP (CFMW-029-GW CFMW-012-GW)	Fluoride	51 (≤20)	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and RPD and DUP RPD, data were qualified as estimated in nine samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125477-1

Sample	Analyte	Flag	A or P	Reason
CFMW-011a-GW CFMW-016a-GW CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW CFMW-019a-GW CFMW-045-GW	Chloride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-021-GW CFMW-027-GW CFMW-043-GW CFMW-011a-GW CFMW-016a-GW CFMW-019a-GW CFMW-045-GW CFMW-029-GW CFMW-012-GW	Fluoride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R
CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW CFMW-011a-GW CFMW-016a-GW CFMW-019a-GW CFMW-045-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-021-GW	Sulfate	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-021-GW CFMW-029-GW CFMW-027-GW CFMW-012-GW CFMW-043-GW CFMW-011a-GW CFMW-016a-GW CFMW-019a-GW CFMW-045-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (RPD)
CFMW-029-GW CFMW-012-GW	Fluoride	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125477-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125477-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-011a-GW	Chloride	1130J+ ug/L	A

LDC #: 37837A6

SDG #: 460-125477-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/16/17

Page: 1 of 2

Reviewer: CSD

2nd Reviewer: KK

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ 30 (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrate/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D) a

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/14/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=(6)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D=(17,18)=CN 74X
VII.	Duplicate sample analysis	SW	DUP=CFMW-015-GWDUP (SDG:460-125567-1)
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-021-GW	460-125477-1	Water	12/14/16
2	CFMW-029-GW	460-125477-2	Water	12/14/16
3	CFMW-027-GW	460-125477-3	Water	12/14/16
4	CFMW-012-GW	460-125477-4	Water	12/14/16
5	CFMW-043-GW	460-125477-5	Water	12/14/16
6	CFMW-EB16-AQ No TSS & TDS	460-125477-7	Water	12/14/16
7	CFMW-011a-GW	460-125477-8	Water	12/14/16
8	CFMW-016a-GW	460-125477-9	Water	12/14/16
9	CFMW-019a-GW	460-125477-10	Water	12/14/16
10	CFMW-045-GW	460-125477-11	Water	12/14/16
11	CFMW-021-GWMS 9056 300.0	460-125477-1MS	Water	12/14/16
12	CFMW-021-GWMSD	460-125477-1MSD	Water	12/14/16
13	CFMW-021-GWDUP TDS & Hard	460-125477-1DUP	Water	12/14/16
14	CFMW-029-GWMS NH3	460-125477-2MS	Water	12/14/16
15	CFMW-029-GWMSD	460-125477-2MSD	Water	12/14/16
16	CFMW-029-GWDUP	460-125477-2DUP	Water	12/14/16

LDC #: 37837A6

SDG #: 460-125477-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/16/17

Reviewer: SD

2nd Reviewer: KK

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

	Client ID		Lab ID	Matrix	Date
17	CFMW-012-GWMS	CN	460-125477-4MS	Water	12/14/16
18	CFMW-012-GWMSD	↓	460-125477-4MSD	Water	12/14/16
19	CFMW-016a-GWMS	353.2	460-125477-9MS	Water	12/14/16
20	CFMW-016a-GWMSD	↓	460-125477-9MSD	Water	12/14/16
21					
22					
23					
24					
25					

Notes:

LDC #: 35833A6

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: 3D
2nd Reviewer: KK

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37837A6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: KL

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 32832DG

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: PR

All circled methods are applicable to each sample.

Sample ID	Parameter
1-5, 7-10	pH TDS Cl F NO_3/NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
6	pH TDS Cl F NO_3/NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 11-12	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 13	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 14-15	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 16	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 17-18	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC: 19-20	pH TDS Cl F NO_3/NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37837A6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/14/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 7

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	6		7							
Chloride	180	1800	1130J+							

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37837A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	11/12	W	Cl	66 (90-110)	56 (90-110)		7-8	J-/UJ/A (det)
			F	42 (90-110)	33 (90-110)		1, 3, 5, 7-10	J-/UJ/A (det)
			OPO4-P		80 (90-110)		1-5, 7-10	J-/UJ/A (nd)
	14/15	W	Cl	66 (90-110)	65 (90-110)		1-5, 9-10	J-/UJ/A (det)
			F	65 (90-110)	69 (90-110)		2, 4	J-/UJ/A (det)
			SO4	23 (90-110)	25 (90-110)		1	J-/R/A (det)
	11/12	W	OPO4-P			26 (≤15)	1-5, 7-10	J/UJ/A (nd)

Comments: 11/12: SO4 > 4X
EB not associated
17/18: CN > 4X

LDC #: 37837A6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: JSD
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤ 35% for soil samples? If no, see qualifications below. A control limit of ±R.L. (±2X R.L. for soil) was used for sample values that were <5X the R.L., including the case when only one of the duplicate sample values was <5X R.L.. If field blanks were used for laboratory duplicates, note in the Overall Assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Difference (Limits)	Associated Samples	Qualifications
		16	W	F	51 (≤20)		2, 4	J/UJ/A (det)

Comments:

37837ADUP.wpd

LDC #: 37837A6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of CN was recalculated.Calibration date: 12/19/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/l)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	CN	s1	0	0.0125	0.99971	0.99993	Y*
		s2	0.01	0.438			
		s3	0.025	1.12			
		s4	0.05	2.21			
		s5	0.1	4.37			
		s6	0.2	8.47			
		s7	0.4	16.5			
ICV 10:19 Calibration verification	CN	Found 0.205 mg/L	True 0.2 mg/L		103%R	103%R	Y
ICV 23:10 Calibration verification	OPO4-P	2.39 mg/L	2.5 mg/L		95.6%R	95.5%R	Y*
ICV 22:52 Calibration verification	SO4	7.16 mg/L	7.5 mg/L		95.5%R	95.5%R	Y

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37837A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 17:51	Laboratory control sample	Alkalinity	98049 ug/L	99600 ug/L	98.4%R	98.5%R	Y
MS 12:52	Matrix spike sample	NH3	(SSR-SR) 1079 ug/L	1000 ug/L	108%R	108%R	
DUP 14:27	Duplicate sample	Hardness	184 mg/L	188 mg/L	2%RPD	2%RPD	

Comments:

TOTCLC.6

LDC #: 35835A10

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: KP

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y/ N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y/ N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (4) Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

T = 3ml
N = 0.02N
V = 50ml

Recalculation: $\frac{3ml \times 0.02N \times 50000}{50ml} \times \frac{1000ug}{1mg} = 60000$ ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Total CN	1560	1560	Y
	2	NO3/NO2-N	1230	1230	
	3	NH3	259	259	
	4	Hardness	60000	60000	
	5	Alkalinity	258000	258000	
	6	Cl	180	180	
	7	TDS	185 mg/L	185 mg/L	
	8	TSS	46.0 mg/L	46.0 mg/L	
	9	NO3/NO2-N	129	129	
	10	TDS	323 mg/L	323 mg/L	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125567-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-010-GW	460-125567-2	Water	12/15/16
CFMW-015-GW	460-125567-3	Water	12/15/16
CFMW-014-GW	460-125567-4	Water	12/15/16
CFMW-019-GW	460-125567-5	Water	12/15/16
Trip Blank	460-125567-6	Water	12/15/16
CFMW-DUP6-GW	460-125567-7	Water	12/15/16
CFMW-049-GW	460-125567-8	Water	12/15/16
CFMW-047-GW	460-125567-10	Water	12/15/16
CFMW-050-GW	460-125567-11	Water	12/15/16
CFMW-015-GWMS	460-125567-3MS	Water	12/15/16
CFMW-015-GWMSD	460-125567-3MSD	Water	12/15/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
11/29/16 (ICV-13)	Bromomethane Chloroethane	50.7 34.9	All samples in SDG 460-125567-1	NA	-
11/29/16 (ICV-13)	Methyl acetate 1,2-Dibromo-3-chloropropane	21.5 23.6	All samples in SDG 460-125567-1	UJ (all non-detects) UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/22/16 (10:38)	Chloroethane	38.9	All samples in SDG 460-125567-1	NA	-
12/22/16 (10:38)	Trichlorofluoromethane Acetone	25.9 21.1	All samples in SDG 460-125567-1	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-015-GWMS/MSD (CFMW-015-GW)	Chloroethane Bromomethane	161 (52-150) -	175 (75-150) 176 (10-150)	NA	-
CFMW-015-GWMS/MSD (CFMW-015-GW)	Trichlorofluoromethane	-	63 (71-143)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples CFMW-DUP6-GW and CFMW-049-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D and MS/MSD %R, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-125567-1

Sample	Compound	Flag	A or P	Reason
CFMW-010-GW CFMW-015-GW CFMW-014-GW CFMW-019-GW Trip Blank CFMW-DUP6-GW CFMW-049-GW CFMW-047-GW CFMW-050-GW	Methyl acetate 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-010-GW CFMW-015-GW CFMW-014-GW CFMW-019-GW Trip Blank CFMW-DUP6-GW CFMW-049-GW CFMW-047-GW CFMW-050-GW	Trichlorofluoromethane Acetone	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-015-GW	Trichlorofluoromethane	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

LDC #: 37837B1

SDG #: 460-125567-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/5/17

Page: 1 of 1

Reviewer: P

2nd Reviewer: KK

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A, SW	% RSD ≤ 15 | 30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	A	TB = 5 < RL
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	ND	D = 6, 7
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-010-GW	460-125567-2	Water	12/15/16
2	CFMW-015-GW	460-125567-3	Water	12/15/16
3	CFMW-014-GW	460-125567-4	Water	12/15/16
4	CFMW-019-GW	460-125567-5	Water	12/15/16
5	Trip Blank	460-125567-6	Water	12/15/16
6	CFMW-DUP6-GW P	460-125567-7	Water	12/15/16
7	CFMW-049-GW D	460-125567-8	Water	12/15/16
8	CFMW-047-GW	460-125567-10	Water	12/15/16
9	CFMW-050-GW	460-125567-11	Water	12/15/16
10	CFMW-015-GWMS	460-125567-3MS	Water	12/15/16
11	CFMW-015-GWMSD	460-125567-3MSD	Water	12/15/16
12				
13	MB 460-411325			

LDC #: 37837 B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: KK

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?	✓			< RL
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37837B 1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.		✓		

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37837B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
+	11/29/16	ICV - 13	B	50.7	all	J+ all/A all ND
+			D	34.9		
−			QQQQ	21.5		J-/UJ/A
−			MM	23.6		

ICVvoa.wpd

LDC #: 37837B 1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	12/22/16	CCV13-P21975	D	38.9		All	J+ det/A and ND
-	1038		KK	25.9		↓	J-/UJ/A
-			F	21.1		↓	↓

CONCAL.wpd

.LDC #: 37837B /

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD : GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	10 & 11	D	161 (52-150)	175 (52-150)	( )	2	J+ det /A all ND
		B	( )	176 (10-150)	( )	↓	↓
		KK	( )	63 (71-143)	( )	↓	J-/UJ/A
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37837B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	11/29/2016	F	0.8072	0.8072	0.8610	0.8610	8.5	8.5
	GCMS13		C	0.2985	0.2985	0.3025	0.3025	5.7	5.7
			CC	1.6163	1.6163	1.6134	1.6134	7.3	7.3
			JJJ	1.4631	1.4631	1.4492	1.4492	5.8	5.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 10:38 P21975	12/22/16	F (IS1)	0.8610	0.6792	0.6792	21.1	21.1
			C (IS2)	0.3025	0.2950	0.2950	2.5	2.5
			CC (IS3)	1.6134	1.677	1.677	4.0	4.0
			JJ (IS4)	1.4492	1.506	1.506	3.9	3.9
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37837B1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: KV

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	46.3	93	93	0
1,2-Dichloroethane-d4	↓	46.7	93	93	↓
Toluene-d8	↓	46.9	94	94	↓
Bromofluorobenzene	↓	45.3	91	91	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37837B1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 10 & 11

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	ND	21.8	21.5	109	109	108	108	1	1
Trichloroethene	↓	↓	↓	20.0	19.8	100	100	99	99	1	1
Benzene	↓	↓	↓	21.3	21.1	106	106	106	106	1	1
Toluene	↓	↓	↓	21.2	21.2	106	106	106	106	0	0
Chlorobenzene	↓	↓	↓	20.8	20.6	104	104	103	103	1	1

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-411325

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	21.6	NA	108	108				
Trichloroethene			20.5		102	102				
Benzene			21.8		109	109				
Toluene			21.7		109	109				
Chlorobenzene			21.3		107	107	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #2, E:

Conc. = $\frac{6594 \ (50.0)}{638146 \ (02805)}$

= 1.8 ng/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125567-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-010-GW	460-125567-2	Water	12/15/16
CFMW-015-GW	460-125567-3	Water	12/15/16
CFMW-014-GW	460-125567-4	Water	12/15/16
CFMW-019-GW	460-125567-5	Water	12/15/16
CFMW-DUP6-GW	460-125567-7	Water	12/15/16
CFMW-049-GW	460-125567-8	Water	12/15/16
CFMW-047-GW	460-125567-10	Water	12/15/16
CFMW-050-GW	460-125567-11	Water	12/15/16
CFMW-015-GWMS	460-125567-3MS	Water	12/15/16
CFMW-015-GWMSD	460-125567-3MSD	Water	12/15/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/19/16 (04:56)	Bis(2-chloroethyl) ether 1,2,4,5-Tetrachlorobenzene Biphenyl Acenaphthene Pentachlorophenol	23.9 21.0 23.9 33.1 22.1	All samples in SDG 460-125567-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
12/19/16 (04:56)	4-Nitroaniline	24.3	All samples in SDG 460-125567-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-015-GWMS/MSD (CFMW-015-GW)	Biphenyl	-	110 (54-108)	None	-
	2,4-Dinitrophenol	-	126 (45-125)		
	2,6-Dinitrotoluene	123 (68-121)	137 (68-121)		
	4-Chlorophenyl-phenyl ether	-	119 (60-114)		
	Acenaphthylene	116 (61-106)	131 (61-106)		
	Dibenzofuran	-	110 (67-108)		
	Fluorene	-	123 (67-112)		
	Hexachlorocyclopentadiene	-	108 (18-99)		
	Benzo(a)anthracene	123 (73-119)	-		
CFMW-015-GWMS/MSD (CFMW-015-GW)	2,4-Dimethylphenol	39 (61-95)	41 (61-95)	UJ (all non-detects)	A
	2-Nitroaniline	43 (46-124)	43 (46-124)	UJ (all non-detects)	
	4-Chloroaniline	17 (51-108)	20 (51-108)	UJ (all non-detects)	
CFMW-015-GWMS/MSD (CFMW-015-GW)	3,3'-Dichlorobenzidine	0 (68-123)	0 (68-123)	R (all non-detects)	A
	3-Nitroaniline	0 (60-117)	0 (60-117)	R (all non-detects)	
	4-Nitroaniline	0 (48-135)	0 (48-135)	R (all non-detects)	

Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples CFMW-DUP6-GW and CFMW-049-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method.

Due to MS/MSD %R, data were rejected in one sample.

Due to continuing calibration %D and MS/MSD %R, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-125567-1

Sample	Compound	Flag	A or P	Reason
CFMW-010-GW CFMW-015-GW CFMW-014-GW CFMW-019-GW CFMW-DUP6-GW CFMW-049-GW CFMW-047-GW CFMW-050-GW	Bis(2-chloroethyl) ether 1,2,4,5-Tetrachlorobenzene Biphenyl Acenaphthene Pentachlorophenol	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-015-GW	2,4-Dimethylphenol 2-Nitroaniline 4-Chloroaniline	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-015-GW	3,3'-Dichlorobenzidine 3-Nitroaniline 4-Nitroaniline	R (all non-detects) R (all non-detects) R (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

LDC #: 37837B2a

SDG #: 460-125567-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/5/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: KK

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / Δ	
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration/ICV	A / Δ	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	Δ	
VI.	Field blanks	N	
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	Δ	LCS
X.	Field duplicates	ND	D = 5, 6
XI.	Internal standards	Δ	
XII.	Compound quantitation RL/LOQ/LODs	Δ	
XIII.	Target compound identification	Δ	
XIV.	System performance	Δ	
XV.	Overall assessment of data	Δ	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-010-GW	460-125567-2	Water	12/15/16
2	CFMW-015-GW	460-125567-3	Water	12/15/16
3	CFMW-014-GW	460-125567-4	Water	12/15/16
4	CFMW-019-GW	460-125567-5	Water	12/15/16
5	CFMW-DUP6-GW D	460-125567-7	Water	12/15/16
6	CFMW-049-GW D	460-125567-8	Water	12/15/16
7	CFMW-047-GW	460-125567-10	Water	12/15/16
8	CFMW-050-GW	460-125567-11	Water	12/15/16
9	CFMW-015-GWMS	460-125567-3MS	Water	12/15/16
10	CFMW-015-GWMSD	460-125567-3MSD	Water	12/15/16
11				
12	MB 460-410267			
13				

LDC #: 37837B2a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT
2nd Reviewer: KK

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37837B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: PK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37837B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	12/19/16	CCV06-M236469	B	23.9		All	J-/UJ/A all ND
-	0456		VVVV	21.0			
-			EEEE	23.9			
-			GG	33.1			
+			θθ	24.3			J+ det/A
-			TT	22.1			J-/UJ/A

CONCAL.wpd

LDC #: 37837B2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	9 + 10	pls refer	To following	pages)	( )	2	All ND
			( )	( )	( )		
			( )	( )			
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

FORM III
GC/MS SEMI VOA MATRIX SPIKE RECOVERY

9 & 10

Lab Name: TestAmerica Edison Job No.: 460-125567-1

SDG No.:

Matrix: Water Level: Low Lab File ID: M236482.D

Lab ID: 460-125567-3 MS Client ID: CFMW-015-GW MS

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC	QC LIMITS REC	#	
1,1'-Biphenyl EEEE	80.3	0.63 U	78.2	97	54-108		
1,2,4,5-Tetrachlorobenzene	80.3	0.43 U	79.9	99	46-105		
1,4-Dioxane	80.3	3.1 U	34.8	43	25-66		
2,2'-oxybis[1-chloropropane]	80.3	0.93 U	74.5	93	50-108		
2,3,4,6-Tetrachlorophenol	80.3	0.69 U	69.7	87	57-122		
2,4,5-Trichlorophenol	80.3	0.49 U	61.4	76	59-117		
2,4,6-Trichlorophenol	80.3	0.53 U	67.8	84	62-120		
2,4-Dichlorophenol	80.3	0.63 U	58.9	73	62-102		
2,4-Dimethylphenol θ	80.3	0.91 U	31.7	39	61-95	F1	J-/UJ/Δ
2,4-Dinitrophenol	161	2.4 U	178	111	45-125		
2,4-Dinitrotoluene	80.3	1.0 U	93.6	116	70-123		
2,6-Dinitrotoluene EE	80.3	0.88 U	99.1	123	68-121	F1	J+dit/Δ
2-Chloronaphthalene	80.3	0.61 U	77.2	96	54-105		
2-Chlorophenol	80.3	0.74 U	53.8	67	54-92		
2-Methylnaphthalene	80.3	0.88 U	65.9	82	47-104		
2-Methylphenol	80.3	1.3 U	38.8	48	43-80		
2-Nitroaniline BB	80.3	0.65 U	34.3	43	46-124	F1	J-/UJ/Δ
2-Nitrophenol	80.3	0.59 U	61.0	76	58-109		
3 & 4 Methylphenol	80.3	0.88 U	40.0	50	34-77		
3,3'-Dichlorobenzidine BBB	80.3	1.0 U	1.0 U	0	68-123	F1	J-/R/Δ
3-Nitroaniline FF	80.3	0.82 U	0.82 U	0	60-117	F1	J-/R/Δ
4,6-Dinitro-2-methylphenol	161	2.0 U	140	87	59-132		
4-Bromophenyl phenyl ether	80.3	1.0 U	68.6	85	57-126		
4-Chloro-3-methylphenol	80.3	0.76 U	51.9	65	58-98		
4-Chloroaniline T	80.3	0.73 U	13.4	17	51-108	F1	J-/UJ/Δ
4-Chlorophenyl phenyl ether	80.3	0.96 U	89.1	111	60-114		
4-Nitroaniline θθ	80.3	0.48 U	0.48 U	0	48-135	F1	J-/R/Δ
4-Nitrophenol	161	4.7 U	43.2	27	11-47		
Acenaphthene	80.3	0.88 U	60.6	75	58-107		
Acenaphthylene DD	80.3	0.65 U	93.2	116	61-106	F1	J+dit/Δ
Acetophenone	80.3	1.0 U	71.8	89	54-115		
Anthracene	80.3	0.57 U	67.4	84	70-118		
Atrazine	161	0.77 U	175	109	38-146		
Benzaldehyde	161	0.86 U	120	75	46-111		
Benzo[a]anthracene CCC	80.3	0.55 U	99.1	123	73-119	F1	J+dit/Δ
Benzo[a]pyrene	80.3	0.16 U	85.2	106	76-125		
Benzo[b]fluoranthene	80.3	0.44 U	88.7	110	78-123		
Benzo[g,h,i]perylene	80.3	0.75 U	86.8	108	63-133		
Benzo[k]fluoranthene	80.3	0.18 U	73.7	92	71-126		
Bis(2-chloroethoxy)methane	80.3	0.69 U	66.9	83	67-104		
Bis(2-chloroethyl)ether	80.3	0.12 U	51.6	64	63-106		
Bis(2-ethylhexyl) phthalate	80.3	0.72 U	98.5	123	63-135		

Column to be used to flag recovery and RPD values

FORM III 8270D

FORM III
GC/MS SEMI VOA MATRIX SPIKE RECOVERY

Lab Name: TestAmerica Edison Job No.: 460-125567-1

SDG No.:

Matrix: Water Level: Low Lab File ID: M236482.D

Lab ID: 460-125567-3 MS Client ID: CFMW-015-GW MS

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC	QC LIMITS REC	#
Butyl benzyl phthalate	80.3	0.60 U	94.4	117	66-129	
Caprolactam	161	1.1 U	35.0	22	10-43	
Carbazole	80.3	0.85 U	71.6	89	68-121	
Chrysene	80.3	0.67 U	94.3	117	73-121	
Dibenz(a,h)anthracene	80.3	0.090 U	92.0	115	59-136	
Dibenzofuran	80.3	0.85 U	82.5	103	67-108	
Diethyl phthalate	80.3	1.0 U	93.5	116	61-129	
Dimethyl phthalate	80.3	0.98 U	84.4	105	65-121	
Di-n-butyl phthalate	80.3	0.82 U	74.8	93	64-130	
Di-n-octyl phthalate	80.3	0.69 U	87.9	109	64-131	
Fluoranthene	80.3	0.72 U	76.0	95	66-123	
Fluorene	80.3	0.80 U	83.8	104	67-112	
Hexachlorobenzene	80.3	0.47 U	72.7	91	63-125	
Hexachlorobutadiene	80.3	0.76 U	65.8	82	34-99	
Hexachlorocyclopentadiene	80.3	0.61 U	79.1	98	18-99	
Hexachloroethane	80.3	0.090 U	63.7	79	39-92	
Indeno[1,2,3-cd]pyrene	80.3	0.21 U	95.6	119	57-142	
Isophorone	80.3	0.67 U	72.5	90	55-105	
Naphthalene	80.3	0.80 U	63.9	80	51-98	
Nitrobenzene	80.3	0.49 U	69.4	86	56-106	
N-Nitrosodi-n-propylamine	80.3	0.83 U	72.3	90	48-118	
N-Nitrosodiphenylamine	80.3	0.74 U	67.2	84	69-118	
Pentachlorophenol	161	2.2 U	87.0	54	54-120	
Phenanthrene	80.3	0.65 U	71.9	90	70-117	
Phenol	80.3	0.41 U	24.6	31	16-43	
Pyrene	80.3	0.83 U	91.6	114	63-129	

Column to be used to flag recovery and RPD values

FORM III 8270D

FORM III
GC/MS SEMI VOA MATRIX SPIKE DUPLICATE RECOVERY

9 + 10

Lab Name: TestAmerica Edison Job No.: 460-125567-1

SDG No.:

Matrix: Water Level: Low Lab File ID: M236483.D

Lab ID: 460-125567-3 MSD Client ID: CFMW-015-GW MSD

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC	% RPD	QC LIMITS RPD	QC LIMITS REC	#	
1,1'-Biphenyl EEEE	81.6	89.6	110	14	30	54-108	F1	J+ dit/Δ
1,2,4,5-Tetrachlorobenzene	81.6	84.2	103	5	30	46-105		
1,4-Dioxane	81.6	34.8	43	0	30	25-66		
2,2'-oxybis[1-chloropropane]	81.6	78.7	96	5	30	50-108		
2,3,4,6-Tetrachlorophenol	81.6	71.4	88	2	30	57-122		
2,4,5-Trichlorophenol	81.6	69.2	85	12	30	59-117		
2,4,6-Trichlorophenol	81.6	75.5	93	11	30	62-120		
2,4-Dichlorophenol	81.6	71.7	88	20	30	62-102		
2,4-Dimethylphenol G	81.6	33.6	41	6	30	61-95	F1	J- /UJ/Δ
2,4-Dinitrophenol HH	163	206	126	14	30	45-125	F1	J+ dit/Δ
2,4-Dinitrotoluene	81.6	96.5	118	3	30	70-123		
2,6-Dinitrotoluene EE	81.6	112	137	12	30	68-121	F1	J+ dit/Δ
2-Chloronaphthalene	81.6	82.8	101	7	30	54-105		
2-Chlorophenol	81.6	61.5	75	13	30	54-92		
2-Methylnaphthalene	81.6	73.2	90	10	30	47-104		
2-Methylphenol	81.6	45.5	56	16	30	43-80		
2-Nitroaniline BB	81.6	35.1	43	2	30	46-124	F1	J- /UJ/Δ
2-Nitrophenol	81.6	70.3	86	14	30	58-109		
3 & 4 Methylphenol	81.6	45.1	55	12	30	34-77		
3,3'-Dichlorobenzidine BBB	81.6	1.1 U	0	NC	30	68-123	F1	J- /R/Δ
3-Nitroaniline FF	81.6	0.84 U	0	NC	30	60-117	F1	J- /R/Δ
4,6-Dinitro-2-methylphenol	163	152	93	8	30	59-132		
4-Bromophenyl phenyl ether	81.6	72.8	89	6	30	57-126		
4-Chloro-3-methylphenol	81.6	60.9	75	16	30	58-98		
4-Chloroaniline T	81.6	15.9	20	17	30	51-108	F1	J- /UJ/Δ
4-Chlorophenyl phenyl ether MM	81.6	97.2	119	9	30	60-114	F1	J+ dit/Δ
4-Nitroaniline OO	81.6	0.49 U	0	NC	30	48-135	F1	J- /R/Δ
4-Nitrophenol	163	48.3	30	11	30	11-47		
Acenaphthene	81.6	57.7	71	5	30	58-107		
Acenaphthylene DD	81.6	107	131	14	30	61-106	F1	J+ dit/Δ
Acetophenone	81.6	74.3	91	3	30	54-115		
Anthracene	81.6	72.2	88	7	30	70-118		
Atrazine	163	187	114	7	30	38-146		
Benzaldehyde	163	117	72	2	30	46-111		
Benzo[a]anthracene	81.6	94.6	116	5	30	73-119		
Benzo[a]pyrene	81.6	94.9	116	11	30	76-125		
Benzo[b]fluoranthene	81.6	95.7	117	8	30	78-123		
Benzo[g,h,i]perylene	81.6	95.0	116	9	30	63-133		
Benzo[k]fluoranthene	81.6	84.3	103	13	30	71-126		
Bis(2-chloroethoxy)methane	81.6	75.7	93	12	30	67-104		
Bis(2-chloroethyl)ether	81.6	59.2	73	14	30	63-106		
Bis(2-ethylhexyl) phthalate	81.6	93.8	115	5	30	63-135		

Column to be used to flag recovery and RPD values

FORM III 8270D

FORM III
GC/MS SEMI VOA MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: TestAmerica Edison Job No.: 460-125567-1

SDG No.:

Matrix: Water Level: Low Lab File ID: M236483.D

Lab ID: 460-125567-3 MSD Client ID: CFMW-015-GW MSD

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC	% RPD	QC LIMITS RPD	QC LIMITS REC	#	
Butyl benzyl phthalate	81.6	95.1	116	1	30	66-129		
Caprolactam	163	32.7	20	7	30	10-43		
Carbazole	81.6	72.0	88	0	30	68-121		
Chrysene	81.6	92.4	113	2	30	73-121		
Dibenz(a,h)anthracene	81.6	100	122	8	30	59-136		
Dibenzofuran JJ	81.6	89.7	110	8	30	67-108	F1	J+dit/Δ
Diethyl phthalate	81.6	97.5	119	4	30	61-129		
Dimethyl phthalate	81.6	94.4	116	11	30	65-121		
Di-n-butyl phthalate	81.6	78.5	96	5	30	64-130		
Di-n-octyl phthalate	81.6	96.6	118	9	30	64-131		
Fluoranthene	81.6	81.9	100	8	30	66-123		
Fluorene NN	81.6	101	123	18	30	67-112	F1	J+dit/Δ
Hexachlorobenzene	81.6	84.3	103	15	30	63-125		
Hexachlorobutadiene	81.6	73.0	89	10	30	34-99		
Hexachlorocyclopentadiene X	81.6	87.9	108	11	30	18-99	F1	J+dit/Δ
Hexachloroethane	81.6	69.3	85	8	30	39-92		
Indeno[1,2,3-cd]pyrene	81.6	104	128	9	30	57-142		
Isophorone	81.6	73.9	90	2	30	55-105		
Naphthalene	81.6	69.7	85	9	30	51-98		
Nitrobenzene	81.6	76.0	93	9	30	56-106		
N-Nitrosodi-n-propylamine	81.6	77.5	95	7	30	48-118		
N-Nitrosodiphenylamine	81.6	67.8	83	1	30	69-118		
Pentachlorophenol	163	102	62	16	30	54-120		
Phenanthrene	81.6	79.7	98	10	30	70-117		
Phenol	81.6	27.1	33	10	30	16-43		
Pyrene	81.6	89.0	109	3	30	63-129		

Column to be used to flag recovery and RPD values

FORM III 8270D

LDC #: 37837B2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KL

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	12/13/2016	A	1.6862	1.6862	1.8237	1.8237	18.4	18.4
			S	0.9080	0.9080	1.0152	1.0152	20.0	20.0
			GG	1.4750	1.4750	1.5349	1.5349	6.2	6.2
			UU	0.9379	0.9379	0.9826	0.9826	11.7	11.7
			DDD	0.9307	0.9307	0.9364	0.9364	11.2	11.2
			III	0.9887	0.9887	0.9969	0.9969	6.8	6.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0456	12/19/16	Δ (1st IS)	1.8237	1.852	1.852	1.6	1.6
			S (2nd IS)	1.0152	0.8716	0.8716	14.2	14.2
			GG (3rd IS)	1.5349	1.027	1.027	33.1	33.1
			UU (4th IS)	0.9826	1.005	1.005	2.2	2.2
			DDD (5th IS)	0.9364	0.9239	0.9239	1.3	1.3
			III (6th IS)	0.9969	1.027	1.027	3.0	3.0
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837B2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: RK

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #8

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.53	85	85	0
2-Fluorobiphenyl	↓	9.10	91	91	↓
Terphenyl-d14		10.2	102	102	
Phenol-d5		2.83	28	28	
2-Fluorophenol		4.33	43	43	
2,4,6-Tribromophenol	↓	11.6	116	116	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37837B2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 9 + 10

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	-----	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	80.3	81.6	ND	24.6	27.1	31	31	33	33	10	10
N-Nitroso-di-n-propylamine	↓		ND	72.3	77.5	90	90	95	95	7	7
4-Chloro-3-methylphenol	80.3	↓	ND	51.9	60.9	65	65	75	75	16	16
Acenaphthene	80.3	↓	ND	60.6	57.7	75	75	71	71	5	5
Pentachlorophenol	161	163	↓	87.0	102	54	54	62	62	16	16
Pyrene	80.3		↓	91.6	89.0	114	114	109	109	3	3

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837B2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCSD 460 - 410267

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	21.6	NA	27	27				
N-Nitroso-di-n-propylamine	↓	↓	69.8	↓	87	87				
4-Chloro-3-methylphenol	↓	↓	64.7	↓	81	81				
Acenaphthene	↓	↓	83.6	↓	104	104				
Pentachlorophenol	↓	↓	178	↓	111	111				
Pyrene	↓	↓	92.8	↓	116	116	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837B2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. ICS, A:

Conc. = $\frac{(327145)(8.0)(2)(1000)}{(602896)(\cancel{1.8237}\ 1.6065)(250)}$

=

21.6 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125567-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB17-AQ	460-125567-1	Water	12/15/16
CFMW-010-GWF	460-125567-2F	Water	12/15/16
CFMW-015-GWF	460-125567-3F	Water	12/15/16
CFMW-014-GWF	460-125567-4F	Water	12/15/16
CFMW-019-GWF	460-125567-5F	Water	12/15/16
CFMW-DUP6-GWF	460-125567-7F	Water	12/15/16
CFMW-049-GWF	460-125567-8F	Water	12/15/16
CFMW-049a-GWF	460-125567-9F	Water	12/15/16
CFMW-047-GWF	460-125567-10F	Water	12/15/16
CFMW-050-GWF	460-125567-11F	Water	12/15/16
CFMW-015-GWFMS	460-125567-3FMS	Water	12/15/16
CFMW-015-GWFDUP	460-125567-3FDUP	Water	12/15/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB17-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB17-AQ	12/15/16	Calcium Sodium	232 ug/L 234 ug/L	CFMW-010-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-015-GWFMS, no data were qualified for Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-DUP6-GWF and CFMW-049-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-DUP6-GWF	CFMW-049-GWF			
Barium	278	278	0 (≤30)	-	-
Calcium	47500	47200	1 (≤30)	-	-
Magnesium	15300	15400	1 (≤30)	-	-
Potassium	804	783	3 (≤30)	-	-
Sodium	10200	10200	0 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

LDC #: 37837B4a

SDG #: 460-125567-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/10/17

Page: 1 of 1

Reviewer: SD

2nd Reviewer: KK

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/15/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB= (1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS= (11) = Na 74X
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER=(3)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	FD= (6,7)
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB17-AQ	460-125567-1	Water	12/15/16
2	CFMW-010-GWF	460-125567-2F	Water	12/15/16
3	CFMW-015-GWF	460-125567-3F	Water	12/15/16
4	CFMW-014-GWF	460-125567-4F	Water	12/15/16
5	CFMW-019-GWF	460-125567-5F	Water	12/15/16
6	CFMW-DUP6-GWF	460-125567-7F	Water	12/15/16
7	CFMW-049-GWF	460-125567-8F	Water	12/15/16
8	CFMW-049a-GWF	460-125567-9F	Water	12/15/16
9	CFMW-047-GWF	460-125567-10F	Water	12/15/16
10	CFMW-050-GWF	460-125567-11F	Water	12/15/16
11	CFMW-015-GWFMS A11	460-125567-3FMS	Water	12/15/16
12	CFMW-015-GWFDUP ✓	460-125567-3FDUP	Water	12/15/16
13				
14				
15				

LDC #: 37837B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: KK

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

VALIDATION FINDINGS CHECKLIST

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37857B49

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: JSD
2nd reviewer: KK

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-10		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC:1112		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37837B4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer: KK

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/15/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Sample Identification											
	1	Action Limit	No Qual.										
Ca	232	2320											
Na	234	2340											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 37837B4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: SD
2nd Reviewer: KK

METHOD: Metals (EPA Method 6010B/7000)

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Analyte	Concentration (ug/L)		RPD (≤30)	Qual. (Parent Only)
	6	7		
Barium	278	278	0	
Calcium	47500	47200	1	
Magnesium	15300	15400	1	
Potassium	804	783	3	
Sodium	10200	10200	0	

LDC #: 37835184a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 18:45	ICP/MS (Initial calibration)	Zn	41.72ug/L	40ug/L	104%R	104%R	Y
ICV 13:45	CVAA (Initial calibration)	Hg	5.00ug/L	5ug/L	100%R	100%R	Y
	ICP (Continuing calibration)						
CCV 20:23	ICP/MS (Continuing calibration)	V	50.31ug/L	50ug/L	101%R	101%R	Y
CCV 15:45	CVAA (Contining calibration)	Hg	4.94ug/L	5ug/L	99%R	99%R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

calcic.4sw.wpd

LDC #: 37833B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 18:57	ICP interference check	Ni	193.7 ug/L	200 ug/L	97%R	97%R	Y
LCS 20:06	Laboratory control sample	Al	524 ug/L	500 ug/L	105%R	105%R	
MS 16:04	Matrix spike	Hg	(SSR-SR) 0.966 ug/L	1 ug/L	97%R	97%R	
DUP 20:11	Duplicate	Ba	34.15 ug/L	33.88 ug/L	0.5%RPD	0.5%RPD	
SER 20:20	ICP serial dilution	Na	383995 ug/L	365329 ug/L	5.1%D	5.1%D	

Comments:

TOTCLC.4SW

LDC #: 57835184a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 116.06 ug/L x 2 = 232 ug/L

RD = Raw data concentration RD = 116.06 ug/L
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Ca	232	232	Y
	2	As	6.8	6.8	
	3	Ba	34.0	34.0	
	4	Cr	1.3	1.3	
	5	Co	5.1	5.1	
	6	Mg	15300	15300	
	7	K	783	783	
	8	Na	12000	12000	
	9	Cu	1.4	1.4	
	10	Mn	3.7	3.7	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125567-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB17-AQ	460-125567-1	Water	12/15/16
CFMW-010-GW	460-125567-2	Water	12/15/16
CFMW-015-GW	460-125567-3	Water	12/15/16
CFMW-014-GW	460-125567-4	Water	12/15/16
CFMW-019-GW	460-125567-5	Water	12/15/16
CFMW-DUP6-GW	460-125567-7	Water	12/15/16
CFMW-049-GW	460-125567-8	Water	12/15/16
CFMW-049a-GW	460-125567-9	Water	12/15/16
CFMW-047-GW	460-125567-10	Water	12/15/16
CFMW-050-GW	460-125567-11	Water	12/15/16
CFMW-015-GWMS	460-125567-3MS	Water	12/15/16
CFMW-015-GWMSD	460-125567-3MSD	Water	12/15/16
CFMW-015-GWDUP	460-125567-3DUP	Water	12/15/16
CFMW-050-GWDUP	460-125567-11DUP	Water	12/15/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB17-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB17-AQ	12/15/16	Nitrate/Nitrite as N	109 ug/L	CFMW-010-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-015-GWMS/MSD (CFMW-015-GW CFMW-014-GW CFMW-019-GW CFMW-DUP6-GW CFMW-049-GW CFMW-047-GW CFMW-050-GW)	Chloride	181 (90-110)	78 (90-110)	J (all detects)	A
CFMW-015-GWMS/MSD (CFMW-015-GW CFMW-014-GW)	Fluoride	87 (90-110)	-	J- (all detects)	A
CFMW-015-GWMS/MSD (CFMW-015-GW CFMW-014-GW CFMW-019-GW)	Sulfate	77 (90-110)	89 (90-110)	J- (all detects)	A
CFMW-015-GWMS/MSD (CFMW-010-GW CFMW-015-GW CFMW-014-GW CFMW-019-GW CFMW-DUP6-GW CFMW-049-GW CFMW-049a-GW CFMW-047-GW CFMW-050-GW)	Orthophosphate as P	179 (90-110)	157 (90-110)	NA	-

For CFMW-015-GWMS/MSD, no data were qualified for Cyanide and Ammonia as N percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-015-GWMS/MSD (CFMW-015-GW CFMW-014-GW CFMW-019-GW CFMW-DUP6-GW CFMW-049-GW CFMW-047-GW CFMW-050-GW)	Chloride	68 (≤15)	J (all detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-015-GWDUP (CFMW-010-GW CFMW-015-GW CFMW-014-GW CFMW-019-GW CFMW-DUP6-GW CFMW-049-GW CFMW-049a-GW CFMW-047-GW CFMW-050-GW)	Total suspended solids	6 (≤5)	J (all detects) UJ (all non-detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

Samples CFMW-DUP6-GW and CFMW-049-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-DUP6-GW	CFMW-049-GW			
Total cyanide	84.6 ug/L	82.9 ug/L	2 (≤30)	-	-
Nitrate as N	551 ug/L	568 ug/L	3 (≤30)	-	-
Hardness	200000 ug/L	196000 ug/L	2 (≤30)	-	-
Alkalinity	209000 ug/L	210000 ug/L	0 (≤30)	-	-
Total dissolved solids	230 mg/L	221 mg/L	4 (≤30)	-	-
Fluoride	827 ug/L	834 ug/L	1 (≤30)	-	-
Sulfur	3440 ug/L	3440 ug/L	0 (≤30)	-	-
Chloride	639 ug/L	637 ug/L	0 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and RPD and DUP RPD, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125567-1

Sample	Analyte	Flag	A or P	Reason
CFMW-015-GW CFMW-014-GW CFMW-019-GW CFMW-DUP6-GW CFMW-049-GW CFMW-047-GW CFMW-050-GW	Chloride	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)(RPD)
CFMW-015-GW CFMW-014-GW	Fluoride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R
CFMW-015-GW CFMW-014-GW CFMW-019-GW	Sulfate	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-010-GW CFMW-015-GW CFMW-014-GW CFMW-019-GW CFMW-DUP6-GW CFMW-049-GW CFMW-049a-GW CFMW-047-GW CFMW-050-GW	Total suspended solids	J (all detects) UJ (all non-detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

LDC #: 37837B6

SDG #: 460-125567-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/16/17

Page: 1 of 1

Reviewer: SD

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D) 9

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/15/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = (1)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = (11, 12)
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	SW	FD = (6, 7)
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB17-AQ No TDS & TSS	460-125567-1	Water	12/15/16
2	CFMW-010-GW	460-125567-2	Water	12/15/16
3	CFMW-015-GW	460-125567-3	Water	12/15/16
4	CFMW-014-GW	460-125567-4	Water	12/15/16
5	CFMW-019-GW	460-125567-5	Water	12/15/16
6	CFMW-DUP6-GW	460-125567-7	Water	12/15/16
7	CFMW-049-GW	460-125567-8	Water	12/15/16
8	CFMW-049a-GW	460-125567-9	Water	12/15/16
9	CFMW-047-GW	460-125567-10	Water	12/15/16
10	CFMW-050-GW	460-125567-11	Water	12/15/16
11	CFMW-015-GWMS 300.0 9056 353.2 NH3 CN	460-125567-3MS	Water	12/15/16
12	CFMW-015-GWMSD ↓ ↓ ↓ ↓ ↓	460-125567-3MSD	Water	12/15/16
13	CFMW-015-GWDUP ↓ ↓ TDS, TSS, Hard, Alk	460-125567-3DUP	Water	12/15/16
14	CFMW-050-GWDUP ↓	460-125567-11DUP	Water	12/15/16
15				
16				

LDC #: 37857B6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: KK

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37853R20

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: PF

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37835B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: KP

All circled methods are applicable to each sample.

Sample ID	Parameter
1	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
2-10	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:11-12	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:13	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 TSS Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:14	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37837B6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/15/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	1		No Qualifiers							
NO3/NO2-N	109	1090								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37837B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	11/12	W	Cl	181 (90-110)	78 (90-110)		3-7, 9-10	J/UJ/A (det)
			F	87 (90-110)			3-4	J-/UJ/A (det)
			SO4	77 (90-110)	89 (90-110)		3-5	J-/UJ/A (det)
			OPO4-P	179 (90-110)	157 (90-110)		2-10	J+det/A (nd)
	11/12	W	Cl			68 (≤15)	3-7, 9-10	J/UJ/A (det)

Comments: 11/12: CN, NH3 > 4X

LDC #: 37837B6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤ 35% for soil samples? If no, see qualifications below. A control limit of ±R.L. (±2X R.L. for soil) was used for sample values that were <5X the R.L., including the case when only one of the duplicate sample values was <5X R.L.. If field blanks were used for laboratory duplicates, note in the Overall Assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Difference (Limits)	Associated Samples	Qualifications
		13	W	TSS	6 (≤5)		2-10	J/UJ/A (det/nd)

Comments:

LDC#: 37837B6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: JD
2nd Reviewer: PK

Inorganics, Method See Cover

Analyte	Concentration		RPD (≤30)	Qualification (Parent only)
	6	7		
Total Cyanide	84.6 (ug/L)	82.9 (ug/L)	2	
NO3/NO2-N	551 (ug/L)	568 (ug/L)	3	
Hardness	200000 (ug/L)	196000 (ug/L)	2	
Alkalinity	209000 (ug/L)	210000 (ug/L)	0	
TDS	230 (mg/L)	221 (mg/L)	4	
Fluoride	827 (ug/L)	834 (ug/L)	1	
Sulfate	3440 (ug/L)	3440 (ug/L)	0	
Chloride	639 (ug/L)	637 (ug/L)	0	

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LDC #: 31B3786

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of F was recalculated.Calibration date: 10/26/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	F	s1	0.1	6654	0.9996	0.9990	Y*
		s2	0.2	22153			
		s3	1	148188			
		s4	2	299498			
		s5	3	476835			
		s6	4	645687			
ICV 22:25 Calibration verification	F	Found 1.021mg/L	True 1mg/L		102.1%R	102.1%R	Y
ICV 22:25 Calibration verification	Cl	1.464mg/L	1.5mg/L		97.6%R	97.6%R	↓
ICV 22:25 Calibration verification	SO4	7.16mg/L	7.5mg/L		95.5%R	95.5%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37837B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 12:52	Laboratory control sample	Hardness	276000 ug/L	280000 ug/L	98.6%R	98.6%R	Y
MS 6:34	Matrix spike sample	OPO4-P	(SSR-SR) 4470 ug/L	2500 ug/L	179%R	179%R	
DUP 13:07	Duplicate sample	TDS	1024 mg/L	1020 mg/L	0.4%RPD	0.4%RPD	

Comments:

TOTCLC.6

LDC #: 37387B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: KK

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (5) Alkalinity reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

T = 8.4248 ml
N = 0.0203N
V = 25ml

Recalculation: $\frac{(8.4248\,ml)(0.0203N)(50000)}{25ml} \times \frac{1000ug}{1mg} = 342$

342000 ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	CN	9.1	9.1	Y
	2	NH3	477	477	
	3	NO3/NO2-N	18600	18600	
	4	Hardness	192000	192000	
	5	Alkalinity	342000	342000	
	6	TDS	230mg/L	230mg/L	
	7	NO3/NO2-N	568	568	
	8	TSS	140mg/L	140mg/L	
	9	CN	145	145	
	10	Cl	759	759	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125644-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
Trip Blank	460-125644-4	Water	12/16/16
CFMW-008a-GW	460-125644-5	Water	12/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-125644-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-125644-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-125644-1

No Sample Data Qualified in this SDG

LDC #: 37837C1

SDG #: 460-125644-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/5/17

Page: 1 of 1

Reviewer: P

2nd Reviewer: KK

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² / ICV ≤ 2
IV.	Continuing calibration	A	CCV ≤ 2
V.	Laboratory Blanks	A	
VI.	Field blanks	A	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	Trip Blank	460-125644-4	Water	12/16/16
2	CFMW-008a-GW	460-125644-5	Water	12/16/16
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-411366						

LDC #: 37837c1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: KK

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37837c1

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?				
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37837C1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	12/13/2016	M	0.3005	0.3005	0.3220	0.3220	11.9	11.9
	GCMS8		C	0.2596	0.2596	0.2534	0.2534	3.2	3.2
			CC	1.5000	1.5000	1.5438	1.5438	10.0	10.0
			JJJ	1.4137	1.4137	1.4509	1.4509	9.6	9.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837c1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KL

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	LCV 11:01 J4979)	12/22/16	M (IS1)	0.3220	0.2899	0.2899	10.0	10.0
			C (IS2)	0.2534	0.2459	0.2459	19.4	19.4
			CC (IS3)	1.5438	1.452	1.452	5.9	5.9
			JJJ (IS4)	1.4509	1.426	1.426	1.7	1.7
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37837C1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.5	107	107	0
1,2-Dichloroethane-d4	↓	51.5	103	103	↓
Toluene-d8	↓	50.3	101	101	↓
Bromofluorobenzene	↓	49.2	98	98	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37837c/

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCSD 460-411366

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	19.1	17.3	95	95	86	86	10	10
Trichloroethene			20.1	19.8	100	100	99	99	2	2
Benzene			19.7	18.1	99	99	90	90	9	9
Toluene			19.7	18.5	98	98	93	93	6	6
Chlorobenzene			19.9	19.0	99	99	95	95	4	4

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837c1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #2, V:

Conc. = $\frac{1549\ (50.0)}{(359789)(1.4468)}$

= 0.15 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125644-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-008a-GW	460-125644-5	Water	12/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/20/16 (03:38)	4-Nitrophenol Diethylphthalate Pentachlorophenol Di-n-butylphthalate Butylbenzylphthalate Di-n-octylphthalate Dibenzo(a,h)anthracene	34.4 20.8 22.3 20.5 30.9 22.4 28.7	All samples in SDG 460-125644-1	NA	-
12/20/16 (04:16)	Caprolactam Atrazine	30.9 24.2	All samples in SDG 460-125644-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-410601 (All samples in SDG 460-125644-1)	Butylbenzylphthalate	140 (66-129)	143 (66-129)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-125644-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-125644-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-125644-1

No Sample Data Qualified in this SDG

LDC #: 37837C2a

SDG #: 460-125644-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/5/17

Page: 1 of 1

Reviewer: EJ

2nd Reviewer: PK

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-008a-GW	460-125644-5	Water	12/16/16
2				
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-410601						

LDC #: 37837 C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: KK

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37837C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FQ
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37837C2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
+	12/20/16	CCV14 - N120548	II	34.4		All	J+ det / A all ND
+	0338		LL	20.8			
+			TT	22.3			
+			XX	20.5			
+			ΔΔΔ	30.9			
+			FFF	22.4			
			KKK	28.7			
+	12/20/16	CCV14 - N120549	MMMM	30.9			
+	0416		KKKK	24.2			

LDC #: 37837Cda

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460 -	AAA	140 (66-129)	143 (66-129)	( )	All	J+ det / P ND
	410601		( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37837 C2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms14	12/18/2016	A	1.6419	1.6419	1.6065	1.6065	11.6	11.6
			S	0.9920	0.9920	1.0212	1.0212	18.1	18.1
			DD	1.7689	1.7689	1.7929	1.7929	14.3	14.3
			UU	1.1454	1.1454	1.1488	1.1488	13.8	13.8
			DDD	1.0591	1.0591	1.0303	1.0303	8.3	8.3
			III	1.0427	1.0427	0.8992	0.8992	14.4	14.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837 c2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0338 N120918	12/20/16	A (1st IS)	1.6065	1.687	1.687	5.0	5.0
			S (2nd IS)	1.0212	0.9730	0.9730	4.7	4.7
			DD (3rd IS)	1.7929	1.765	1.765	1.5	1.5
			UU (4th IS)	1.1488	1.119	1.119	2.6	2.6
			DDD (5th IS)	1.0303	1.024	1.024	0.6	0.6
			III (6th IS)	0.8992	1.062	1.062	18.1	18.1
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837 cor

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.84	88	88	0
2-Fluorobiphenyl		8.01	80	80	
Terphenyl-d14		12.4	124	124	
Phenol-d5		2.70	27	27	
2-Fluorophenol		3.93	39	39	
2,4,6-Tribromophenol		10.8	108	108	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37837e2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: 460 - 410601 was 10

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	26.6	22.8	33	33	29	29	15	15
N-Nitroso-di-n-propylamine	↓	↓	73.5	68.2	92	92	85	85	7	7
4-Chloro-3-methylphenol			68.3	63.8	85	85	80	80	7	7
Acenaphthene			78.1	73.8	98	98	92	92	6	6
Pentachlorophenol	160	160	176	173	110	110	108	108	2	2
Pyrene	80.0	80.0	94.8	98.0	119	119	122	122	3	3

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837 C2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #1, EET

Conc. = $\frac{(0.3019)(2)(1000)(\quad)(\quad)}{(\quad)(250)(\quad)(\quad)(\quad)(\quad)}$

= 2.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification
	7059 (X)	= 0.6122 (X) +	0.001519	(X^2)	
	305355				
		X = 0.3019			

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125644-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB18-AQ	460-125644-1	Water	12/16/16
CFMW-059a-GWF	460-125644-2F	Water	12/16/16
CFMW-032a-GWF	460-125644-3F	Water	12/16/16
CFMW-008a-GWF	460-125644-5F	Water	12/16/16
CFMW-008-GWF	460-125644-6F	Water	12/16/16
CFMW-057a-GWF	460-125644-7F	Water	12/16/16
CFMW-059a-GWFMS	460-125644-2FMS	Water	12/16/16
CFMW-059a-GWFDUP	460-125644-2FDUP	Water	12/16/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB18-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB18-AQ	12/16/16	Calcium Sodium	207 ug/L 370 ug/L	CFMW-059a-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-059a-GWF	Sodium	3430 ug/L	3430J+ ug/L

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-059a-GWFMS, no data were qualified for Calcium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125567-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-059a-GWF	Sodium	3430J+ ug/L	A

LDC #: 37837C4a

SDG #: 460-125644-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/16/17

Page: 1 of 1

Reviewer: SD

2nd Reviewer: KK

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/16/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB= (1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS= (1) = Ca 74x
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER= (2)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB18-AQ	460-125644-1	Water	12/16/16
2	CFMW-059a-GWF	460-125644-2F	Water	12/16/16
3	CFMW-032a-GWF	460-125644-3F	Water	12/16/16
4	CFMW-008a-GWF	460-125644-5F	Water	12/16/16
5	CFMW-008-GWF	460-125644-6F	Water	12/16/16
6	CFMW-057a-GWF	460-125644-7F	Water	12/16/16
7	CFMW-059a-GWFMS 6020	460-125644-2FMS	Water	12/16/16
8	CFMW-059a-GWFDUP	460-125644-2FDUP	Water	12/16/16
9				
10				
11				
12				
13				

Notes:

LDC #: 37835K4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: KK

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37837 C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: JD
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37837C49

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: SD
2nd reviewer: FK

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-6		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC 7-8		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37837C4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: SD
2nd Reviewer: KK

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/16/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Sample Identification											
[redacted]	1	Action Limit	2										
Ca	207	2070											
Na	370	3700	3430J+										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37837C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 18:45	ICP/MS (Initial calibration)	Se	41.5 ug/L	40 ug/L	104%R	104%R	Y
ICV 13:22	CVAA (Initial calibration)	Hg	5.08 ug/L	5 ug/L	102%R	102%R	↓
	ICP (Continuing calibration)						
CCV 19:04	ICP/MS (Continuing calibration)	Tl	9.74 ug/L	10 ug/L	97%R	97%R	Y
CCV 14:59	CVAA (Contining calibration)	Hg	4.96 ug/L	5 ug/L	99%R	99%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

LDC #: 37837C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KR

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICSAB 18:57	ICP interference check	Co	189.5 ug/L	200 ug/L	95%R	95%R	Y
LCS 19:14	Laboratory control sample	Be	4.9 ug/L	5 ug/L	98%R	98%R	
MS 19:16	Matrix spike	Cd	(SSR-SR) 10.6 ug/L	10 ug/L	106%R	106%R	
DUP 19:18	Duplicate	Mn	29.88 ug/L	29.83 ug/L	0.5%RPD	0.5%RPD	
SER 19:23	ICP serial dilution	Ca	28063 ug/L	28957 ug/L	3.1%D	3.1%D	

Comments: _____

TOTCLC.4SW

LDC #: 37837C49

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: 3D
2nd reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (2) As were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 1.987 ug/L x 2 ≈ 4.0 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 1.987 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Na	370	370	Y
	2	As	4.0	4.0	↓
	3	Ba	269	269	↓
	4	Ca	431000	431000	↓
	5	Zn	20.4	20.4	↓
	6	K	6500	6500	↓

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125644-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB18-AQ	460-125644-1	Water	12/16/16
CFMW-059a-GW	460-125644-2	Water	12/16/16
CFMW-032a-GW	460-125644-3	Water	12/16/16
CFMW-008a-GW	460-125644-5	Water	12/16/16
CFMW-008-GW	460-125644-6	Water	12/16/16
CFMW-057a-GW	460-125644-7	Water	12/16/16
CFMW-008a-GWMS	460-125644-5MS	Water	12/16/16
CFMW-008a-GWMSD	460-125644-5MSD	Water	12/16/16
CFMW-008a-GWDUP	460-125644-5DUP	Water	12/16/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB18-AQ was identified as an equipment blank. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-008a-GWMS/MSD (CFMW-059a-GW CFMW-032a-GW CFMW-057a-GW)	Chloride	70 (90-110)	56 (90-110)	J (all detects)	A
CFMW-008a-GWMS/MSD (CFMW-059a-GW CFMW-032a-GW CFMW-008a-GW CFMW-008-GW CFMW-057a-GW)	Fluoride Sulfate	69 (90-110) 78 (90-110)	67 (90-110) 84 (90-110)	J (all detects) J (all detects)	A
CFMW-015-GWMS/MSD (CFMW-008a-GW CFMW-008-GW)	Chloride	181 (90-110)	78 (90-110)	J (all detects)	A

MS/MSD percent recoveries were not calculated for Orthophosphate as P due to bad matrix of the samples.

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-015-GWMS/MSD (CFMW-008a-GW CFMW-008-GW)	Chloride	68 (≤15)	J (all detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and RPD, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125644-1

Sample	Analyte	Flag	A or P	Reason
CFMW-059a-GW CFMW-032a-GW CFMW-057a-GW CFMW-008a-GW CFMW-008-GW	Chloride	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-059a-GW CFMW-032a-GW CFMW-008a-GW CFMW-008-GW CFMW-057a-GW	Fluoride Sulfate	J (all detects) J (all detects)	A	Matrix spike/Matrix spike duplicate (%R
CFMW-008a-GW CFMW-008-GW	Chloride	J (all detects)	A	Matrix spike/Matrix spike duplicate (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125644-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125644-1

No Sample Data Qualified in this SDG

LDC #: 37837C6 **VALIDATION COMPLETENESS WORKSHEET** Date: 1/16/17

SDG #: 460-125644-1 Level IV Page: 1 of 1

Laboratory: Test America, Inc. Reviewer: SD

2nd Reviewer: KK

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrate/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/16/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	ND	EB = (1)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = CFMW-015-GW MS/D (SDG: 460-125567-1)
VII.	Duplicate sample analysis	A	DUP = CFMW-015-GWDUP, CFMW-050-GWDUP (SDG: 460-125567-1)
VIII.	Laboratory control samples	A	LCS/D's & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB18-AQ No TDS & TSS	460-125644-1	Water	12/16/16
2	CFMW-059a-GW	460-125644-2	Water	12/16/16
3	CFMW-032a-GW	460-125644-3	Water	12/16/16
4	CFMW-008a-GW	460-125644-5	Water	12/16/16
5	CFMW-008-GW	460-125644-6	Water	12/16/16
6	CFMW-057a-GW	460-125644-7	Water	12/16/16
7	CFMW-008a-GWMS 9056 300.0	460-125644-5MS	Water	12/16/16
8	CFMW-008a-GWMSD	460-125644-5MSD	Water	12/16/16
9	CFMW-008a-GWDUP	460-125644-5DUP	Water	12/16/16
10				
11				
12				
13				
14				

Notes:

LDC #: 37835C60

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: SD
2nd Reviewer: KK

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37835C6

VALIDATION FINDINGS CHECKLIST

Reviewer: SB
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 37873B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: KK

All circled methods are applicable to each sample.

Sample ID	Parameter
1	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
2-6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
DUP-7-9	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37837C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	7/8	W	Cl	70 (90-110)	56 (90-110)		2-3, 6	J-/UJ/A (det)
			F	69 (90-110)	67 (90-110)		2-6	J-/UJ/A (det)
			SO4	78 (90-110)	84 (90-110)		2-6	J-/UJ/A (det)
			OPO4-P	0 (90-110)	0 (90-110)		2-6	Text (MS/D was not calculated due to bad matrix of the sample)
	CFMW-015-GWMS/D (SDG: 460-125567-1)	W	Cl	181 (90-110)	78 (90-110)		4-5	J/UJ/A (det)
	CFMW-015-GWMS/D (SDG: 460-125567-1)	W	Cl			68 (≤15)	4-5	J/UJ/A (det)

Comments:

LDC #: 37835K4

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Reviewer: JD
2nd Reviewer: KK

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of NH_3 was recalculated. Calibration date: 12/22/18

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NH_3	s1	0.0	310810	0.9998	0.9998	Y
		s2	0.1	1330848			
		s3	0.5	4491597			
		s4	1	8582170			
		s5	2	16482093			
		s6	4	31633632			
ICV 10:54 Calibration verification	NH_3	Found 2.115 mg/L	True 2 mg/L		106%R	106%R	
ICV 15:43 Calibration verification	CN	0.207 mg/L	0.2 mg/L		104%R	104%R	
ICV 17:05 Calibration verification	NO_3/NO_2-N	1.009 mg/L	1 mg/L		101%R	101%R	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 31837C60

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 9:34	Laboratory control sample	TSS	82.0 mg/L	84.9 mg/L	96.6%R	96.6%R	Y
MS 20:23	Matrix spike sample	F	(SSR-SR) 692 ug/L	1000 ug/L	69%R	69%R	
DUP 17:05	Duplicate sample	Alkalinity	207.7 mg/L	207.2 mg/L	0.2%RPD	0.2%RPD	

Comments:

TOTCLC.6

LDC #: 37835C60

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: KK

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (2) SO4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{A - (-65849.324)}{86244.1497}$

A = 875257

Recalculation: $\frac{875257 - (-65849.324)}{86244.1497} \times \frac{1000ug}{1mg} \approx 10900$ ug/L

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	2	NH3	103	103	Y
	3	NO3/NO2-N	104	104	
	4	Hardness	1150000	1150000	
	5	Alkalinity	340000	340000	
	6	TDS	1080mg/L	1080mg/L	
	6	TSS	186mg/L	186mg/L	
	2	SO4	10900	10900	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125747-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-044b-GW	460-125747-2	Water	12/19/16
CFMW-023-GW	460-125747-4	Water	12/19/16
Trip Blank	460-125747-6	Water	12/19/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/24/16 (10:56)	Dichlorodifluoromethane Bromomethane 1,1,2-Trichloro-1,2,2-trifluoroethane Methyl cyclohexane	31.8 38.2 29.4 37.4	All samples in SDG 460-125747-1	J (all detects) UJ (all non-detects)	A
12/24/16 (10:56)	Chloromethane	31.7	All samples in SDG 460-125747-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-411827 (All samples in SDG 460-125747-1)	Methyl cyclohexane	-	60 (71-143)	UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD %R, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-125747-1

Sample	Compound	Flag	A or P	Reason
CFMW-044b-GW CFMW-023-GW Trip Blank	Dichlorodifluoromethane Bromomethane 1,1,2-Trichloro-1,2,2-trifluoroethane Methyl cyclohexane	J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-044b-GW CFMW-023-GW Trip Blank	Methyl cyclohexane	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-125747-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-125747-1

No Sample Data Qualified in this SDG

LDC #: 37837D1

SDG #: 460-125747-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/5/17

Page: 1 of 1

Reviewer: EJ

2nd Reviewer: KK

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 3
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-044b-GW	460-125747-2	Water	12/19/16
2	CFMW-023-GW	460-125747-4	Water	12/19/16
3	Trip Blank	460-125747-6	Water	12/19/16
4				
5				
6				
7				
8				

Notes:

	MB 460-411827						

LDC #: 37837D1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: KK

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) > 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 37837D1

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 37837D 1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	12/24/16	CCV08_J4 9900	JJ	31.8		All	J-/UJ/A NP+Det
+	1056		A	31.7			J+det/A NP
-			B	38.2			J-/UJ/A
-			TTT	29.4			
-			TTTT	37.4			

LDC #: 37837D1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCSD 460 -	TTTT	( )	60 (61-145)	( )	All	J-/UJ/P (ND)
	411827		( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 37837D1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100/400 std)	Recalculated (RRF 20/100/400 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	12/13/2016	M	0.3005	0.3005	0.3220	0.3220	11.9	11.9
	GCMS8		C	0.2596	0.2596	0.2534	0.2534	3.2	3.2
			CC	1.5000	1.5000	1.5438	1.5438	10.0	10.0
			JJJ	1.4137	1.4137	1.4509	1.4509	9.6	9.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 10:46	12/24/16	M (IS1)	0.3220	0.2954	0.2954	8.3	8.3
			C (IS2)	0.2534	0.2408	0.2408	5.0	5.0
			CC (IS3)	1.5438	1.575	1.575	2.1	2.1
			JJJ (IS4)	1.4509	1.381	1.381	4.8	4.8
			(IS5)					
2			(IS1)					
			(IS2)					
			(IS3)					
			(IS4)					
			(IS5)					
3								
4								

LDC #: 37837P1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.1	106	106	0
1,2-Dichloroethane-d4	↓	53.3	107	107	↓
Toluene-d8	↓	50.5	101	101	↓
Bromofluorobenzene	↓	47.2	94	94	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 37837D1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS10 460-411827

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	17.4	16.6	87	87	83	83	4	4
Trichloroethene	↓	↓	19.8	19.3	99	99	96	96	3	3
Benzene	↓	↓	20.2	19.6	101	101	98	98	3	3
Toluene	↓	↓	20.3	19.5	102	102	97	97	4	4
Chlorobenzene	↓	↓	20.7	19.9	104	104	100	100	4	4

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837p1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KF

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #1, JJ:

Conc. = ( ) ( ) ( ) / ( ) ( ) ( ) ( )

=

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification
	9347	(50) = 0.2747	(X) - 0.098		
	540083				
		X = JJ =	3.5 ug/L		

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125747-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-044b-GW	460-125747-2	Water	12/19/16
CFMW-023-GW	460-125747-4	Water	12/19/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
12/27/16 (03:57)	Phenol 2,2'-Oxybis(1-chloropropane) Hexachloroethane Pentachlorophenol	23.8 26.7 20.3 22.6	All samples in SDG 460-125747-1	NA	-
12/27/16 (03:57)	Biphenyl Dimethylphthalate Diethylphthalate	23.1 20.8 23.4	All samples in SDG 460-125747-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-411036 (All samples in SDG 460-125747-1)	Bis(2-chloroethyl) ether	62 (63-106)	-	UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD %R, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-125747-1

Sample	Compound	Flag	A or P	Reason
CFMW-044b-GW CFMW-023-GW	Biphenyl Dimethylphthalate Diethylphthalate	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-044b-GW CFMW-023-GW	Bis(2-chloroethyl) ether	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-125747-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-125747-1

No Sample Data Qualified in this SDG

LDC #: 37837D2a

SDG #: 460-125747-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/5/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	US
IX.	Laboratory control samples	SW	LCS/P
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-044b-GW	460-125747-2	Water	12/19/16
2	CFMW-023-GW	460-125747-4	Water	12/19/16
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-411036						

LDC #: 37837D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: KK

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 37837D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: HK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 37837D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 7
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
-	12/22/16	CCV6-M236676	W	20.1		MB 460-411036	J-/UJ/A ND
	1552						
+	12/27/16	CCV6-M23680U	A	23.8		All - MB	J+ all/A All ND
+	0357		H	26.7			↓
+			K	20.3			
-			EEEE	23.1			J-/UJ/A
-			CC	20.8			↓
-			LL	23.4			
+			TT	22.6			J+ all/A

CONCAL.wpd

LDC #: 37837022a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460-411036	B	62 (63-106)	( )	( )	All	J-/UJ/P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		

LDC #: 87837D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL gcms6	12/19/2016	A	1.6139	1.6139	1.7668	1.7668	17.0	17.0
			W	0.6370	0.6370	0.7931	0.7931	19.4	19.4
			DD	1.3223	1.3223	1.5232	1.5232	18.4	18.4
			UU	0.9285	0.9285	0.9853	0.9853	11.7	11.7
			DDD	0.9265	0.9265	0.9709	0.9709	6.3	6.3
			III	1.0091	1.0091	0.9996	0.9996	10.8	10.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 15:52 M236676	12/22/16	A	(1st IS)	1.7668	1.696	1.696	4.0	4.0
			W	(2nd IS)	0.7931	0.6340	0.6340	20.1	20.
			DD	(3rd IS)	1.5232	1.483	1.483	2.6	2.6
			HH	(4th IS)	0.9853	0.9546	0.9546	3.1	3.1
			DDD	(5th IS)	0.9709	0.9240	0.9240	4.8	4.8
			III	(6th IS)	0.9996	1.032	1.032	3.2	3.2
2	CCV 0357 M236800	12/27/16		(1st IS)		2.187	2.187	23.8	23.8
				(2nd IS)		0.7337	0.7337	7.5	7.5
				(3rd IS)		1.364	1.364	10.4	10.4
				(4th IS)		0.8853	0.8853	10.2	10.2
				(5th IS)		1.069	1.065	9.6	9.6
				(6th IS)		1.015	1.015	1.6	1.6
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837D2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.0	90	90	0
2-Fluorobiphenyl		8.70	87	87	
Terphenyl-d14		11.4	114	114	
Phenol-d5		3.15	32	32	
2-Fluorophenol		2.91	29	29	
2,4,6-Tribromophenol		9.60	96	96	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 37837009

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: lab ID 460-411036

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
Phenol	80.0	80.0	21.2	20.7	26	26	26	26	2	2
N-Nitroso-di-n-propylamine	↓	↓	54.6	58.9	68	68	74	74	8	8
4-Chloro-3-methylphenol			55.2	54.4	69	69	68	68	1	1
Acenaphthene			70.2	76.4	88	88	96	96	9	9
Pentachlorophenol	160	160	160	171	100	100	107	107	7	7
Pyrene	80.0	80.0	76.8	70.5	96	96	88	88	9	9

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 37837D2

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KK

2/237

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #1, 34 4: methylphenol

$$\text{Conc.} = \frac{10240\ (8.0)\ (2)\ (1500)}{374285\ (1.3194)(237)}$$

= 1.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125747-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB19-AQ	460-125747-1	Water	12/19/16
CFMW-044b-GWF	460-125747-2F	Water	12/19/16
CFMW-044a-GWF	460-125747-3F	Water	12/19/16
CFMW-023-GWF	460-125747-4F	Water	12/19/16
CFMW-053a-GWF	460-125747-5F	Water	12/19/16
CFMW-044b-GWFMS	460-125747-2FMS	Water	12/19/16
CFMW-044b-GWFDUP	460-125747-2FDUP	Water	12/19/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB19-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB19-AQ	12/19/16	Calcium Sodium	350 ug/L 373 ug/L	CFMW-044b-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125567-1

No Sample Data Qualified in this SDG

LDC #: 37837D4a

SDG #: 460-125747-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/16/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer: KK

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/19/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=(1)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS=(6)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SER=(2)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB19-AQ	460-125747-1	Water	12/19/16
2	CFMW-044b-GWF	460-125747-2F	Water	12/19/16
3	CFMW-044a-GWF	460-125747-3F	Water	12/19/16
4	CFMW-023-GWF	460-125747-4F	Water	12/19/16
5	CFMW-053a-GWF	460-125747-5F	Water	12/19/16
6	CFMW-044b-GWFMS 6020	460-125747-2FMS	Water	12/19/16
7	CFMW-044b-GWFDUP ↓	460-125747-2FDUP	Water	12/19/16
8				
9				
10				
11				
12				
13				

Notes:

LDC #: 31837D4G

VALIDATION FINDINGS CHECKLIST

Reviewer: 3D
2nd Reviewer: KK

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anayized for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

VALIDATION FINDINGS CHECKLIST

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 37883D4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: JD
2nd reviewer: KK

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-5		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
QC:6-7		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37837D4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (EPA Method 200.7/200.8)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/19/16
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Sample Identification										
	1	Action Limit	No Qual.									
Ca	350	3500										
Na	373	3730										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37831D4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 12:18	ICP/MS (Initial calibration)	Sb	39.9 ug/L	40 ug/L	100 %R	100 %R	Y
ICV 13:42	CVAA (Initial calibration)	Hg	4.84 ug/L	5 ug/L	97 %R	97 %R	Y
	ICP (Continuing calibration)						
CCV 13:25	ICP/MS (Continuing calibration)	Pb	51.7 ug/L	50 ug/L	103 %R	103 %R	Y
CCV 15:19	CVAA (Contining calibration)	Hg	4.80 ug/L	5 ug/L	96 %R	96 %R	Y
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

calclc.4sw.wpd

LDC #: 37857046

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 12:30	ICP interference check	Cu	177.8 ug/L	200 ug/L	89%R	89%R	Y
LCS 14:51	Laboratory control sample	Hg	0.935 ug/L	1 ug/L	94%R	94%R	
MS 14:49	Matrix spike	Ni	(SSR-SR) 21.06 ug/L	20 ug/L	105%R	105%R	
DUP 14:51	Duplicate	Na	3904 ug/L	3873 ug/L	0.8%RPD	0.8%RPD	
SER 14:50	ICP serial dilution	Ba	245.8 ug/L	250.3 ug/L	1.8%D	1.8%D	

Comments:

LDC #: 37837D4q

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: KF

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (3) Co were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 0.768ug/L x 2 = 1.5 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 0.768ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Na	373	373	Y
	2	Ba	251	251	
	3	Co	1.5	1.5	
	4	Mg	17700	17700	
	5	Pb	0.89	0.89	

Note:

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125747-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB19-AQ	460-125747-1	Water	12/19/16
CFMW-044b-GW	460-125747-2	Water	12/19/16
CFMW-044a-GW	460-125747-3	Water	12/19/16
CFMW-023-GW	460-125747-4	Water	12/19/16
CFMW-053a-GW	460-125747-5	Water	12/19/16
CFMW-EB19-AQDUP	460-125747-1DUP	Water	12/19/16
CFMW-053a-GWMS	460-125747-5MS	Water	12/19/16
CFMW-053a-GWMSD	460-125747-5MSD	Water	12/19/16
CFMW-053a-GWDUP	460-125747-5DUP	Water	12/19/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB19-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB19-AQ	12/19/16	Chloride	222 ug/L	CFMW-044b-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-053a-GWMS/MSD (CFMW-044b-GW CFMW-044a-GW CFMW-023-GW CFMW-053a-GW)	Orthophosphate as P	114 (90-110)	122 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125747-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125747-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125747-1

No Sample Data Qualified in this SDG

LDC #: 37837D6

SDG #: 460-125747-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/17/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer: KK

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ JD (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/19/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=(1)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D=(7,8)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB19-AQ No TDS & TSS	460-125747-1	Water	12/19/16
2	CFMW-044b-GW	460-125747-2	Water	12/19/16
3	CFMW-044a-GW	460-125747-3	Water	12/19/16
4	CFMW-023-GW	460-125747-4	Water	12/19/16
5	CFMW-053a-GW	460-125747-5	Water	12/19/16
6	CFMW-EB19-AQDUP Alk	460-125747-1DUP	Water	12/19/16
7	CFMW-053a-GWMS OPO4	460-125747-5MS	Water	12/19/16
8	CFMW-053a-GWMSD	460-125747-5MSD	Water	12/19/16
9	CFMW-053a-GWDUP	460-125747-5DUP	Water	12/19/16
10				
11				
12				
13				
14				

Notes:

NO3/NO2-N validated with RO

LDC #: 31835106

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: KK

Method: Inorganics (EPA Method See Cover

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 35837D6

VALIDATION FINDINGS CHECKLIST

Reviewer: JSD
2nd Reviewer: MH

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 35831D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: KK

All circled methods are applicable to each sample.

Sample ID	Parameter
1	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
2-5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC:7-9	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37837D6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: SD
2nd Reviewer: KK

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 12/19/16 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification							
[redacted]	1		No Qualifiers							
Chloride	222	2220								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 37837D6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	7/8	W	OPO4-P	114 (90-110)	122 (90-110)		2-5	J+det/A (nd)

Comments:

LDC #: 38310b

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of SO4 was recalculated. Calibration date: 10/26/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	SO4	s1	0.6	24460	0.9993	0.9990	Y*
		s2	1.5	70939			
		s3	7.5	564588			
		s4	15	1168895			
		s5	22.5	1862291			
		s6	30	2563155			
ICV 22:52 Calibration verification	SO4	Found 7.16mg/L	True 7.5mg/L		95.5%R	95.5%R	Y
ICV 23:10 Calibration verification	ORPO4P	2.39mg/L	2.5mg/L		95.6%R	95.5%R	↓
ICV 13:59 Calibration verification	CN	0.213mg/L	0.2mg/L		107%R	107%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

* Rounding

LDC #: 37835D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 15:20	Laboratory control sample	NH_3	1045 ug/L	1000 ug/L	105%R	104%R	Y*
MS 12:45	Matrix spike sample	OPO4-P	(SSR-SR) 2865 ug/L	2500 ug/L	115%R	114%R	Y*
DUP ND=NC	Duplicate sample	Alkalinity	ND / NC	ND / NC	NC	NC	Y

Comments: * Rounding

TOTCLC.6

LDC #: 37837D6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (3) TDS reported with a positive detect were recalculated and verified using the following equation:

Concentration = $W_1 - W_2$

Recalculation: 65.4731 g/100ml − 65.4516 g/100ml = 0.0215 g/100ml

W_1 = 65.4731 g/100ml
W_2 = 65.4516 g/100ml

$0.0215 \text{ g}/100\text{ml} \times \frac{10(100\text{ml})}{1\text{L}} \times \frac{1000\text{mg}}{1\text{g}} = 215 \text{ mg/L}$

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Cl	222	223	y*
	2	CN	8.2	8.2	y
	3	NO3/NO2-N	1240	1240	
	4	Hardness	234000	234000	
	5	Alkalinity	2020000	2020000	
	2	NH3	207	207	
	3	TDS	215mg/L	215mg/L	
	5	TSS	36.6mg/L	36.6mg/L	↓

Note:

*Rounding

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 24, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125810-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-015-SW	460-125810-1	Water	12/20/16
CFSWP-025-SW	460-125810-2	Water	12/20/16

Samples appended with F were analyzed for dissolved metals

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-125810-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-125810-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-125810-1

No Sample Data Qualified in this SDG

LDC #: 37837E4a

SDG #: 460-125810-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/16/17

Page: 1 of 1

Reviewer: SD

2nd Reviewer: PK

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/20/16
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	N	CS
VIII.	Duplicate sample analysis	N	
IX.	Serial Dilution	N	Not Performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-015-SW	460-125810-1	Water	12/20/16
2	CFSWP-025-SW	460-125810-2	Water	12/20/16
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Notes:

LDC #: 37837E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: KK

Method: Metals (EPA SW 846 Method 6010B/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.			✓	
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 37837E46

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?	✓			
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?			✓	
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 37837E4G

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: JO
2nd reviewer: PK

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-2		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ____

Comments: Mercury by CVAA if performed

LDC #: 37837E4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (See cover)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
ICV 17:26	ICP/MS (Initial calibration)	As	39.4 ug/L	40 ug/L	99%R	98%R	Y*
ICV 13:23	CVAA (Initial calibration)	Hg	5.04 ug/L	5 ug/L	101%R	101%R	Y
	ICP (Continuing calibration)						
CCV 18:45	ICP/MS (Continuing calibration)	Ba	50.3 ug/L	50 ug/L	101%R	101%R	Y
CCV 13:53	CVAA (Contining calibration)	Hg	4.67 ug/L	5 ug/L	93%R	93%R	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments:

LDC #: 37831E4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICS AB 17:38	ICP interference check	Cd	103.3 ug/L	100 ug/L	103%R	103%R	Y
LCS 15:30	Laboratory control sample	Hg	0.880 ug/L	1 ug/L	88%R	88%R	↓
	Matrix spike		(SSR-SR)				
	Duplicate						
	ICP serial dilution						

Comments:

TOTCLC.4SW

LDC #: 37831E49

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for (1) Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

Recalculation: 10.002 ug/L x 2 ≈ 20.0 ug/L

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

RD = 10.002 ug/L
Dil = 2

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Al	20.0	20.0	Y
	2	Na	2880	2880	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: January 18, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-125810-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-015-SW	460-125810-1	Water	12/20/16
CFSWP-025-SW	460-125810-2	Water	12/20/16
CFSWP-025-SWMS	460-125810-2MS	Water	12/20/16
CFSWP-025-SWMSD	460-125810-2MSD	Water	12/20/16
CFSWP-025-SWDUP	460-125810-2DUP	Water	12/20/16

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-025-SWMS/MSD (All samples in SDG 460-125810-1)	Fluoride Sulfate Orthophosphate as P	83 (90-110) 77 (90-110) 67 (90-110)	- 81 (90-110) 70 (90-110)	J- (all detects) UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference materials (SRM) were analyzed as required by the methods. The results were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-125810-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-015-SW CFSWP-025-SW	Fluoride Sulfate Orthophosphate as P	J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-125810-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-125810-1

No Sample Data Qualified in this SDG

LDC #: 37837E6

SDG #: 460-125810-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 1/17/17

Page: 1 of 1

Reviewer: JD

2nd Reviewer: PK

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-~~N~~ 30 (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrate/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D) 9 30

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	12/20/16
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/D = (3,4)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/D & SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID			Lab ID	Matrix	Date
1	CFSWP-015-SW			460-125810-1	Water	12/20/16
2	CFSWP-025-SW			460-125810-2	Water	12/20/16
3	CFSWP-025-SWMS	9056	300.0	460-125810-2MS	Water	12/20/16
4	CFSWP-025-SWMSD	↓	↓	460-125810-2MSD	Water	12/20/16
5	CFSWP-025-SWDUP			460-125810-2DUP	Water	12/20/16
6						
7						
8						
9						
10						
11						
12						
13						

Notes:

NO_3/NO_2-N validated with RD

LDC #: 37837E6

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: SD
2nd Reviewer: KK

Method: Inorganics (EPA Method See Cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			✓	
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 37837E6

VALIDATION FINDINGS CHECKLIST

Reviewer: SD
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 51831 Ey

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: JD
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter
1-2	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 Hardness TSS
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
AC:3-5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 37837E6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Trace metals (EPA SW 846 Method 6010/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
	3/4	W	F	83 (90-110)			All	J-/UJ/A (det)
			SO4	77 (90-110)	81 (90-110)			J-/UJ/A (det)
			OPO4-P	67 (90-110)	70 (90-110)			J-/UJ/A (nd)

Comments:

LDC #: 37837E6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

Method: Inorganics, Method See Cover

The correlation coefficient (r) for the calibration of OPO4-P was recalculated. Calibration date: 10/26/16

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found X 100 / True

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Area	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	OPO4-P	s1	0.2	6401	0.9996	0.9990	Y*
		s2	0.5	34171			
		s3	2.5	226775			
		s4	5	444853			
		s5	7.5	709665			
		s6	10	955401			
ICV 23:10 Calibration verification	OPO4-P	Found 2.39 mg/L	True 2.5 mg/L		95.6%R	95.5%R	Y*
ICV 14:10 Calibration verification	NH3	2.13 mg/L	2 mg/L		107%R	107%R	Y
ICV 13:59 Calibration verification	CN	0.213 mg/L	0.2 mg/L		107%R	107%R	↓

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

*Rounding

LDC #: 37835E60

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: JD
2nd Reviewer: KK

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS 14:14	Laboratory control sample	NH3	1009 ug/L	1000 ug/L	101%R	101%R	Y
MS 00:23	Matrix spike sample	F	(SSR-SR) 830 ug/L	1000 ug/L	83%R	83%R	↓
MSD 00:41	Duplicate sample	SO4	8548 ug/L	8301 ug/L	3%RPD	3%RPD	↓

Comments:

TOTCLC.6

LDC #: 37831E4

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: JD
2nd reviewer: KK

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for (1) Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = $\frac{T \times N \times 50000}{V}$

Recalculation: $\frac{(10.4ml)(0.02N)(50000)}{50ml} \times \frac{1000ug}{1mg} \approx 208000$ ug/L

T = 10.4ml V = 50ml
N = 0.02N

#	Sample ID	Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Acceptable (Y/N)
	1	Hardness	208000	208000	Y
	1	Alkalinity	202000	202000	↓
	2	TDS	243 mg/L	243 mg/L	↓
	2	TSS	3.5 mg/L	3.5 mg/L	↓
	2	F	115	115	↓

Note:

The attached zipped file contains six files:

File	Format	Description	
1) Readme_ColumbiaFalls_012417.doc	MS Word 2003	A "Readme" file (this document).	
	MS Excel 2003	A spreadsheet for the following SDG(s):	
2) 460-125477-1_TestResultsQC_v1.xlsx		460-1254771-1	37837A
3) 460-125567-1_TestResultsQC_v1.xlsx		460-125567-1	37837B
4) 460-125644-1_TestResultsQC_v1.xlsx		460-125644-1	37837C
5) 460-125747-1_TestResultsQC_v1.xlsx		460-125747-1	37837D
6) 460-125810-1_TestResultsQC_v1.xlsx		460-125810-1	37837E

No discrepancies were observed between the hardcopy data packages and the electronic data deliverables during EDD population of validation qualifiers. A 100% verification of the EDD was not performed.

Please contact Christina Rink at (760) 827-1100 if you have any questions regarding this electronic data submittal.

LDC #: 37837

EDD POPULATION COMPLETENESS WORKSHEET

Date: 1/24/17
Page: 1 of 1
2nd Reviewer: BA

The LDC job number listed above was entered by ___

	EDD Process		Comments/Action
I.	EDD Completeness	-	
Ia.	- All methods present?	y	
Ib.	- All samples present/match report?	y	
Ic.	- All reported analytes present?	y	
Id.	- 10% or 100% verification of EDD?	y	
II.	EDD Preparation/Entry	-	
IIa.	- Carryover U/J?	y	
IIb.	- Reason Codes used? If so, note which codes.	N	
IIc.	- Additional Information (QC Level, Validator, Validated Y/N, etc.)	N	
III.	Reasonableness Checks	-	
IIIa.	- Do all qualified ND results have ND qualifier (e.g. UJ)?	y	
IIIb.	- Do all qualified detect results have detect qualifier (e.g. J)?	y	
IIIc.	- If reason codes are used, do all qualified results have reason code field populated, and vice versa?	y	
IIId.	-Does the detect flag require changing for blank qualifier? If so, are all U results marked ND?	y/NA	
IIIe.	- Do blank concentrations in report match EDD where data was qualified due to blank contamination?	y	
IIIf.	- Were any results reported above calibration range? If so, were results qualified appropriately?	N/NA	
IIIg.	-Is the readme complete? If applicable, were edits or discrepancies listed in the readme?	y	

Notes: *see discrepancy sheet

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

April 21, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on March 29, 2017. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #38346:

SDG #	Fraction
460-129850-1, 460-129875-1, 460-129899-1 460-130032-1, 460-130088-1	Volatiles, Semivolatiles, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

EDD

LDC #38346 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		Total CN- (335.4)		Free CN- (9016)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		TDS (2540C)		TSS (2540D)							
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-129850-1	03/29/17	04/19/17	-	-	-	-	5	0	-	-	5	0	5	0	5	0	5	0	3	0	5	0	5	0	-	-	5	0	5	0						
B	460-129875-1	03/29/17	04/19/17	-	-	-	-	6	0	-	-	6	0	6	0	6	0	6	0	5	0	6	0	6	0	6	0	6	0	6	0						
C	460-129899-1	03/29/17	04/19/17	-	-	-	-	4	0	-	-	4	0	4	0	4	0	4	0	-	-	4	0	4	0	-	-	3	0	3	0						
D	460-130032-1	03/29/17	04/19/17	5	0	4	0	1	0	7	0	8	0	8	0	8	0	8	0	5	0	8	0	8	0	8	0	7	0	7	0						
E	460-130088-1	03/29/17	04/19/17	7	0	6	0	1	0	11	0	12	0	12	0	12	0	12	0	8	0	12	0	12	0	12	0	11	0	11	0						
Total	T/CR			12	0	10	0	17	0	18	0	35	0	35	0	35	0	35	0	21	0	35	0	35	0	26	0	32	0	32	0	0	0	0	0	0	378

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 17, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-129850-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-014-SW	460-129850-1	Water	03/13/17
CFSWP-015-SW	460-129850-2	Water	03/13/17
CFSWP-025-SW	460-129850-3	Water	03/13/17
CFSWP-016-SW	460-129850-4	Water	03/13/17
CFSWP-Dup4-SW	460-129850-5	Water	03/13/17
CFSWP-016-SWMS	460-129850-4MS	Water	03/13/17
CFSWP-016-SWDUP	460-129850-4DUP	Water	03/13/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. For CFSWP-016-SWMS, no data were qualified for Calcium and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFSWP-014-SW and CFSWP-Dup4-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-014-SW	CFSWP-Dup4-SW			
Antimony	0.64	0.62	3 (≤30)	-	-
Barium	109	104	5 (≤30)	-	-
Calcium	55800	52800	6 (≤30)	-	-
Chromium	37.7	2.4	176 (≤30)	J (all detects)	A
Copper	2.3	1.4U	49 (≤30)	J (all detects) UJ (all non-detects)	A
Iron	304	51.7	142 (≤30)	J (all detects)	A
Magnesium	13500	12400	8 (≤30)	-	-
Manganese	13.7	9.7	34 (≤30)	J (all detects)	A
Potassium	656	486	30 (≤30)	-	-
Sodium	5530	2490	76 (≤30)	J (all detects)	A

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-129850-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-014-SW CFSWP-Dup4-SW	Chromium Iron Manganese Sodium Copper	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-129850-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-129850-1

No Sample Data Qualified in this SDG

LDC #: 38346A4a

SDG #: 460-129850-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-14-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: PK

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (Ca, Mg - 4x)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 4
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D = 1+5
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-014-SW	460-129850-1	Water	03/13/17
2	CFSWP-015-SW	460-129850-2	Water	03/13/17
3	CFSWP-025-SW	460-129850-3	Water	03/13/17
4	CFSWP-016-SW	460-129850-4	Water	03/13/17
5	CFSWP-Dup4-SW	460-129850-5	Water	03/13/17
6	CFSWP-016-SWMS	460-129850-4MS	Water	03/13/17
7	CFSWP-016-SWDUP	460-129850-4DUP	Water	03/13/17
8				
9				
10				
11				
12				
13	PBW			

Notes:

LDC #: 38346A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KP

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38346A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38346A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→5	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
QC 6, 7	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____

Comments: Mercury by CVAA if performed

LDC#: 38346A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: VK

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	1	5		
Antimony	0.64	0.62	3	
Barium	109	104	5	
Calcium	55800	52800	6	
Chromium	37.7	2.4	176	J/UJ/A (all dets)
Copper	2.3	1.4U	49	J/UJ/A (det & ND)
Iron	304	51.7	142	J/UJ/A (all dets)
Magnesium	13500	12400	8	
Manganese	13.7	9.7	34	J/UJ/A (all dets)
Potassium	656	486	30	
Sodium	5530	2490	76	J/UJ/A (all dets)

V:\FIELD DUPLICATES\FD_inorganic\38346A4a.WPD

LDC #: 38346A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
2327 ICV	ICP/MS (Initial calibration)	Tl	8.18	8.00	102	102	Y
1343 ICV	CVAA (Initial calibration)	Hg	5.1050	5.00	102	102	↓
	ICP (Continuing calibration)						↓
0123 CCV3	ICP/MS (Continuing calibration)	Cu	47.26	50.0	95	95	↓
1458 CCV4	CVAA (Continuing calibration)	Hg	4.8552	5.00	97	97	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
2343 ICSAB	ICP interference check	Zn	91.73 (µg/L)	100 (µg/L)	92	92	Y
0053 LCS	Laboratory control sample	Cd	23.48 (µg/L)	25.0 (µg/L)	94	94	↓
0100 6	Matrix spike	As	(SSR-SR) 46.06 (µg/L)	50.0 (µg/L)	92	92	↓
0106 / 0103 7	Duplicate	Mn	5.58 (µg/L)	6.38 (µg/L)	13	13	↓
0106 / 0113 4	ICP serial dilution	Ca	53675 (µg/L)	56504 (µg/L)	5.3	5.4	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 38346A4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for # 1, Cr were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(18.87\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 37.74\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cr	37.7	37.7	Y
2	2	K	502	502	
3	3	Sb	0.74	0.74	
4	4	Mn	5.6	5.6	
5	5	Ba	104	104	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 18, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-129850-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-014-SW	460-129850-1	Water	03/13/17
CFSWP-015-SW	460-129850-2	Water	03/13/17
CFSWP-025-SW	460-129850-3	Water	03/13/17
CFSWP-016-SW	460-129850-4	Water	03/13/17
CFSWP-Dup4-SW	460-129850-5	Water	03/13/17
CFSWP-014-SWMS	460-129850-1MS	Water	03/13/17
CFSWP-014-SWMSD	460-129850-1MSD	Water	03/13/17
CFSWP-016-SWMS	460-129850-4MS	Water	03/13/17
CFSWP-016-SWMSD	460-129850-4MSD	Water	03/13/17
CFSWP-016-SWDUP	460-129850-4DUP	Water	03/13/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-016-SWMS/MSD (All samples in SDG 460-129850-1)	Sulfate Chloride	122 (90-110) 123 (90-110)	125 (90-110) 133 (90-110)	J+ (all detects) J+ (all detects)	A
CFSWP-016-SWMS/MSD (All samples in SDG 460-129850-1)	Ammonia as N	112 (90-110)	-	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
CFSWP-016-SWDUP (All samples in SDG 460-129850-1)	Total suspended solids	-	14.2 mg/L (≤1.0)	J (all detects) UJ (all non-detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFSWP-014-SW and CFSWP-Dup4-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFSWP-014-SW	CFSWP-Dup4-SW			
Alkalinity	203000 ug/L	205000 ug/L	1 (≤30)	-	-
Chloride	3060 ug/L	3080 ug/L	1 (≤30)	-	-
Fluoride	126 ug/L	134 ug/L	6 (≤30)	-	-
Hardness	200000 ug/L	202000 ug/L	1 (≤30)	-	-
Nitrate/Nitrite as N	244 ug/L	251 ug/L	3 (≤30)	-	-
Sulfate	3320 ug/L	3780 ug/L	13 (≤30)	-	-
Total dissolved solids	223 mg/L	180 mg/L	21 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-129850-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-014-SW CFSWP-015-SW CFSWP-025-SW CFSWP-016-SW CFSWP-Dup4-SW	Sulfate Chloride	J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-014-SW CFSWP-015-SW CFSWP-025-SW CFSWP-016-SW CFSWP-Dup4-SW	Total suspended solids	J (all detects) UJ (all non-detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-129850-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-129850-1

No Sample Data Qualified in this SDG

LDC #: 38346A6

SDG #: 460-129850-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-14-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	SW	D= 1+5
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-014-SW	460-129850-1	Water	03/13/17
2	CFSWP-015-SW	460-129850-2	Water	03/13/17
3	CFSWP-025-SW	460-129850-3	Water	03/13/17
4	CFSWP-016-SW	460-129850-4	Water	03/13/17
5	CFSWP-Dup4-SW	460-129850-5	Water	03/13/17
6	CFSWP-014-SWMS	460-129850-1MS	Water	03/13/17
7	CFSWP-014-SWMSD	460-129850-1MSD	Water	03/13/17
8	CFSWP-016-SWMS	460-129850-4MS	Water	03/13/17
9	CFSWP-016-SWMSD	460-129850-4MSD	Water	03/13/17
10	CFSWP-016-SWDUP	460-129850-4DUP	Water	03/13/17
11				
12				
13				
14	PBW			

Notes:

LDC #: 38346A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.			✓	
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38346A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38346A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1, 2, 5	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN Hard TSS
3, 4	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
QC 6, 7	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN
8, 9	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38346A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	8/9	water	SO_4	122 (90-110)	125 (90-110)		all	J+ dets/A (all dets)
	↓	↓	Cl	123 (↓)	133 (↓)		↓	(↓)
	↓	↓	NH_3-N	112 (↓)			↓	↓ (all N.D.)

Comments:

MSD.6

LDC #: 38346A6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	difference RPD (Limits)	Associated Samples	Qualifications
1		10	water	TSS	14.2 mg/L (≤1.0)	all	J/UJ/A (det & ND)

Comments:

DUP.6

LDC#: 38346A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	1	6		
Alkalinity	203000	205000	1	
Chloride	3060	3080	1	
Fluoride	126	134	6	
Hardness	200000	202000	1	
Nitrate/Nitrite as N	244	251	3	
Sulfate	3320	3780	13	
TDS (mg/L)	223	180	21	

V:\FIELD DUPLICATES\FD_inorganic\38346A6.WPD

LDC #: 38346A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of NH_3-N was recalculated. Calibration date: 3-21-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	NH_3-N	Blank	0.0 (mg/L)	106202	r=0.9998	r=0.9998	Y
		Standard 1	0.1 ( )	1101638			
		Standard 2	0.5 ( )	4576621			
		Standard 3	1.0 ( )	8816083			
		Standard 4	2.0 ( )	17294094			
		Standard 5	4.0 ( )	33235796			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Total CN	1141 CCV	0.203 (mg/L)	0.200 (mg/L)	102	102	
Calibration verification	NO_3/NO_2-N	1017 ICV	1.037 (mg/L)	1.00 (mg/L)	104	104	
Calibration verification	F	1104 CCV	1.01 (mg/L)	1.00 (mg/L)	1 % D	0.9 %D	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
SRM	Laboratory control sample	Hardness	560000 (µg/L)	560000 (µg/L)	100.0	100.0	Y
8	Matrix spike sample	Total CN	(SSR-SR) 209 (µg/L)	200 (µg/L)	104	105	↓
10	Duplicate sample	TSS	19.0 (mg/L)	4.80 (mg/L)	119	119	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38346A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$\text{Hardness} = \frac{(10.0\ \text{ml})(0.020\ \text{N})(50000)(1000\ \mu g/mg)}{50\ \text{ml}} = 200000\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Hardness	200000	200000	Y
2	2	NO_3/NO_2-N	273	273	
3	3	SO_4	3250	3250	
4	4	TSS	19.0 (mg/L)	19.0 (mg/L)	
	↓	TDS	204 (↓)	204 (↓)	
5	5	Alk	205000	205000	

Note: methods 335.4, 350.1, and 9016 are N.D. for all samples

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 18, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-129875-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-003-SW	460-129875-1	Water	03/16/17
CFSWP-004-SW	460-129875-2	Water	03/16/17
CFSWP-005-SW	460-129875-3	Water	03/16/17
CFSWP-006-SW	460-129875-4	Water	03/16/17
CFSWP-007-SW	460-129875-5	Water	03/16/17
CFSWP-020-SW	460-129875-6	Water	03/16/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-129875-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-129875-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-129875-1

No Sample Data Qualified in this SDG

LDC #: 38346B4a

SDG #: 460-129875-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-17-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: EW

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	N	client specified
VIII.	Duplicate sample analysis	N	" "
IX.	Serial Dilution	N	not performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-003-SW	460-129875-1	Water	03/16/17
2	CFSWP-004-SW	460-129875-2	Water	03/16/17
3	CFSWP-005-SW	460-129875-3	Water	03/16/17
4	CFSWP-006-SW	460-129875-4	Water	03/16/17
5	CFSWP-007-SW	460-129875-5	Water	03/16/17
6	CFSWP-020-SW	460-129875-6	Water	03/16/17
7				
8				
9				
10				
11				
12				
13	PBW			

Notes:

LDC #: 38346B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.			✓	
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38346B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38346B4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: KH

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→6	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38346B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
2333 ICV	ICP/MS (Initial calibration)	Mg	4179.09	4000	104	104	Y
1345 ICV	CVAA (Initial calibration)	Hg	4.8050	5.00	96	96	
	ICP (Continuing calibration)						
0125 CCV3	ICP/MS (Continuing calibration)	Ni	46.81	50.0	94	94	
1415 CCV2	CVAA (Continuing calibration)	Hg	4.9359	5.00	99	99	
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
2349 ICSAB	ICP interference check	Se	101.8 (µg/L)	100 (µg/L)	102	102	Y
0012 LCS	Laboratory control sample	Ag	22.64 (µg/L)	25.0 (µg/L)	91	91	↓
–	Matrix spike	–	(SSR-SR) –	–	–	–	–
–	Duplicate	–	–	–	–	–	–
–	ICP serial dilution	–	–	–	–	–	–

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346B4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: AK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Mn were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(12.82\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 25.64\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Mn	25.6	25.6	Y
2	2	Al	625	625	
3	3	Pb	0.41	0.42	
4	4	V	1.9	1.9	
5	5	As	0.84	0.84	
6	6	Fe	43.1	43.1	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 18, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-129875-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-003-SW	460-129875-1	Water	03/16/17
CFSWP-004-SW	460-129875-2	Water	03/16/17
CFSWP-005-SW	460-129875-3	Water	03/16/17
CFSWP-006-SW	460-129875-4	Water	03/16/17
CFSWP-007-SW	460-129875-5	Water	03/16/17
CFSWP-020-SW	460-129875-6	Water	03/16/17
CFSWP-003-SWMS	460-129875-1MS	Water	03/16/17
CFSWP-003-SWMSD	460-129875-1MSD	Water	03/16/17
CFSWP-020-SWMS	460-129875-6MS	Water	03/16/17
CFSWP-020-SWMSD	460-129875-6MSD	Water	03/16/17
CFSWP-020-SWDUP	460-129875-6DUP	Water	03/16/17
CFSWP-020-SWREMS	460-129875-6REMS	Water	03/16/17
CFSWP-020-SWREMSD	460-129875-6REMSD	Water	03/16/17
CFSWP-020-SWREDUP	460-129875-6REDUP	Water	03/16/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-020-SWMS/MSD (All samples in SDG 460-129875-1)	Fluoride	84 (90-110)	118 (90-110)	J (all detects)	A
CFSWP-020-SWMS/MSD (All samples in SDG 460-129875-1)	Sulfate	117 (90-110)	150 (90-110)	J+ (all detects)	A
CFSWP-020-SWMS/MSD (All samples in SDG 460-129875-1)	Orthophosphate as P	84 (90-110)	-	UJ (all non-detects)	A
CFSWP-020-SWREMS/MSD (All samples in SDG 460-129875-1)	Chloride	134 (90-110)	122 (90-110)	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFSWP-020-SWMS/MSD (All samples in SDG 460-129875-1)	Fluoride Sulfate	25 (≤15) 17 (≤15)	J (all detects) J (all detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and RPD, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-129875-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW CFSWP-007-SW CFSWP-020-SW	Fluoride	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW CFSWP-007-SW CFSWP-020-SW	Sulfate Chloride	J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW CFSWP-007-SW CFSWP-020-SW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW CFSWP-007-SW CFSWP-020-SW	Fluoride Sulfate	J (all detects) J (all detects)	A	Matrix spike/Matrix spike duplicate (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-129875-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-129875-1

No Sample Data Qualified in this SDG

LDC #: 38346B6

SDG #: 460-129875-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-17-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: KA

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-129850-1 / 460-129899-1)
VII.	Duplicate sample analysis	A	DUP (↓)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-003-SW	460-129875-1	Water	03/16/17
2	CFSWP-004-SW	460-129875-2	Water	03/16/17
3	CFSWP-005-SW	460-129875-3	Water	03/16/17
4	CFSWP-006-SW	460-129875-4	Water	03/16/17
5	CFSWP-007-SW	460-129875-5	Water	03/16/17
6	CFSWP-020-SW	460-129875-6	Water	03/16/17
7	CFSWP-003-SWMS	460-129875-1MS	Water	03/16/17
8	CFSWP-003-SWMSD	460-129875-1MSD	Water	03/16/17
9	CFSWP-020-SWMS	460-129875-6MS	Water	03/16/17
10	CFSWP-020-SWMSD	460-129875-6MSD	Water	03/16/17
11	CFSWP-020-SWDUP	460-129875-6DUP	Water	03/16/17
12	CFSWP-020-SW REMS	REMS		
13	CFSWP-020-SW REMSD	REMSD		
14	CFSWP-020-SW RE DUP	REDUP		

Notes: PBW

LDC #: 38346B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38346B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KV

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38346B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→4, 6	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN Hard TSS
5	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ Hard TSS
WC 7, 8	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
9→11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
12→14	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____

Comments:

LDC #: 38346B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	9/10	water	F	84 (90-110)	118 (90-110)		all	J/UJ/A (all dets)
			SO4	117 ( )	150 ( )			J+ dets/A ( )
			PO4-P	84 ( )				J-/UJ/A (all ND)
			F			25 (≤15)		J/UJ/A (all dets)
			SO4			17 ( )		( )
2	12/13		Cl	134 ( )	122 ( )			J+ dets/A ( )
			SO4	124 ( )	121 ( )		* none	No Qual.

Comments: * This analytical batch was analyzed for Cl only

LDC #: 38346B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KR

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Free CN was recalculated. Calibration date: 3-22-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Abs. True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Free CN	Blank	0 (µg/L)	0.0	r^2 = 1.000	r^2 = 1.000	Y
		Standard 1	2 ( )	0.007			
		Standard 2	5 ( )	0.013			
		Standard 3	10 ( )	0.023			
		Standard 4	25 ( )	0.057			
		Standard 5	50 ( )	0.112			
		Standard 6	150 ( )	0.324			
		Standard 7	–	–			
Calibration verification	NH_3-N	1125 CCV 1	2.02 (mg/L)	2.00 (mg/L)	101	101	
Calibration verification	NO_3/NO_2-N	1543 CCV1	1.00 (mg/L)	1.00 (mg/L)	100	100	
Calibration verification	Cl	1612 CCV2	1.50 (mg/L)	1.50 (mg/L)	0.0 %D	0.2 %D	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KF

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1155 SRM (LCS)	Laboratory control sample	Alk	85113 (µg/L)	81200 (µg/L)	104.8	104.8	Y
0211 9	Matrix spike sample	PO_4-P	(SSR-SR) 2110 (µg/L)	2500 (µg/L)	84	84	↓
~~1330~~ / 0001 / 0155 11	Duplicate sample	SO_4	4490 (µg/L)	4320 (µg/L)	4	4	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38346B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Total CN reported with a positive detect were recalculated and verified using the following equation:

Concentration =
$Y = mx + b$
where
$m = 0.0220$
$b = -1.02e-03$
dil = 1x

Recalculation:
$CN\ mg/L = 0.0220(0.396) - 0.00102$
$= 0.007692$
then $(0.007692\ mg/L)(1000\ \mu g/mg) = 7.692\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Total Cyanide	7.7	7.7	Y
	↓	Hardness	88000	88000	
2	2	TSS	22.7 (mg/L)	22.7 (mg/L)	
	↓	TDS	116 (↓)	116 (↓)	
3	3	Free Cyanide	8.0	8.0	
	↓	Alkalinity	112000	112000	
4	4	Cl	804	804	
5	5	NO_3/NO_2-N	127	128	
6	6	NH_3-N	82.4	82.4	↓

Note: method 9056A is N.D. for all samples

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 18, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-129899-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-021-SW	460-129899-1	Water	03/15/17
CFSWP-010-SW	460-129899-2	Water	03/15/17
CFSWP-013-SW	460-129899-3	Water	03/15/17
CFSWP-FB3-AQ	460-129899-4	Water	03/15/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFSWP-FB3-AQ was identified as a field blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-129899-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-129899-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-129899-1

No Sample Data Qualified in this SDG

LDC #: 38346C4a

SDG #: 460-129899-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-17-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: PK

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks MG ND	~~SW~~	FB = 4 (< RL)
VII.	Matrix Spike/Matrix Spike Duplicates	N	client specified
VIII.	Duplicate sample analysis	N	" "
IX.	Serial Dilution	N	not performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

		Client ID	Lab ID	Matrix	Date
1	1	CFSWP-021-SW	460-129899-1	Water	03/15/17
2	2	CFSWP-010-SW	460-129899-2	Water	03/15/17
3	2	CFSWP-013-SW	460-129899-3	Water	03/15/17
4	2	CFSWP-FB3-AQ	460-129899-4	Water	03/15/17
5					
6					
7					
8					
9					
10					
11					
12	1	PBW1			
13	2	PBW2			

Notes:

LDC #: 38346C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.			✓	
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.			✓	
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38346C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: PH

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	~~✓~~	✓		

MH

LDC #: 38346C4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: PR

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 4	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38346C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
2333 ICV	ICP/MS (Initial calibration)	Cr	40.88	40.0	102	102	Y
1345 ICV	CVAA (Initial calibration)	Hg	4.8050	5.00	96	96	↓
	ICP (Continuing calibration)						↓
0125 CCV3	ICP/MS (Continuing calibration)	Sb	49.51	50.0	99	99	↓
1415 CCV2	CVAA (Continuing calibration)	Hg	4.9359	5.00	99	99	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
2349 ICSAB	ICP interference check	Mn	189.9 (µg/L)	200 (µg/L)	95	95	Y
0012 LCS	Laboratory control sample	Be	23.04 (µg/L)	25.0 (µg/L)	92	92	↓
–	Matrix spike	–	(SSR-SR) –	–	–	–	–
–	Duplicate	–	–	–	–	–	–
–	ICP serial dilution	–	–	–	–	–	–

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346C4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Ba were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(44.35\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 88.70\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Ba	88.7	88.7	Y
2	2	Cu	1.5	1.5	↓
3	3	As	2.2	2.2	↓
4	4	Sb	0.69	0.68	↓

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-129899-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-021-SW	460-129899-1	Water	03/15/17
CFSWP-010-SW	460-129899-2	Water	03/15/17
CFSWP-013-SW	460-129899-3	Water	03/15/17
CFSWP-FB3-AQ	460-129899-4	Water	03/15/17
CFSWP-FB3-AQMS	460-129899-4MS	Water	03/15/17
CFSWP-FB3-AQMSD	460-129899-4MSD	Water	03/15/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFSWP-FB3-AQ was identified as a field blank. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-020-SWMS/MSD (CFSWP-021-SW CFSWP-010-SW CFSWP-013-SW)	Chloride	134 (90-110)	122 (90-110)	J+ (all detects)	A
CFSWP-020-SWMS/MSD (CFSWP-FB3-AQ)	Chloride	134 (90-110)	122 (90-110)	NA	-
CFSWP-020-SWMS/MSD (CFSWP-010-SW CFSWP-013-SW)	Sulfate	124 (90-110)	121 (90-110)	J+ (all detects)	A
CFSWP-020-SWMS/MSD (CFSWP-021-SW CFSWP-FB3-AQ)	Sulfate	124 (90-110)	121 (90-110)	NA	-
CFSWP-016-SWMS/MSD (CFSWP-021-SW)	Sulfate	122 (90-110)	125 (90-110)	J+ (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-016-SWMS/MSD (CFSWP-021-SW CFSWP-010-SW CFSWP-013-SW CFSWP-FB3-AQ)	Ammonia as N	112 (90-110)	-	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-129899-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-021-SW CFSWP-010-SW CFSWP-013-SW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-010-SW CFSWP-013-SW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-021-SW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-129899-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-129899-1

No Sample Data Qualified in this SDG

LDC #: 38346C6

SDG #: 460-129899-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-17-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: KC

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	ND	FB = 4 (< RL)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-129850-1, 460-129875-1)
VII.	Duplicate sample analysis	A	DUP (↓ ↓)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-021-SW	460-129899-1	Water	03/15/17
2	CFSWP-010-SW	460-129899-2	Water	03/15/17
3	CFSWP-013-SW	460-129899-3	Water	03/15/17
4	CFSWP-FB3-AQ	460-129899-4	Water	03/15/17
5	CFSWP-FB3-AQMS	460-129899-4MS	Water	03/15/17
6	CFSWP-FB3-AQMSD	460-129899-4MSD	Water	03/15/17
7				
8				
9				
10				
11				
12				
13	PBW1			
14	PBW2			

Notes:

LDC #: 38346C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KV

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38346C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors epplicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 38346C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: VV

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→3	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
4	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
QC 5,6	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38346C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KR

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	CFSWP-020-S	W water	Cl	134(90-110)	122(90-110)		1→4	J+ dets / A (det in 1→3)
	MS/MSD	↓	SO4	124(↓)	121(↓)		2→4	↓ (det in 2,3)
2	CFSWP-016-SW	↓	SO4	122(↓)	125(↓)		1	↓ (det)
	MS/MSD	↓	NH3-N	112(↓)			1→4	↓ (all N.D.)

Comments:

MSD.6

LDC #: 38346C6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Cl was recalculated. Calibration date: 3-7-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Cl	Blank	–	–	$r^2 = 0.9982$	$r^2 = 0.9980$	Y
		Standard 1	0.12 (mg/L)	7688			
		Standard 2	0.30 ( )	24717			
		Standard 3	1.50 ( )	109480			
		Standard 4	3.00 ( )	221229			
		Standard 5	4.50 ( )	363203			
		Standard 6	6.00 ( )	474531			
		Standard 7	–	–			
Calibration verification	NO_3/NO_2-N	1526 ICV	1.010 (mg/L)	1.00 (mg/L)	101	101	
Calibration verification	Total CN	1307 CCV1	0.199 (mg/L)	0.200 (mg/L)	100	100	
Calibration verification	NH_3-N	1221 CCV2	1.99 (mg/L)	2.00 (mg/L)	100	99	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346C6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1152 LCS	Laboratory control sample	NH_3-N	961.1 (µg/L)	1000 (µg/L)	96	96	Y
1316 5	Matrix spike sample	Total CN	(SSR-SR) 206 (µg/L)	200 (µg/L)	103	103	↓
1324/1324 CFSWP-016-	Duplicate sample SWDUP	Hardness	(µg/L) 202000	(µg/L) 202000	0	0	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38346C6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: MD

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Alkalinity reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$Alk\ mg/L = \frac{(4.912\ ml)(0.021\ N)(50000)}{25\ ml} = 206.3\ mg/L$$

then $(206.3\ mg/L)(1000\ \mu g/mg) = 206300\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Alkalinity	206000	206000	Y
		Hardness	204000	204000	
2	2	NO3/NO2-N	216	216	
		TDS	139 (mg/L)	139 (mg/L)	
3	3	TSS	2.0 (mg/L)	2.0 (mg/L)	
4	4	Cl	101	101	

Note: methods 335.4 and 350.1 are N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 11, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130032-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-25B-GW	460-130032-4	Water	03/20/17
CFMW-026-GW	460-130032-6	Water	03/20/17
CFMW-028-GW	460-130032-7	Water	03/20/17
CFMW-043-GW	460-130032-8	Water	03/20/17
Trip Blank	460-130032-9	Water	03/20/17
CFMW-043-GWMS	460-130032-8MS	Water	03/20/17
CFMW-043-GWMSD	460-130032-8MSD	Water	03/20/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/20/17	Chloromethane Bromomethane Chloroethane 1,2-Dibromo-3-chloropropane	22.0 21.4 27.0 23.2	All samples in SDG 460-130032-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/22/17	Dichlorodifluoromethane Cyclohexane Methylcyclohexane	29.8 20.2 26.2	All samples in SDG 460-130032-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130032-1

Sample	Compound	Flag	A or P	Reason
CFMW-25B-GW CFMW-026-GW CFMW-028-GW CFMW-043-GW Trip Blank	Chloromethane Bromomethane Chloroethane 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-25B-GW CFMW-026-GW CFMW-028-GW CFMW-043-GW Trip Blank	Dichlorodifluoromethane Cyclohexane Methylcyclohexane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

LDC #: 38346D1

SDG #: 460-130032-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/09/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 5
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-25B-GW	460-130032-4	Water	03/20/17
2	CFMW-026-GW	460-130032-6	Water	03/20/17
3	CFMW-028-GW	460-130032-7	Water	03/20/17
4	CFMW-043-GW	460-130032-8	Water	03/20/17
5	Trip Blank	460-130032-9	Water	03/20/17
6	CFMW-043-GWMS	460-130032-8MS	Water	03/20/17
7	CFMW-043-GWMSD	460-130032-8MSD	Water	03/20/17
8				
9				

Notes:

	MB 460-425813						

LDC #: 38346D1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) > 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 38 346 D1

VALIDATION FINDINGS CHECKLIST

Reviewer:
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38346D1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
-	3/20/17	ICV	A	22.0	All	J/UJ/A all ND
-	1725		B	21.4		
-			D	27.0		
-			MM	23.2		

ICVvoa.wpd

LDC #: 38346D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	3/22/17	CCV	JJ	29.8		All	J-/UJ/A all ND
-	1957		SSSS	20.2		↓	↓
-			TTTT	26.2			

CONCAL.wpd

LDC #: 38346D1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/000 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/20/2017	M	0.2432	0.2432	0.2564	0.2564	9.3	9.3
	GCMS2		C	0.4675	0.4675	0.4744	0.4744	13.1	13.1
			CC	1.8638	1.8638	1.9012	1.9012	12.1	12.1
			JJJ	1.3970	1.3970	1.3775	1.3775	4.6	4.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 19:57	3/22/17	M (1st internal standard)	0.2564	0.2314	0.2314	9.8	9.8
			C (2nd internal standard)	0.4744	0.3999	0.3999	15.7	15.7
			CC (3rd internal standard)	1.9012	1.889	1.889	0.7	0.7
			WJ (4th internal standard)	1.3775	1.365	1.365	0.9	0.9
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	51.2	102	102	0
1,2-Dichloroethane-d4	↓	49.9	100	100	↓
Toluene-d8	↓	48.7	97	97	↓
Bromofluorobenzene	↓	51.8	104	104	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38346 P1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 6 + 7

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	ND	17.9	19.0	90	90	95	95	6	6
Trichloroethene	↓	↓	↓	19.6	18.4	98	98	92	92	6	6
Benzene	↓	↓	↓	20.0	21.2	100	100	106	106	6	6
Toluene	↓	↓	↓	19.3	19.4	97	97	97	97	1	1
Chlorobenzene	↓	↓	↓	19.4	20.2	97	97	101	101	4	4

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-425813

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	21.4	NA	107	107				
Trichloroethene			20.9		105	105				
Benzene			22.8		114	114				
Toluene			21.2		106	106				
Chlorobenzene			21.8		109	109	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D/

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-425813 cc

Conc. = $\frac{303516\ (50)}{376051\ (\cancel{0.4744})\ F7\ 1.9012}$

= 21.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 11, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130032-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-25B-GW	460-130032-4	Water	03/20/17
CFMW-026-GW	460-130032-6	Water	03/20/17
CFMW-028-GW	460-130032-7	Water	03/20/17
CFMW-043-GW	460-130032-8	Water	03/20/17
CFMW-043-GWMS	460-130032-8MS	Water	03/20/17
CFMW-043-GWMSD	460-130032-8MSD	Water	03/20/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/23/17	Indeno(1,2,3-cd)pyrene	22.7	CFMW-25B-GW CFMW-026-GW CFMW-028-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

LDC #: 38346D2a

SDG #: 460-130032-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/10/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-25B-GW	460-130032-4	Water	03/20/17
2	CFMW-026-GW	460-130032-6	Water	03/20/17
3	CFMW-028-GW	460-130032-7	Water	03/20/17
4	CFMW-043-GW	460-130032-8	Water	03/20/17
5	CFMW-043-GWMS	460-130032-8MS	Water	03/20/17
6	CFMW-043-GWMSD	460-130032-8MSD	Water	03/20/17
7				
8				
9				

Notes:

	MB 460-425785						

LDC #: 38346D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?			✓	
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38346D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38346D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	3/23/17 1449	CCV	JJJ	22.7		1→3	J+UJ/A (ND)

LDC #: 38346D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	3/22/2017	A	1.7541	1.7541	2.0032	2.0032	8.0	8.0
			S	0.8427	0.8427	0.9561	0.9561	12.1	12.1
			GG	1.2648	1.2648	1.3931	1.3931	10.1	10.1
			UU	0.9899	0.9899	1.1288	1.1288	6.9	6.9
			DDD	0.9245	0.9245	1.0588	1.0588	6.2	6.2
			III	1.0808	1.0808	1.0963	1.0963	6.3	6.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0044	3/23/17	A (1st IS)	2.0032	1.807	1.807	9.8	9.8
			S (2nd IS)	0.9561	0.9181	0.9181	4.0	4.0
			GG (3rd IS)	1.3931	1.242	1.242	10.8	10.8
			NN (4th IS)	1.1288	1.026	1.026	9.1	9.1
			PPD (5th IS)	1.0588	1.002	1.002	5.4	5.4
			III (6th IS)	1.0963	1.081	1.081	1.4	1.4
2	CCV 1449	3/23/17	(1st IS)		1.954	1.954	2.5	2.5
			(2nd IS)		0.8650	0.8650	9.5	9.5
			(3rd IS)		1.311	1.311	5.9	5.9
			(4th IS)		0.995	0.995	11.8	11.8
			(5th IS)		0.996	0.996	5.9	5.9
			(6th IS)		1.096	1.096	0.0	0.0
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346Dda

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.50	95	95	0
2-Fluorobiphenyl	↓	8.47	85	85	↓
Terphenyl-d14	↓	8.03	80	80	↓
Phenol-d5	↓	3.15	32	32	↓
2-Fluorophenol	↓	4.85	48	48	↓
2,4,6-Tribromophenol	↓	9.76	98	98	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38346 D2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration, SA = Spike added, SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 5 + 6

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	80.0	80.0	ND	27.1	26.8	34	34	34	34	1	1
N-Nitroso-di-n-propylamine	↓	↓	↓	71.9	72.2	90	90	90	90	0	0
4-Chloro-3-methylphenol	↓	↓	↓	62.4	62.0	78	78	78	78	0	0
Acenaphthene	↓	↓	↓	70.0	65.9	88	88	82	82	6	6
Pentachlorophenol	160	160	↓	132	126	83	83	79	79	5	5
Pyrene	80	80	↓	66.9	64.0	84	84	80	80	4	4

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 425785

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	26.9 ~~62.4~~ FT	NA	~~78~~ 34	34				
N-Nitroso-di-n-propylamine	↓	↓	72.1	↓	90	90				
4-Chloro-3-methylphenol	↓	↓	57.6	↓	72	72				
Acenaphthene	↓	↓	62.4	↓	78	78				
Pentachlorophenol	160	↓	134	↓	84	84				
Pyrene	80	↓	62.5	↓	78	78	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. ICS 46.0 - 425.785 A

Conc. = $\frac{311167\ (8.0)\ (2)\ (1000)}{369136\ (2.0032)\ (250)}$

=

26.9 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 20, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130032-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB20-AQ	460-130032-5	Water	03/20/17
CFMW-012a-GWF	460-130032-1F	Water	03/20/17
CFMW-001-GWF	460-130032-2F	Water	03/20/17
CFMW-003a-GWF	460-130032-3F	Water	03/20/17
CFMW-026-GWF	460-130032-6F	Water	03/20/17
CFMW-028-GWF	460-130032-7F	Water	03/20/17
CFMW-043-GWF	460-130032-8F	Water	03/20/17
CFMW-25B-GWF	460-130032-4F	Water	03/20/17
CFMW-043-GWFMS	460-130032-8FMS	Water	03/20/17
CFMW-043-GWFDUP	460-130032-8FDUP	Water	03/20/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB20-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB20-AQ	03/20/17	Calcium Sodium	648 ug/L 689 ug/L	CFMW-026-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. For CFMW-043-GWFMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

LDC #: 38346D4a

SDG #: 460-130032-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-18-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (Ba, Ca, Mg, Na - 4x)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 7
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

		Client ID	Lab ID	Matrix	Date
1	1	CFMW-EB20-AQ	460-130032-5	Water	03/20/17
2	2	CFMW-012a-GWF	460-130032-1F	Water	03/20/17
3	2	CFMW-001-GWF	460-130032-2F	Water	03/20/17
4	2	CFMW-003a-GWF	460-130032-3F	Water	03/20/17
5	2	CFMW-026-GWF	460-130032-6F	Water	03/20/17
6	2	CFMW-028-GWF	460-130032-7F	Water	03/20/17
7	2	CFMW-043-GWF	460-130032-8F	Water	03/20/17
8	2	CFMW-043-GWFMS	460-130032-8FMS	Water	03/20/17
9	2	CFMW-043-GWFDUP	460-130032-8FDUP	Water	03/20/17
10	2	CFMW-25B-GWF	460-130032-4F	Water	3/20/17
11					
12	1	PBW1			
13	2	PBW2			

Notes:

LDC #: 38346D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: DK

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38346D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38346D4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→7, 10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
QC 8, 9	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____

Comments: Mercury by CVAA if performed

LDC #: 38346D4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/20/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 5 (>10x)

Analyte	Blank ID	Sample Identification										
	1	Action Level	No Qual's.									
Ca	648	6480										
Na	689	6890										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38346D4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1401 ICV	ICP/MS (Initial calibration)	Ni	40.838	40.0	102	102	Y
1402 ICV	CVAA (Initial calibration)	Hg	5.1709	5.00	103	103	↓
	ICP (Continuing calibration)						↓
1654 CCV6	ICP/MS (Continuing calibration)	Co	48.691	50.0	97	97	↓
1432 CCV2	CVAA (Continuing calibration)	Hg	5.0105	5.00	100	100	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1413 ICSAB	ICP interference check	Cu	192.3 (µg/L)	200 (µg/L)	96	96	Y
1704 LCS	Laboratory control sample	Sb	4.909 (µg/L)	5.00 (µg/L)	98	98	↓
1706 8	Matrix spike	Pb	(SSR-SR) 10.27 (µg/L)	10.0 (µg/L)	103	103	↓
1711 / 1709 9	Duplicate	K	987.6 (µg/L)	982.8 (µg/L)	0.5	0.5	↓
1711 / 1713 7	ICP serial dilution	Na	41687 (µg/L)	39791 (µg/L)	4.5	4.5	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Al were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(19.257\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 38.514\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Al	38.5	38.5	Y
2	2	Mg	13100	13100	
3	3	As	0.86	0.86	
4	4	Se	1.2	1.2	
5	5	K	860	860	
6	6	Ba	154	154	
7	7	Mn	3.1	3.1	
8	10	Fe	81.3	81.3	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130032-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-012a-GW	460-130032-1	Water	03/20/17
CFMW-001-GW	460-130032-2	Water	03/20/17
CFMW-003a-GW	460-130032-3	Water	03/20/17
CFMW-25B-GW	460-130032-4	Water	03/20/17
CFMW-EB20-AQ	460-130032-5	Water	03/20/17
CFMW-026-GW	460-130032-6	Water	03/20/17
CFMW-028-GW	460-130032-7	Water	03/20/17
CFMW-043-GW	460-130032-8	Water	03/20/17
CFMW-043-GWMS	460-130032-8MS	Water	03/20/17
CFMW-043-GWMSD	460-130032-8MSD	Water	03/20/17
CFMW-043-GWDUP	460-130032-8DUP	Water	03/20/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB20-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB20-AQ	03/20/17	Chloride	125 ug/L	CFMW-026-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-043-GWMS/MSD (CFMW-003a-GW)	Chloride	113 (90-110)	116 (90-110)	J+ (all detects)	A
CFMW-043-GWMS/MSD (CFMW-043-GW)	Sulfate	121 (90-110)	118 (90-110)	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
CFMW-043-GWDUP (CFMW-012a-GW CFMW-001-GW CFMW-003a-GW CFMW-25B-GW CFMW-026-GW CFMW-028-GW CFMW-043-GW)	Total suspended solids	18 (≤5)	-	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130032-1

Sample	Analyte	Flag	A or P	Reason
CFMW-003a-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-043-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-012a-GW CFMW-001-GW CFMW-003a-GW CFMW-25B-GW CFMW-026-GW CFMW-028-GW CFMW-043-GW	Total suspended solids	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130032-1

No Sample Data Qualified in this SDG

LDC #: 38346D6

SDG #: 460-130032-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-18-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 5
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-012a-GW	460-130032-1	Water	03/20/17
2	CFMW-001-GW	460-130032-2	Water	03/20/17
3	CFMW-003a-GW	460-130032-3	Water	03/20/17
4	CFMW-25B-GW	460-130032-4	Water	03/20/17
5	CFMW-EB20-AQ	460-130032-5	Water	03/20/17
6	CFMW-026-GW	460-130032-6	Water	03/20/17
7	CFMW-028-GW	460-130032-7	Water	03/20/17
8	CFMW-043-GW	460-130032-8	Water	03/20/17
9	CFMW-043-GWMS	460-130032-8MS	Water	03/20/17
10	CFMW-043-GWMSD	460-130032-8MSD	Water	03/20/17
11	CFMW-043-GWDUP	460-130032-8DUP	Water	03/20/17
12				
13	PBW1			
14	PBW2			

Notes:

LDC #: 38346D6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: MG

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38346D6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38346D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1, 4	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
2, 3, 6 → 8	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS Free CN
5	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4 Hard
QC 9, 10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4 Free CN
↓ 11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38346D6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/20/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 6 (>10x)

Analyte	Blank ID	Action Limit	Sample Identification									
[illegible]	5		No Qual.									
Cl	125	1250										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38346D6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	9/10	Water	Cl	113 (90-110)	116 (90-110)		3	J+ dets /A (det)
	↓	↓	SO4	121 (↓)	118 (↓)		8	↓ (↓)

Comments:

LDC #: 38346D6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		11	Water	TSS	18 (≤ 5)	1→4, 6→8	J/UJ/A (all dets)

Comments:

LDC #: 38346D6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of PO_4-P was recalculated. Calibration date: 3-7-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	PO_4-P	Blank	–	–	r^2=0.9968	r^2=0.9970	Y
		Standard 1	0.2 (mg/L)	4479			
		Standard 2	0.5 ( )	20301			
		Standard 3	2.5 ( )	140759			
		Standard 4	5.0 ( )	298089			
		Standard 5	7.5 ( )	505801			
		Standard 6	10.0 ( )	639395			
		Standard 7	–	–			
Calibration verification	SO_4	0429 CCV	7.70 (mg/L)	7.50 (mg/L)	2.7 %D	2.7 %D	
Calibration verification	NH_3-N	1327 CCV1	1.98 (mg/L)	2.00 (mg/L)	99	99	
Calibration verification	NO_3/NO_2-N	0918 ICV	1.026 (mg/L)	1.00 (mg/L)	103	103	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1213 LLCS	Laboratory control sample	Total CN	95.4 (µg/L)	100 (µg/L)	95	95	Y
0905 9	Matrix spike sample	PO_4-P	(SSR-SR) 2750 (µg/L)	2500 (µg/L)	110	110	↓
1453 / 1500 11	Duplicate sample	Alk	271000 (µg/L)	274000 (µg/L)	1	1	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346D6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, TDS reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$TDS = \frac{(64.9662\,g - 64.9469\,g)(1000\,mg/g)}{0.100\,L} = 193.0\,mg/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	TDS	193 (mg/L)	193 (mg/L)	Y
2	2	Alkalinity	212000	212000	
3	3	TSS	493 (mg/L)	493 (mg/L)	
4	4	Hardness	240000	240000	
5	5	Cl	125	125	
6	6	NO_3/NO_2-N	960	960	
7	7	Total Cyanide	283	283	
8	8	Free Cyanide	14.7	14.7	

Note: methods 350.1 and 9056A are N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 11, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130088-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-033-GW	460-130088-3	Water	03/21/17
CFMW-035-GW	460-130088-4	Water	03/21/17
CFMW-034-GW	460-130088-5	Water	03/21/17
CFMW-031-GW	460-130088-6	Water	03/21/17
Trip Blank	460-130088-7	Water	03/21/17
CFMW-023-GW	460-130088-9	Water	03/21/17
CFMW-020-GW	460-130088-10	Water	03/21/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/23/17	Bromomethane	28.5	CFMW-033-GW CFMW-035-GW CFMW-034-GW Trip Blank	UJ (all non-detects)	A
03/23/17	Chloroethane Methyl acetate	26.5 25.2	CFMW-033-GW CFMW-035-GW CFMW-034-GW Trip Blank	NA	-

Date	Compound	%D	Associated Samples	Flag	A or P
03/24/17	Dichlorodifluoromethane Methylcyclohexane	27.5 28.3	CFMW-031-GW CFMW-023-GW CFMW-020-GW	UJ (all non-detects) UJ (all non-detects)	A
03/24/17	Methyl acetate	22.3	CFMW-031-GW CFMW-023-GW CFMW-020-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Compound	Concentration	Associated Samples
Trip Blank	03/21/17	Acetone	6.9 ug/L	CFMW-033-GW CFMW-035-GW CFMW-034-GW CFMW-031-GW CFMW-023-GW CFMW-020-GW

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130088-1

Sample	Compound	Flag	A or P	Reason
CFMW-033-GW CFMW-035-GW CFMW-034-GW Trip Blank	Bromomethane	UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-031-GW CFMW-023-GW CFMW-020-GW	Dichlorodifluoromethane Methylcyclohexane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130088-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130088-1

No Sample Data Qualified in this SDG

LDC #: 38346E1

SDG #: 460-130088-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/10/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	~~SW~~ A	< RL
VI.	Field blanks	SW	TB = 5
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-033-GW	460-130088-3	Water	03/21/17
2 1	CFMW-035-GW	460-130088-4	Water	03/21/17
3 1	CFMW-034-GW	460-130088-5	Water	03/21/17
4 2	CFMW-031-GW	460-130088-6	Water	03/21/17
5 1	Trip Blank	460-130088-7	Water	03/21/17
6 2	CFMW-023-GW	460-130088-9	Water	03/21/17
7 2	CFMW-020-GW	460-130088-10	Water	03/21/17
8				
9				

Notes:

1	MB 460-426055						
2	MB 460-426140						

LDC #: 38346E1

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		< RL
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?	✓			
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 38346E1

VALIDATION FINDINGS CHECKLIST

Reviewer: EJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38346E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
-	3/23/17	CCV	B	28.5		1→3, 5,	J-/UJ/A all ND
+	2217		D	26.5		MB 460-426055	J+ det/A
+			QQQQ	25.2			↓
-	3/24/17	CCV	JJ	27.5		4, 6, 7,	J-/UJ/A all ND
+	10:11		QQQQ	22.3		MB 460-426140	J+ det/A
-			TTTT	28.3		↓	J-/UJ/A

LDC #: 38346E1

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target compounds detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/21/17
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 1-4, 6, 7 (ND)

Compound	Blank ID	Sample Identification								
	5									
F	6.9									

Blank units:_____ **Associated sample units:**_____
Sampling date:_____
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other:_____ Associated Samples:_____

Compound	Blank ID	Sample Identification								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as Methylene chloride, Acetone, 2-Butanone and Carbon disulfide that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

LDC #: 38346E1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/12/2017	F	0.6453	0.6453	0.7396	0.7396	13.3	13.3
	GCMS8		C	0.2639	0.2639	0.2818	0.2818	13.4	13.4
			CC	1.3859	1.3859	1.3706	1.3706	9.1	9.1
			JJJ	1.3367	1.3367	1.3296	1.3296	8.8	8.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 2217	3/23/17	F (1st internal standard)	0.7396	0.7785	0.7785	5.3	5.3
			C (2nd internal standard)	0.2818	0.3232	0.3232	14.7	14.7
			CC (3rd internal standard)	1.3706	1.469	1.469	7.2	7.2
			JJJ (4th internal standard)	1.3296	1.463	1.463	10.0	10.0
2	CCV 1011	3/24/17	F (1st internal standard)	0.7396	0.7359	0.7359	0.5	0.5
			C (2nd internal standard)	0.2818	~~1.458~~ 0.3114	0.3114	~~6.4~~ 10.5	10.5
			CC (3rd internal standard)	1.3706	1.458	1.458	6.4	6.4
			JJJ (4th internal standard)	1.3296	1.395	1.395	4.9	4.9
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346E1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.6	107	107	0
1,2-Dichloroethane-d4	↓	56.9	114	114	↓
Toluene-d8	↓	49.1	98	98	↓
Bromofluorobenzene	↓	51.6	103	103	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38346 E /

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: 2

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-426140

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	21.9	NA	109	109				
Trichloroethene	↓	↓	20.2	↓	101	101				
Benzene	↓	↓	21.9	↓	110	110				
Toluene	↓	↓	21.4	↓	107	107				
Chlorobenzene	↓	↓	20.5	↓	102	102	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346E /

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #1 , F :

Conc. = $\frac{(1718)(50.0)}{(558053)(0.2803)}$

=

0.55 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 11, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130088-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-033-GW	460-130088-3	Water	03/21/17
CFMW-035-GW	460-130088-4	Water	03/21/17
CFMW-034-GW	460-130088-5	Water	03/21/17
CFMW-031-GW	460-130088-6	Water	03/21/17
CFMW-023-GW	460-130088-9	Water	03/21/17
CFMW-020-GW	460-130088-10	Water	03/21/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/23/17	Indeno(1,2,3-cd)pyrene	22.7	All samples in SDG 460-130088-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130088-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130088-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130088-1

No Sample Data Qualified in this SDG

LDC #: 38346E2a

SDG #: 460-130088-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/10/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	460-130032-8 MS/MSD
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-033-GW	460-130088-3	Water	03/21/17
2	CFMW-035-GW	460-130088-4	Water	03/21/17
3	CFMW-034-GW	460-130088-5	Water	03/21/17
4	CFMW-031-GW	460-130088-6	Water	03/21/17
5	CFMW-023-GW	460-130088-9	Water	03/21/17
6	CFMW-020-GW	460-130088-10	Water	03/21/17
7				
8				
9				

Notes:

	MB 460-425785						

LDC #: 38346Q2a E

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: F7
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?			✓	
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38346E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38346D2a E

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 7
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	3/23/17 1449	CCV	JJJ	22.7		FT ~~1-3~~ All - MB	Jtdw / A (ND)

CONCAL.wpd

LDC #: 38346D2a E

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	3/22/2017	A	1.7541	1.7541	2.0032	2.0032	8.0	8.0
			S	0.8427	0.8427	0.9561	0.9561	12.1	12.1
			GG	1.2648	1.2648	1.3931	1.3931	10.1	10.1
			UU	0.9899	0.9899	1.1288	1.1288	6.9	6.9
			DDD	0.9245	0.9245	1.0588	1.0588	6.2	6.2
			III	1.0808	1.0808	1.0963	1.0963	6.3	6.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346 D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0044	3/23/17	Δ (1st IS)	2.0032	1.807	1.807	9.8	9.8
			S (2nd IS)	0.9561	0.9181	0.9181	4.0	4.0
			GG (3rd IS)	1.3931	1.242	1.242	10.8	10.8
			HH (4th IS)	1.1288	1.026	1.026	9.1	9.1
			PPD (5th IS)	1.0588	1.002	1.002	5.4	5.4
			III (6th IS)	1.0963	1.081	1.081	1.4	1.4
2	CCV 1449	3/23/17	(1st IS)		1.954	1.954	2.5	2.5
			(2nd IS)		0.8650	0.8650	9.5	9.5
			(3rd IS)		1.311	1.311	5.9	5.9
			(4th IS)		0.995	0.995	11.8	11.8
			(5th IS)		0.996	0.996	5.9	5.9
			(6th IS)		1.096	1.096	0.0	0.0
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346E2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 6

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.09	91	91	0
2-Fluorobiphenyl		7.84	78	78	
Terphenyl-d14		7.61	76	76	
Phenol-d5		3.24	32	32	
2-Fluorophenol		4.93	49	49	
2,4,6-Tribromophenol		9.25	93	93	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38346D2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 425785

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	26.9 ~~62.4~~ FT	NA	~~78~~ 34	34				
N-Nitroso-di-n-propylamine	↓	↓	72.1	↓	90	90				
4-Chloro-3-methylphenol	↓	↓	57.6	↓	72	72				
Acenaphthene	↓	↓	62.4	↓	78	78				
Pentachlorophenol	160	↓	134	↓	84	84				
Pyrene	80	↓	62.5	↓	78	78	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346Rda E

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer: C

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. ICS 46.0 - 425.785 A

Conc. = $\frac{311167}{369136} \frac{(8.0)}{(2.0032)} \frac{(2)(1000)}{(250)}$

=

26.9 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130088-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB21-AQ	460-130088-8	Water	03/21/17
CFMW-056b-GWF	460-130088-1F	Water	03/21/17
CFMW-Dup7-GWF	460-130088-2F	Water	03/21/17
CFMW-033-GWF	460-130088-3F	Water	03/21/17
CFMW-035-GWF	460-130088-4F	Water	03/21/17
CFMW-034-GWF	460-130088-5F	Water	03/21/17
CFMW-031-GWF	460-130088-6F	Water	03/21/17
CFMW-023-GWF	460-130088-9F	Water	03/21/17
CFMW-020-GWF	460-130088-10F	Water	03/21/17
CFMW-028a-GWF	460-130088-11F	Water	03/21/17
CFMW-011a-GWF	460-130088-12F	Water	03/21/17
CFMW-044a-GWF	460-130088-13F	Water	03/21/17
CFMW-056b-GWFMS	460-130088-1FMS	Water	03/21/17
CFMW-056b-GWFDUP	460-130088-1FDUP	Water	03/21/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB21-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB21-AQ	03/21/17	Calcium Sodium	564 ug/L 620 ug/L	CFMW-023-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-023-GWF	Sodium	2780 ug/L	2780U ug/L

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. For CFMW-056b-GWFMS, no data were qualified for Barium, Calcium, and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-056b-GWF and CFMW-Dup7-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-056b-GWF	CFMW-Dup7-GWF			
Barium	123	124	1 (≤30)	-	-
Calcium	61300	61900	1 (≤30)	-	-
Magnesium	15600	15700	1 (≤30)	-	-
Potassium	692	700	1 (≤30)	-	-
Sodium	3490	3510	1 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to equipment blank contamination, data were qualified as not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130088-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130088-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130088-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-023-GWF	Sodium	2780U ug/L	A

LDC #: 38346E4a

SDG #: 460-130088-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-18-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: KR

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (Ba, Ca, Mg - 4x)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 2
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D = 2+3
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

		Client ID	Lab ID	Matrix	Date
	1 1	CFMW-EB21-AQ	460-130088-8	Water	03/21/17
ND	2 2	CFMW-056~~9~~b-GWF	460-130088-1F	Water	03/21/17
	3 2	CFMW-Dup7-GWF	460-130088-2F	Water	03/21/17
	4 2	CFMW-033-GWF	460-130088-3F	Water	03/21/17
	5 2	CFMW-035-GWF	460-130088-4F	Water	03/21/17
	6 2	CFMW-034-GWF	460-130088-5F	Water	03/21/17
	7 2	CFMW-031-GWF	460-130088-6F	Water	03/21/17
	8 2	CFMW-023-GWF	460-130088-9F	Water	03/21/17
	9 2	CFMW-020-GWF	460-130088-10F	Water	03/21/17
	10 2	CFMW-028a-GWF	460-130088-11F	Water	03/21/17
	11 2	CFMW-011a-GWF	460-130088-12F	Water	03/21/17
	12 2	CFMW-044a-GWF	460-130088-13F	Water	03/21/17
ND	13 2	CFMW-056~~9~~b-GWFMS	460-130088-1FMS	Water	03/21/17
↓	14 2	CFMW-056~~9~~b-GWFDUP	460-130088-1FDUP	Water	03/21/17
	15				

LDC #: 38346E4a

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-18-17

SDG #: 460-130088-1

Page: 2 of 2

Laboratory: Test America, Inc.

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16				
17				
18 1	PBW1			
19 2	PBW2			

Notes:

LDC #: 38346E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: VN

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38346E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38346E4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: KK

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→12	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 13, 14	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38346E4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/21/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 8

Analyte	Blank ID	Sample Identification											
	1	Action Level	8										
Ca	564	5640											
Na	620	6200	2780										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 38346E4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	2	3		
Barium	123	124	1	
Calcium	61300	61900	1	
Magnesium	15600	15700	1	
Potassium	692	700	1	
Sodium	3490	3510	1	

V:\FIELD DUPLICATES\FD_inorganic\38346E4a.WPD

LDC #: 38346E4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KE

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1719 ICV	ICP/MS (Initial calibration)	Fe	3926.155	4000	98	98	Y
1347 ICV	CVAA (Initial calibration)	Hg	5.0084	5.00	100	100	
	ICP (Continuing calibration)						
1544 CCV8	ICP/MS (Continuing calibration)	Zn	50.214	50.0	100	100	
1609 CCV7	CVAA (Continuing calibration)	Hg	4.6266	5.00	93	93	
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346E4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1231 ICSAB	ICP interference check	Se	101.6 (µg/L)	100 (µg/L)	102	102	Y
1553 LCS	Laboratory control sample	Cd	5.479 (µg/L)	5.00 (µg/L)	110	110	↓
1556 13	Matrix spike	Cr	(SSR-SR) 21.48 (µg/L)	20.0 (µg/L)	107	107	↓
1601 / 1558 14	Duplicate	K	692.1 (µg/L)	700.6 (µg/L)	1	1	↓
1601 / 1603 2	ICP serial dilution	Mg	15585 (µg/L)	16487 (µg/L)	5.8	5.8	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346E4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Na were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(310.029\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 620.058\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Na	620	620	Y
2	2	K	692	692	
3	3	Mg	15700	15700	
4	4	Co	1.4	1.4	
5	5	As	9.5	9.5	
6	6	Fe	123	123	
7	7	Ca	59000	59000	
8	8	Ba	182	182	
9	9	K	622	622	
10	10	V	7.7	7.7	
11	11	Mn	154	154	
12	12	Al	171	171	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 20, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130088-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-056b-GW	460-130088-1	Water	03/21/17
CFMW-Dup7-GW	460-130088-2	Water	03/21/17
CFMW-033-GW	460-130088-3	Water	03/21/17
CFMW-035-GW	460-130088-4	Water	03/21/17
CFMW-034-GW	460-130088-5	Water	03/21/17
CFMW-031-GW	460-130088-6	Water	03/21/17
CFMW-EB21-AQ	460-130088-8	Water	03/21/17
CFMW-023-GW	460-130088-9	Water	03/21/17
CFMW-020-GW	460-130088-10	Water	03/21/17
CFMW-028a-GW	460-130088-11	Water	03/21/17
CFMW-011a-GW	460-130088-12	Water	03/21/17
CFMW-044a-GW	460-130088-13	Water	03/21/17
CFMW-056b-GWMS	460-130088-1MS	Water	03/21/17
CFMW-056b-GWMSD	460-130088-1MSD	Water	03/21/17
CFMW-056b-GWDUP	460-130088-1DUP	Water	03/21/17
CFMW-035-GWDUP	460-130088-4DUP	Water	03/21/17
CFMW-011a-GWMS	460-130088-12MS	Water	03/21/17
CFMW-011a-GWMSD	460-130088-12MSD	Water	03/21/17
CFMW-044a-GWMS	460-130088-13MS	Water	03/21/17
CFMW-044a-GWMSD	460-130088-13MSD	Water	03/21/17
CFMW-044a-GWDUP	460-130088-13DUP	Water	03/21/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB21-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB21-AQ	03/21/17	Chloride	126 ug/L	CFMW-023-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-023-GW	Chloride	455 ug/L	455U ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-044a-GWMS/MSD (CFMW-028a-GW)	Chloride	127 (90-110)	123 (90-110)	J+ (all detects)	A
CFMW-044a-GWMS/MSD (CFMW-028a-GW CFMW-044a-GW)	Sulfate	140 (90-110)	131 (90-110)	J+ (all detects)	A
CFMW-044a-GWMS/MSD (All samples in SDG 460-130088-1)	Orthophosphate as P	113 (80-110)	115 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFMW-056b-GW and CFMW-Dup7-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-056b-GW	CFMW-Dup7-GW			
Alkalinity	241000 ug/L	241000 ug/L	0 (≤30)	-	-
Chloride	2510 ug/L	2460 ug/L	2 (≤30)	-	-
Fluoride	271 ug/L	266 ug/L	2 (≤30)	-	-

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-056b-GW	CFMW-Dup7-GW			
Hardness	248000 ug/L	240000 ug/L	3 (≤30)	-	-
Nitrate/Nitrite as N	112 ug/L	155 ug/L	32 (≤30)	J (all detects)	A
Sulfate	4470 ug/L	4460 ug/L	0 (≤30)	-	-
Total dissolved solids	256 mg/L	263 mg/L	3 (≤30)	-	-
Total suspended solids	29.6 mg/L	19.2 mg/L	43 (≤30)	J (all detects)	A

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and field duplicate RPD, data were qualified as estimated in four samples.

Due to equipment blank contamination, data were qualified as not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130088-1

Sample	Analyte	Flag	A or P	Reason
CFMW-028a-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-028a-GW CFMW-044a-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-056b-GW CFMW-Dup7-GW	Nitrate/Nitrite as N Total suspended solids	J (all detects) J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130088-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130088-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-023-GW	Chloride	455U ug/L	A

LDC #: 38346E6

SDG #: 460-130088-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-19-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 7
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-130032-1)
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	SW	D = 1+2
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
NA 1	CFMW-056~~6~~b-GW	460-130088-1	Water	03/21/17
2	CFMW-Dup7-GW	460-130088-2	Water	03/21/17
3	CFMW-033-GW	460-130088-3	Water	03/21/17
4	CFMW-035-GW	460-130088-4	Water	03/21/17
5	CFMW-034-GW	460-130088-5	Water	03/21/17
6	CFMW-031-GW	460-130088-6	Water	03/21/17
7	CFMW-EB21-AQ	460-130088-8	Water	03/21/17
8	CFMW-023-GW	460-130088-9	Water	03/21/17
9	CFMW-020-GW	460-130088-10	Water	03/21/17
10	CFMW-028a-GW	460-130088-11	Water	03/21/17
11	CFMW-011a-GW	460-130088-12	Water	03/21/17
12	CFMW-044a-GW	460-130088-13	Water	03/21/17
NA 13	CFMW-056~~6~~b-GWMS	460-130088-1MS	Water	03/21/17
14	CFMW-056~~6~~b-GWMSD	460-130088-1MSD	Water	03/21/17
15	CFMW-056~~6~~b-GWDUP	460-130088-1DUP	Water	03/21/17
16	CFMW-035-GWDUP	460-130088-4DUP	Water	03/21/17

LDC #: 38346E6

SDG #: 460-130088-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-19-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

	Client ID	Lab ID	Matrix	Date
17	CFMW-011a-GWMS	460-130088-12MS	Water	03/21/17
18	CFMW-011a-GWMSD	460-130088-12MSD	Water	03/21/17
19	CFMW-044a-GWMS	460-130088-13MS	Water	03/21/17
20	CFMW-044a-GWMSD	460-130088-13MSD	Water	03/21/17
21	CFMW-044a-GWDUP	460-130088-13DUP	Water	03/21/17
22				
23				
24				
25	PBW1			
26	PBW2			

Notes:

LDC #: 38346E6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: VK

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38346E6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: VW

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38346E6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1, 2, 11	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
3→6, 8→10, 12		pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS FreeCN
7		pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
QC 13, 14		pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
15		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
16		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
17, 18		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
19, 20		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
21		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38346E6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/21/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 8

Analyte	Blank ID	Action Limit	Sample Identification									
[illegible]	7		8									
Cl	126	1260	455									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38346E6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	19/20	water	Cl	127 (90-110)	123 (90-110)		10	J+ dets /A (det)
	↓	↓	F	116 (↓)	115 (↓)		* none	No Qual.
			SO_4	140 (↓)	131 (↓)		10, 12	J+ dets /A (det in 10, 12)
			PO_4-P	113 (↓)	115 (↓)		all	↓ (all N.D.)

Comments: * this batch was analyzed for dilutions of Cl and SO_4 only

LDC#: 38346E6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	1	2		
Alkalinity	241000	241000	0	
Chloride	2510	2460	2	
Fluoride	271	266	2	
Hardness	248000	240000	3	
Nitrate/Nitrite as N	112	155	32	J/UJ/A (all dets)
Sulfate	4470	4460	0	
TDS (mg/L)	256	263	3	
TSS (mg/L)	29.6	19.2	43	J/UJ/A (all dets)

V:\FIELD DUPLICATES\FD_inorganic\38346E6.WPD

LDC #: 38346E6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: EK

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of NO_3/NO_2-N was recalculated. Calibration date: 3-23-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	NO_3/NO_2-N	Blank	0.0 (mg/L)	0	r=1.0000	r=1.0000	Y
		Standard 1	0.1 ( )	599347			
		Standard 2	0.5 ( )	3410816			
		Standard 3	1.0 ( )	6843853			
		Standard 4	1.5 ( )	10172672			
		Standard 5	2.0 ( )	13524301			
		Standard 6	–	–			
		Standard 7	–	–			
Calibration verification	PO_4-P	1714 CCV1	2.70 (mg/L)	2.50 (mg/L)	8% D	7.9% D	
Calibration verification	NH_3-N	1144 CCV1	1.89 (mg/L)	2.00 (mg/L)	94	95	
Calibration verification	Free CN	1845 CCV2	47.99 (µg/L)	50.0 (µg/L)	96	96	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38346E6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1835 LCS	Laboratory control sample	PO_4-P	2665 (µg/L)	2500 (µg/L)	107	107	Y
1610 13	Matrix spike sample	Total CN	(SSR-SR) 207 (µg/L)	200 (µg/L)	104	104	↓
1229 / 1229 21	Duplicate sample	Hardness	(µg/L) 148000	(µg/L) 146000	1	1	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38346E6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, SO_4 reported with a positive detect were recalculated and verified using the following equation:

Concentration =

$y = mx + b$

where
$m = 62743.5$
$b = -45770.8$
dil = 1x

Recalculation:

$234906 = 62743.5(x) - 45770.8$

$4.473\ mg/L = x$

then $(4.473\ mg/L)(1000\ \mu g/mg) = 4473\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	SO_4	4470	4470	Y
2	2	NO_3/NO_2-N	155	155	
3	3	Total CN	515	515	
4	4	TDS	442 (mg/L)	442 (mg/L)	
5	5	Hardness	316000	316000	
6	6	Free CN	45.7	45.7	
7	7	Cl	126	126	
8	8	Alkalinity	254000	254000	
9	9	TSS	11.5 (mg/L)	11.5 (mg/L)	
10	10	Hardness	142000	142000	
11	11	F	246	246	
12	12	Total CN	80.8	80.8	

Note: methods 350.1 and 9056A are N.D. for all samples

LDC #: 38346

EDD POPULATION COMPLETENESS WORKSHEET

Date: 4/20/17
Page: 1 of 1
2nd Reviewer: AD

The LDC job number listed above was entered by BA.

	EDD Process		Comments/Action
I.	EDD Completeness	-	
Ia.	- All methods present?	Y	
Ib.	- All samples present/match report?	Y	
Ic.	- All reported analytes present?	Y	
Id.	- 10% or 100% verification of EDD?	Y	
II.	EDD Preparation/Entry	-	
IIa.	- Carryover U/J?	Y	
IIb.	- Reason Codes used? If so, note which codes.	N	
IIc.	- Additional Information (QC Level, Validator, Validated Y/N, etc.)	N	
III.	Reasonableness Checks	-	
IIIa.	- Do all qualified ND results have ND qualifier (e.g. UJ)?	Y	
IIIb.	- Do all qualified detect results have detect qualifier (e.g. J)?	Y	
IIIc.	- If reason codes are used, do all qualified results have reason code field populated, and vice versa?	N/A	
IIId.	-Does the detect flag require changing for blank qualifier? If so, are all U results marked ND?	Y/Y	
IIIe.	- Do blank concentrations in report match EDD where data was qualified due to blank contamination?	Y	
IIIf.	- Were multiple results reported due to dilutions/reanalysis? If so, were results qualified appropriately?	N/A	
IIIg.	-Are there any discrepancies between the data packet and the EDD?	N	

Notes: *see discrepancy sheet

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

May 4, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on April 10, 2017. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #38423:

SDG #	Fraction
460-130225-1, 460-130226-1, 460-130333-1 460-130410-1, 460-130620-1, 460-130507-1	Volatiles, Semivolatiles, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

EDD

LDC #38423 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		Total CN- (335.4)		Free CN- (9016)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		TDS (2540C)		TSS (2540D)							
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-130225-1	04/10/17	05/01/17	4	0	3	0	-	-	5	0	5	0	5	0	5	0	5	0	3	0	5	0	3	0	1	0	5	0	5	0						
B	460-130226-1	04/10/17	05/01/17	8	0	7	0	1	0	9	0	10	0	10	0	10	0	10	0	8	0	10	0	10	0	10	0	9	0	9	0						
C	460-130333-1	04/10/17	05/01/17	6	0	5	0	1	0	7	0	8	0	8	0	8	0	8	0	6	0	8	0	8	0	-	-	7	0	7	0						
D	460-130410-1	04/10/17	05/01/17	4	0	3	0	1	0	7	0	8	0	8	0	8	0	8	0	4	0	8	0	8	0	8	0	7	0	7	0						
E	460-130620-1	04/10/17	05/01/17	5	0	4	0	1	0	8	0	9	0	9	0	9	0	9	0	4	0	9	0	9	0	9	0	8	0	8	0						
F	460-130507-1	04/10/17	05/01/17	9	0	8	0	1	0	9	0	10	0	10	0	10	0	10	0	4	0	10	0	10	0	10	0	9	0	9	0						
Total	T/CR			36	0	30	0	5	0	45	0	50	0	50	0	50	0	50	0	29	0	50	0	48	0	38	0	45	0	45	0	0	0	0	0	0	571

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130225-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-003-GW	460-130225-2	Water	03/22/17
CFMW-012-GW	460-130225-3	Water	03/22/17
Trip Blank	460-130225-4	Water	03/22/17
CFMW-054-GW	460-130225-5	Water	03/22/17
CFMW-003-GWMS	460-130225-2MS	Water	03/22/17
CFMW-003-GWMSD	460-130225-2MSD	Water	03/22/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Compound	Concentration	Associated Samples
Trip Blank	03/22/17	Acetone	36 ug/L	CFMW-003-GW CFMW-012-GW CFMW-054-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated field blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
CFMW-003-GW	Acetone	6.1 ug/L	6.1U ug/L

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to trip blank contamination, data were qualified as not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130225-1

Sample	Compound	Modified Final Concentration	A or P
CFMW-003-GW	Acetone	6.1U ug/L	A

LDC #: 38423A1

SDG #: 460-130225-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/18/17

Page: 1 of 1

Reviewer: PD

2nd Reviewer: KK

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	SW A	< RL
VI.	Field blanks	SW	TB = 3
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-003-GW	460-130225-2	Water	03/22/17
2	CFMW-012-GW	460-130225-3	Water	03/22/17
3	Trip Blank	460-130225-4	Water	03/22/17
4	CFMW-054-GW	460-130225-5	Water	03/22/17
5	CFMW-003-GWMS	460-130225-2MS	Water	03/22/17
6	CFMW-003-GWMSD	460-130225-2MSD	Water	03/22/17
7				
8				
9				

Notes:

	MB 460-426775						

LDC #: 38423A1

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.	✓			< RL
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?	✓			
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 34923A1

VALIDATION FINDINGS CHECKLIST

Reviewer: PJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38423A1

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target compounds detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 03/22/07
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 1, 2, 4

Compound	Blank ID	Sample Identification								
	3		1	~~2~~						
> F	36		6.1 U	~~3.6 5.0U~~ FT						
				< RL						

Blank units:_____ **Associated sample units:**_____
Sampling date:_____
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other:_____ Associated Samples:_____

Compound	Blank ID	Sample Identification								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as Methylene chloride, Acetone, 2-Butanone and Carbon disulfide that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

LDC #: 38423A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/12/2017	F	0.6453	0.6453	0.7396	0.7396	13.3	13.3
	GCMS8		C	0.2639	0.2639	0.2818	0.2818	13.4	13.4
			CC	1.3859	1.3859	1.3706	1.3706	9.1	9.1
			JJJ	1.3367	1.3367	1.3296	1.3296	8.8	8.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 2027	3/28/17	F (1st internal standard)	0.7396	0.7138	0.7138	3.5	3.5
			C (2nd internal standard)	0.2818	0.3047	0.3047	8.1	8.1
			CC (3rd internal standard)	1.3706	1.433	1.433	4.6	4.6
			JJJ (4th internal standard)	1.3296	1.374	1.374	3.3	3.3
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.5	107	107	0
1,2-Dichloroethane-d4	↓	56.8	114	114	↓
Toluene-d8	↓	49.0	98	98	↓
Bromofluorobenzene	↓	51.1	102	102	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38423A1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 5 + 6

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	200	200	ND	217	212	109	109	106	106	2	2
Trichloroethene			0.58	200	192	100	100	96	96	4	4
Benzene			ND	221	209	110	110	105	105	5	5
Toluene				215	212	108	108	106	106	1	1
Chlorobenzene				203	198	101	101	99	99	3	3

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: LK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-426775

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	20.8	NA	104	104				
Trichloroethene	↓	↓	19.5	↓	97	97				
Benzene	↓	↓	20.1	↓	101	101				
Toluene	↓	↓	20.1	↓	100	100				
Chlorobenzene	↓	↓	19.4	↓	97	97	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #1, F:

Conc. = $\frac{(5376)(250.0)}{(296942)(0.1396)}$

= 6.1 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130225-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-003-GW	460-130225-2	Water	03/22/17
CFMW-012-GW	460-130225-3	Water	03/22/17
CFMW-054-GW	460-130225-5	Water	03/22/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/28/17 (15:52)	Indeno(1,2,3-cd)pyrene	29.3	All samples in SDG in 460-130225-1	NA	A
03/28/17 (16:24)	Caprolactam	30.8	All samples in SDG in 460-130225-1	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-426520 (All samples in SDG 460-130225-1)	Bis(2-chloroethyl) ether	-	112 (63-106)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130225-1

Sample	Compound	Flag	A or P	Reason
CFMW-003-GW CFMW-012-GW CFMW-054-GW	Caprolactam	UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

LDC #: 38423A2a

SDG #: 460-130225-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/18/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-003-GW	460-130225-2	Water	03/22/17
2	CFMW-012-GW	460-130225-3	Water	03/22/17
3	CFMW-054-GW	460-130225-5	Water	03/22/17
4				
5				
6				
7				
8				
9				

Notes:

	MB 460-426520						

LDC #: 38423A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: EF
2nd Reviewer: DL

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38423 A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38423A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	3/28/17 15:52	CCV-4	JJJ	29.3		All - MB	J+ all /A (ND)
-	3/28/17 1624	CCV-4	MMMM	30.8		↓	J-/UJ/A ND

CONCAL.wpd

LDC #: 38423A2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460-	B	( )	112 (63-106	( )	All	J+ det / P NP
	426520		( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		

LDC #: 38423A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS6	3/23/2017	A	1.4493	1.4493	1.6522	1.6522	11.4	11.4
			S	1.0411	1.0411	0.9235	0.9235	10.9	10.9
			GG	1.3818	1.3818	1.1493	1.1493	14.2	14.2
			UU	0.9178	0.9178	0.9184	0.9184	7.1	7.1
			DDD	1.0433	1.0433	1.0380	1.0380	8.7	8.7
			III	1.0285	1.0285	0.9977	0.9977	5.6	5.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: EK

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	3/22/2017	A	1.7541	1.7541	2.0032	2.0032	8.0	8.0
			S	0.8427	0.8427	0.9561	0.9561	12.1	12.1
			GG	1.2648	1.2648	1.3931	1.3931	10.1	10.1
			UU	0.9899	0.9899	1.1288	1.1288	6.9	6.9
			DDD	0.9245	0.9245	1.0588	1.0588	6.2	6.2
			III	1.0808	1.0808	1.0963	1.0963	6.3	6.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1552	3/28/17	A (1st IS)	2.0632	1.958	1.958	2.2	2.2
			S (2nd IS)	0.9561	0.8854	0.8854	7.4	7.4
			GG (3rd IS)	1.3931	1.211	1.211	13.1	13.1
			UU (4th IS)	1.1288	1.031	1.031	8.7	8.7
			DDD (5th IS)	1.0588	0.9844	0.9844	7.0	7.0
			III (6th IS)	1.0963	1.084	1.084	1.1	1.1
2	CCV 0654	3/29/17	A (1st IS)	1.6522	1.457	1.457	11.8	11.8
			S (2nd IS)	0.9235	0.8877	0.8877	3.9	3.9
			GG (3rd IS)	1.1493	1.292	1.292	12.4	12.4
			UU (4th IS)	0.9184	0.9340	0.9340	1.7	1.7
			DDD (5th IS)	1.0380	1.001	1.001	3.6	3.6
			III (6th IS)	0.9971	0.9343	0.9343	6.4	6.4
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.52	95	95	0
2-Fluorobiphenyl	↓	8.20	82	82	↓
Terphenyl-d14	↓	9.56	96	96	↓
Phenol-d5	↓	3.92	39	39	↓
2-Fluorophenol	↓	5.24	52	52	↓
2,4,6-Tribromophenol	↓	10.4	104	104	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38423 A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS/D 460 – 426520

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80	26.0	27.7	32	32	35	35	7	7
N-Nitroso-di-n-propylamine	↓	↓	74.6	89.8	93	93	112	112	19	19
4-Chloro-3-methylphenol	↓	↓	67.2	70.2	84	84	88	88	4	4
Acenaphthene	↓	↓	81.5	77.6	102	102	97	97	5	5
Pentachlorophenol	160	160	147	169	92	92	105	105	13	13
Pyrene	80.0	80.0	80.4	81.5	101	101	102	102	1	1

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS #60-42 6520 A

$$\text{Conc.} = \frac{339782\ (8.0)(2)(1000)}{506991\ (1.6522)(250)}$$

= 26.0 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 26, 2017

Parameters: Dissolved Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130225-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-003-GW	460-130225-2	Water	03/22/17
CFMW-012-GW	460-130225-3	Water	03/22/17
CFMW-054-GW	460-130225-5	Water	03/22/17
CFMW-057a-GW	460-130225-7	Water	03/22/17
CFMW-056-GW	460-130225-11	Water	03/22/17
CFMW-054-GWMS	460-130225-5MS	Water	03/22/17
CFMW-054-GWDUP	460-130225-5DUP	Water	03/22/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. For CFMW-054-GWMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Laboratory Blank Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Dissolved Metals - Field Blank Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

LDC #: 38423A4a

SDG #: 460-130225-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-24-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Dissolved Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-130333-1) Ba, Ca, Mg, Na - 4x
VIII.	Duplicate sample analysis	A	DUP (↓)
IX.	Serial Dilution	A	SD: SDG: 460-130333-1
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-003-GW	460-130225-2	Water	03/22/17
2	CFMW-012-GW	460-130225-3	Water	03/22/17
3	CFMW-054-GW	460-130225-5	Water	03/22/17
4	CFMW-057a-GW	460-130225-7	Water	03/22/17
5	CFMW-056-GW	460-130225-11	Water	03/22/17
6	CFMW-054-GWMS	460-130225-5MS	Water	03/22/17
7	CFMW-054-GWDUP	460-130225-5DUP	Water	03/22/17
8				
9				
10				
11				
12				
13	PBW			

Notes:

LDC #: 38423A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38423A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38423A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→5	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 6, 7	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38423A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1548 ICV	ICP/MS (Initial calibration)	Mn	405.176	400	101	101	Y
1407 ICV	CVAA (Initial calibration)	Hg	5.0630	5.00	101	101	↓
	ICP (Continuing calibration)						↓
1859 CCV8	ICP/MS (Continuing calibration)	As	50.344	50.0	101	101	↓
1437 CCV2	CVAA (Continuing calibration)	Hg	5.0210	5.00	100	100	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1600 ICSAB	ICP interference check	Co	191.5 (µg/L)	200 (µg/L)	96	96	Y
1840 LCS	Laboratory control sample	Tl	4.283 (µg/L)	4.00 (µg/L)	107	107	↓
1427 6	Matrix spike	Hg	(SSR-SR) 0.997 (µg/L)	1.00 (µg/L)	100	100	↓
1424/1426 7	Duplicate	Hg	0.17U (µg/L)	0.17U (µg/L)	0	NC	↓
1847/1849 CFMW-025a-GW	ICP serial dilution	Ca	38033 (µg/L)	38386 (µg/L)	0.93	0.93	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Cu were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(0.748\ \mu g/L)(0.010\ L)(2)}{0.010\ L} = 1.496\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cu	1.5	1.5	Y
2	2	Al	32.4	32.4	
3	3	K	1000	1000	
4	4	Cr	24.1	24.1	
5	5	Zn	176	176	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 25, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130225-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-003-GW	460-130225-2	Water	03/22/17
CFMW-012-GW	460-130225-3	Water	03/22/17
CFMW-054-GW	460-130225-5	Water	03/22/17
CFMW-057a-GW	460-130225-7	Water	03/22/17
CFMW-056-GW	460-130225-11	Water	03/22/17
CFMW-003-GWMS	460-130225-2MS	Water	03/22/17
CFMW-003-GWMSD	460-130225-2MSD	Water	03/22/17
CFMW-003-GWDUP	460-130225-2DUP	Water	03/22/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
03/24/17	CCV (10:47)	Orthophosphate as P	130 (90-110)	CFMW-056-GW	NA	-
03/24/17	CCV (18:10)	Orthophosphate as P	120 (90-110)	CFMW-056-GW	NA	-

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-037-GWMS/MSD (CFMW-012-GW CFMW-054-GW CFMW-056-GW)	Chloride	125 (90-110)	117 (90-110)	J+ (all detects)	A
CFMW-037-GWMS/MSD (CFMW-057a-GW CFMW-056-GW)	Sulfate	130 (90-110)	130 (90-110)	J+ (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-037-GWMS/MSD (CFMW-056-GW)	Orthophosphate as P	135 (90-110)	135 (90-110)	NA	-
CFMW-029-GWMS/MSD (CFMW-003-GW CFMW-057a-GW)	Chloride	133 (90-110)	130 (90-110)	J+ (all detects)	A
CFMW-029-GWMS/MSD (CFMW-012-GW)	Fluoride	114 (90-110)	114 (90-110)	J+ (all detects)	A
CFMW-029-GWMS/MSD (CFMW-003-GW CFMW-012-GW CFMW-054-GW)	Sulfate	145 (90-110)	141 (90-110)	J+ (all detects)	A
CFMW-003-GWMS/MSD (CFMW-057a-GW CFMW-056-GW)	Ammonia as N	113 (90-110)	-	J+ (all detects)	A
CFMW-003-GWMS/MSD (CFMW-003-GW CFMW-012-GW CFMW-054-GW)	Ammonia as N	113 (90-110)	-	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD (CFMW-056-GW)	Orthophosphate as P	184 (80-110)	135 (80-110)	NA	-

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
LCS/LCSD (CFMW-056-GW)	Orthophosphate as P	31 (≤15)	UJ (all non-detects)	P

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and LCS/LCSD RPD, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130225-1

Sample	Analyte	Flag	A or P	Reason
CFMW-003-GW CFMW-012-GW CFMW-054-GW CFMW-057a-GW CFMW-056-GW	Chloride Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-012-GW	Fluoride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-057a-GW CFMW-056-GW	Ammonia as N	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-056-GW	Orthophosphate as P	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130225-1

No Sample Data Qualified in this SDG

LDC #: 38423A6
SDG #: 460-130225-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 4-24-17
Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	SW	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-130226-1, 460-130333-1)
VII.	Duplicate sample analysis	A	DUP (↓ ↓)
VIII.	Laboratory control samples	SW	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-003-GW	460-130225-2	Water	03/22/17
2	CFMW-012-GW	460-130225-3	Water	03/22/17
3	CFMW-054-GW	460-130225-5	Water	03/22/17
4	CFMW-057a-GW	460-130225-7	Water	03/22/17
5	CFMW-056-GW	460-130225-11	Water	03/22/17
6	CFMW-003-GWMS	460-130225-2MS	Water	03/22/17
7	CFMW-003-GWMSD	460-130225-2MSD	Water	03/22/17
8	CFMW-003-GWDUP	460-130225-2DUP	Water	03/22/17
9				
10				
11				
12				
13	PBW1			
14	PBW2			

Notes:

LDC #: 38423A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: PU

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?		✓		
Were titrant checks performed as required? (Level IV only)				
Were balance checks performed as required? (Level IV only)				
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38423A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: VK

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38423A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→3	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN Hard TSS
4	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ Hard TSS
5		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ Hard TSS
QC 6,7		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
↓ 8	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____

Comments: _____

LDC #: 38423A6

VALIDATION FINDINGS WORKSHEET
Calibration

Reviewer: MG
2nd Reviewer: [signature]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

- (Y) N N/A — Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
- Y (N) N/A — Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
- (Y) N N/A — Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

- (Y) N N/A — Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
- Y N N/A — Was a balance check conducted prior to the TDS analysis.?
- Y N N/A — Was the titrant normality checked?

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualifications
1	3-24-17	CCV (10:47)	PO4-P	130 (90-110)	5	J+ dets/P (ND)
2	3-24-17	CCV (18:10)	PO4-P	120 (↓)	↓	↓ (↓)

Comments:

CAL.6

LDC #: 38423A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	CFMW-037-GW	Water	Cl	125 (90-110)	117 (90-110)		2.3.5	J+dets/A (all dets)
	MS/MSD		SO4	130 ( )	130 ( )		4,5	( )
	↓		PO4-P	135 ( )	135 ( )		5	(N.D.)
2	CFMW-029-GW		Cl	133 ( )	130 ( )		1,4	(all dets)
	MS/MSD		F	114 ( )	114 ( )		2	( )
	↓		SO4	145 ( )	141 ( )		1,2,3	( )
3	6/7		NH3-N	113 ( )			all	(dets in 4,5)

Comments:

LDC #: 38423A6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [signature]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	LCS/LCSD	Water	PO4-P	184 (90-110)	135 (90-110)		5	J+ dets/P (ND)
	↓		PO4-P			31 (≤15)	↓	J/UJ/P (↓)

Comments:

LCSD.wpd

LDC #: 38423A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: EK

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of PO_4-P was recalculated. Calibration date: 3-7-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	PO_4-P	Blank	-	-	r^2 = 0.9968	r^2 = 0.9970	Y
		Standard 1	0.2 (mg/L)	4479			
		Standard 2	0.5 ( )	20301			
		Standard 3	2.5 ( )	140759			
		Standard 4	5.0 ( )	298089			
		Standard 5	7.5 ( )	505801			
		Standard 6	10.0 ( )	639395			
		Standard 7	-	-			
Calibration verification	NO_3/NO_2-N	1653 CCV2	1.020 (mg/L)	1.00 (mg/L)	102	102	
Calibration verification	SO_4	1829 CCV3	8.03 (mg/L)	7.50 (mg/L)	7.1 %D	7.1 %D	
Calibration verification	Total CN	1642 ICV	0.203 (mg/L)	0.200 (mg/L)	102	102	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1535 LCS	Laboratory control sample	Free CN	41.03 (µg/L)	50.0 (µg/L)	82	82	Y
1402 6	Matrix spike sample	NH_3-N	(SSR-SR) 1126 (µg/L)	1000 (µg/L)	113	113	↓
1402 / 1412 8	Duplicate sample	Alk.	(µg/L) 694800	(µg/L) 694700	0	0	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38423A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: MW

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Total Cyanide reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = mx + b$
where
$m = 0.0219$
$b = -0.002$
$dil = 1x$

Recalculation:
$CN\ mg/L = 0.0219\ (0.731) - 0.002$
$0.0140\ mg/L = x$
then $(0.0140\ mg/L)(1000\ \mu g/mg) = 14.0\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Total CN	14.0	14.0	Y
		TSS	52.0 (mg/L)	52.0 (mg/L)	
2	2	Free CN	48.0	48.0	
		SO4	43500	43500	
3	3	NO3/NO2-N	2900	2900	
		Hardness	222000	222000	
4	4	NH3-N	202	202	
		TDS	680 (mg/L)	680 (mg/L)	
5	5	Alkalinity	222000	222000	

Note: method 9056A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130226-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-049-GW	460-130226-2	Water	03/23/17
CFMW-050-GW	460-130226-4	Water	03/23/17
CFMW-047-GW	460-130226-5	Water	03/23/17
CFMW-037-GW	460-130226-6	Water	03/23/17
CFMW-045-GW	460-130226-7	Water	03/23/17
CFMW-064-GW	460-130226-8	Water	03/23/17
CFMW-061-GW	460-130226-9	Water	03/23/17
Trip Blank	460-130226-11	Water	03/23/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

LDC #: 38423B1

SDG #: 460-130226-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/18/17

Page: 1 of 1

Reviewer: FT

2nd Reviewer: VK

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	< RL
VI.	Field blanks	ND	< RL
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	460-130225-2 MS/D
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-049-GW	460-130226-2	Water	03/23/17
2	CFMW-050-GW	460-130226-4	Water	03/23/17
3	CFMW-047-GW	460-130226-5	Water	03/23/17
4	CFMW-037-GW	460-130226-6	Water	03/23/17
5	CFMW-045-GW	460-130226-7	Water	03/23/17
6	CFMW-064-GW	460-130226-8	Water	03/23/17
7	CFMW-061-GW	460-130226-9	Water	03/23/17
8	Trip Blank	460-130226-11	Water	03/23/17
9				
10	MB 426775			
11				
12				
13				

LDC #: 38423B1

VALIDATION FINDINGS CHECKLIST

Reviewer: EF
2nd Reviewer: PHF

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.	✓			< RL
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?	✓			< RL
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 38423 B1

VALIDATION FINDINGS CHECKLIST

Reviewer: EJ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38423B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/12/2017	F	0.6453	0.6453	0.7396	0.7396	13.3	13.3
	GCMS8		C	0.2639	0.2639	0.2818	0.2818	13.4	13.4
			CC	1.3859	1.3859	1.3706	1.3706	9.1	9.1
			JJJ	1.3367	1.3367	1.3296	1.3296	8.8	8.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 2027	3/28/17	F (1st internal standard)	0.7396	0.7138	0.7138	3.5	3.5
			C (2nd internal standard)	0.2818	0.3047	0.3047	8.1	8.1
			CC (3rd internal standard)	1.3706	1.433	1.433	4.6	4.6
			JJJ (4th internal standard)	1.3296	1.374	1.374	3.3	3.3
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423B1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.3	107	107	0
1,2-Dichloroethane-d4	↓	56.3	113	113	↓
Toluene-d8	↓	48.2	96	96	↓
Bromofluorobenzene	↓	50.6	101	101	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38423B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-426775

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	20.8	NA	104	104				
Trichloroethene	↓	↓	19.5	↓	97	97				
Benzene	↓	↓	20.1	↓	101	101				
Toluene	↓	↓	20.1	↓	100	100				
Chlorobenzene	↓	↓	19.4	↓	97	97	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423B

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KH

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #3, F:

Conc. = $\frac{2811\ (250.0)}{297369\ (0.7396)}$

= 3.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130226-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-049-GW	460-130226-2	Water	03/23/17
CFMW-050-GW	460-130226-4	Water	03/23/17
CFMW-047-GW	460-130226-5	Water	03/23/17
CFMW-037-GW	460-130226-6	Water	03/23/17
CFMW-045-GW	460-130226-7	Water	03/23/17
CFMW-064-GW	460-130226-8	Water	03/23/17
CFMW-061-GW	460-130226-9	Water	03/23/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Compound	Flag	A or P
CFMW-049-GW	2-Fluorobiphenyl Nitrobenzene-d5	126 (45-107) 109 (51-108)	All base-neutral compounds	NA	-
CFMW-050-GW	2-Fluorobiphenyl Nitrobenzene-d5	132 (45-107) 118 (51-108)	All base-neutral compounds	NA	-
CFMW-061-GW	2-Fluorobiphenyl Nitrobenzene-d5	131 (45-107) 109 (51-108)	All base-neutral compounds	NA	-

Additionally, surrogate recoveries (%R) were not within QC limits for several other samples. Using professional judgment, no data were qualified when one base or one acid surrogate %R was outside the QC limits and the %R was greater than or equal to 10%.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-426653 (All samples in SDG 460-130226-1)	1'1-Biphenyl 2-Chloronaphthalene Acenaphthylene Bis(2-chloroethoxy)methane Bis(2-chloroethyl) ether Hexachlorocyclopentadiene	109 (54-108) 111 (54-105) 108 (61-106) 110 (67-104) 109 (63-106) -	110 (54-108) - 112 (61-106) 108 (67-104) - 106 (18-99)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

LDC #: 38423B2a

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/19/17

SDG #: 460-130226-1

Page: 1 of 1

Laboratory: Test America, Inc.

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-049-GW	460-130226-2	Water	03/23/17
2	CFMW-050-GW	460-130226-4	Water	03/23/17
3	CFMW-047-GW	460-130226-5	Water	03/23/17
4	CFMW-037-GW	460-130226-6	Water	03/23/17
5	CFMW-045-GW	460-130226-7	Water	03/23/17
6	CFMW-064-GW	460-130226-8	Water	03/23/17
7	CFMW-061-GW	460-130226-9	Water	03/23/17
8				
9				
10				
11	MB 460-426653			
12				
13				

LDC #: 38423B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: VR

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?		✓		
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?		✓		
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38423B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: EJ
2nd Reviewer: PR

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

B/N

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. 1'1 - Biphenyl
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU. Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV. Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW. Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38423B2a

VALIDATION FINDINGS WORKSHEET
Surrogate Recovery

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270C)
Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Were percent recoveries (%R) for surrogates within QC limits?
Y (N) N/A If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?
Y N (N/A) If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Sample ID	Surrogate	%R (Limits)	Qualifications
	1	FBP	126 (45-107)	J+ det /P and B/N ND
		NBZ	109 (51-108)	
			( )	
			( )	
	2	↓	132 (↓)	J+ det /P and B/N ND
			118 ( )	
			( )	
	3	FBP	120 (45-107)	no qual
			( )	
	5	FBP	109 (↓)	↓
			( )	
	6	FBP	122 (↓)	↓
			( )	
	7	FBP	131 (45-107)	J+ det /P and B/N ND
		NBZ	109 (51-108)	↓
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	

(NBZ) = Nitrobenzene - d5
(FBP) = 2-Fluorobiphenyl
(TPH) = Terphenyl - d14
(2FP) = 2-Fluorophenol
(TBP) = 2,4,6 -Tribromophenol
(2CP) = 2-Chlorophenol - d4

LDC #: 38423B2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a LCS required?
Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460-	A1	109 (54-108)	110 (54-108)	( )	All	J+ all P and ND
	426653	AA	111 (54-105)	( )	( )		
		DD	108 (61-106)	112 (61-106)	( )		
		P	110 (67-104)	108 (67-104)	( )		
		B	109 (63-106)	( )	( )		
		X	( )	106 (18-99)	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 38423B2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS6	3/23/2017	A	1.4493	1.4493	1.6522	1.6522	11.4	
			S	1.0411	1.0411	0.9235	0.9235	10.9	10.9
			GG	1.3818	1.3818	1.1493	1.1493	14.2	14.2
			UU	0.9178	0.9178	0.9184	0.9184	7.1	7.1
			DDD	1.0433	1.0433	1.0380	1.0380	8.7	8.7
			III	1.0285	1.0285	0.9977	0.9977	5.6	5.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0500	3/29/17	A (1st IS)	1.6522	1.458	1.458	11.8	11.8
			S (2nd IS)	0.9235	0.8271	0.8271	10.4	10.4
			GG (3rd IS)	1.1493	1.089	1.089	5.3	5.3
			HH (4th IS)	0.9184	0.9174	0.9174	0.1	0.1
			DDD (5th IS)	1.0380	1.002	1.002	3.5	3.5
			III (6th IS)	0.9977	0.8903	0.8903	10.8	10.8
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423B2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	10.9	109	109	0
2-Fluorobiphenyl		12.6	126	126	
Terphenyl-d14		12.7	127	127	
Phenol-d5		3.14	31	31	
2-Fluorophenol		4.97	50	50	
2,4,6-Tribromophenol		9.74	97	97	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38423B2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS/D 4600-426653

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	22.2	19.5	28	28	24	24	13	13
N-Nitroso-di-n-propylamine	80.0	↓	83.7	67.2	105	105	84	84	22	22
4-Chloro-3-methylphenol	80.0	↓	65.0	62.5	81	81	78	78	4	4
Acenaphthene	80.0	↓	83.9	81.7	105	105	102	102	3	3
Pentachlorophenol	160.0	160	163	143	102	102	90	90	13	13
Pyrene	80.0	80.0	79	77.6	99	99	97	97	2	2

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423B2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. ICS 460 - 426653 A

Conc. = $\frac{229999\ (8.0)\ (2)\ (1000)}{400465\ (1.6522)\ (250)}$

=

22.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 25, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130226-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB23-AQ	460-130226-1	Water	03/23/17
CFMW-049-GWF	460-130226-2F	Water	03/23/17
CFMW-049a-GWF	460-130226-3F	Water	03/23/17
CFMW-050-GWF	460-130226-4F	Water	03/23/17
CFMW-047-GWF	460-130226-5F	Water	03/23/17
CFMW-037-GWF	460-130226-6F	Water	03/23/17
CFMW-045-GWF	460-130226-7F	Water	03/23/17
CFMW-064-GWF	460-130226-8F	Water	03/23/17
CFMW-061-GWF	460-130226-9F	Water	03/23/17
CFMW-059-GWF	460-130226-10F	Water	03/23/17

Samples appended with "F" were analyzed as dissolved

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB23-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB23-AQ	03/23/17	Calcium Sodium	497 ug/L 614 ug/L	CFMW-049-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

LDC #: 38423B4a

SDG #: 460-130226-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-25-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB = 1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD (SDG: 460-130225-1, 460-130333-1)
VIII.	Duplicate sample analysis	A	DUP (↓ ↓)
IX.	Serial Dilution	N	not performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

		Client ID	Lab ID	Matrix	Date
1	1	CFMW-EB23-AQ	460-130226-1	Water	03/23/17
2	2	CFMW-049-GWF	460-130226-2F	Water	03/23/17
3	2	CFMW-049a-GWF	460-130226-3F	Water	03/23/17
4	2	CFMW-050-GWF	460-130226-4F	Water	03/23/17
5	2	CFMW-047-GWF	460-130226-5F	Water	03/23/17
6	2	CFMW-037-GWF	460-130226-6F	Water	03/23/17
7	2	CFMW-045-GWF	460-130226-7F	Water	03/23/17
8	2	CFMW-064-GWF	460-130226-8F	Water	03/23/17
9	2	CFMW-061-GWF	460-130226-9F	Water	03/23/17
10	3 2	CFMW-059-GWF	460-130226-10F	Water	03/23/17
11					
12	1	PBW1			
13	2	PBW2			
14	3	PBW3 (Hg)			

Notes:

LDC #: 38423B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38423B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38423B4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38423B4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW846 6020A/7470A)
(Y) N N/A Were field blanks identified in this SDG?
(Y) N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/23/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: (EB) Associated Samples: 2 (>10x)

Analyte	Blank ID	Sample Identification										
	1	Action Level	No Qual's.									
Ca	497	4970										
Na	614	6140										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38423B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: EK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1548 ICV	ICP/MS (Initial calibration)	Pb	39.920	40.0	100	100	Y
1407 ICV	CVAA (Initial calibration)	Hg	5.0630	5.00	101	101	↓
	ICP (Continuing calibration)						↓
1957 CCV10	ICP/MS (Continuing calibration)	Se	50.531	50.0	101	101	↓
1459 CCV 3	CVAA (Continuing calibration)	Hg	5.0242	5.00	100	100	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1600 ICSAB	ICP interference check	V	198.9 (µg/L)	200 (µg/L)	99	99	Y
1938 LCS	Laboratory control sample	Cr	10.64 (µg/L)	10.0 (µg/L)	106	106	↓
1427 CFMW-054-GW MS	Matrix spike	Hg	(SSR-SR) 0.997 (µg/L)	1.00 (µg/L)	100	100	↓
1424/1426 CFMW-054-GW DUP	Duplicate	Hg	0.17 U (µg/L)	0.17 U (µg/L)	0	NC	↓
—	ICP serial dilution	—	—	—	—	—	—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 38423B4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Na were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(306.892\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 613.784\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Na	614	614	Y
2	2	Fe	79.3	79.3	
3	3	Cr	4.3	4.3	
4	4	Mn	2.7	2.7	
5	5	Cu	1.4	1.4	
6	6	K	783	783	
7	7	Mg	14100	14100	
8	8	Ba	290	290	
9	9	Ca	46300	46300	
10	10	Na	18600	18600	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 25, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130226-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB23-AQ	460-130226-1	Water	03/23/17
CFMW-049-GW	460-130226-2	Water	03/23/17
CFMW-049a-GW	460-130226-3	Water	03/23/17
CFMW-050-GW	460-130226-4	Water	03/23/17
CFMW-047-GW	460-130226-5	Water	03/23/17
CFMW-037-GW	460-130226-6	Water	03/23/17
CFMW-045-GW	460-130226-7	Water	03/23/17
CFMW-064-GW	460-130226-8	Water	03/23/17
CFMW-061-GW	460-130226-9	Water	03/23/17
CFMW-059-GW	460-130226-10	Water	03/23/17
CFMW-037-GWMS	460-130226-6MS	Water	03/23/17
CFMW-037-GWMSD	460-130226-6MSD	Water	03/23/17
CFMW-037-GWDUP	460-130226-6DUP	Water	03/23/17
CFMW-059-GWDUP	460-130226-10DUP	Water	03/23/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
03/24/17	CCV (18:10)	Orthophosphate as P	120 (90-110)	CFMW-EB23-AQ CFMW-049-GW CFMW-049a-GW CFMW-050-GW CFMW-047-GW CFMW-045-GW CFMW-064-GW CFMW-061-GW CFMW-059-GW	NA	-
03/24/17	CCV (22:14)	Orthophosphate as P	124 (90-110)	All samples in SDG 460-130226-1	NA	-
03/25/17	CCV (02:02)	Orthophosphate as P	116 (90-110)	CFMW-037-GW	NA	-

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB23-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB23-AQ	03/23/17	Chloride Fluoride	120 ug/L 104 ug/L	CFMW-049-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-049-GW	Fluoride	980 ug/L	980J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-037-GWMS/MSD (CFMW-EB23-AQ CFMW-049-GW CFMW-049a-GW CFMW-050-GW CFMW-047-GW CFMW-037-GW CFMW-045-GW CFMW-064-GW CFMW-061-GW)	Chloride	125 (90-110)	117 (90-110)	J+ (all detects)	A
CFMW-037-GWMS/MSD (CFMW-049-GW CFMW-049a-GW CFMW-050-GW CFMW-047-GW CFMW-037-GW CFMW-045-GW CFMW-064-GW CFMW-061-GW CFMW-059-GW)	Sulfate	130 (90-110)	130 (90-110)	J+ (all detects)	A
CFMW-037-GWMS/MSD (CFMW-EB23-AQ)	Sulfate	130 (90-110)	130 (90-110)	NA	-
CFMW-037-GWMS/MSD (All samples in SDG 460-130226-1)	Orthophosphate as P	135 (90-110)	135 (90-110)	NA	-
CFMW-003-GWMS/MSD (All samples in SDG 460-130226-1)	Ammonia as N	113 (90-110)	-	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD (All samples in SDG 460-130226-1)	Orthophosphate as P	184 (80-110)	135 (80-110)	NA	-

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
LCS/LCSD (All samples in SDG 460-130226-1)	Orthophosphate as P	31 (≤15)	UJ (all non-detects)	P

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and LCS/LCSD RPD, data were qualified as estimated in ten samples.

Due to equipment blank contamination, data were qualified as not detected in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130226-1

Sample	Analyte	Flag	A or P	Reason
CFMW-EB23-AQ CFMW-049-GW CFMW-049a-GW CFMW-050-GW CFMW-047-GW CFMW-037-GW CFMW-045-GW CFMW-064-GW CFMW-061-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-049-GW CFMW-049a-GW CFMW-050-GW CFMW-047-GW CFMW-037-GW CFMW-045-GW CFMW-064-GW CFMW-061-GW CFMW-059-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-EB23-AQ CFMW-049-GW CFMW-049a-GW CFMW-050-GW CFMW-047-GW CFMW-037-GW CFMW-045-GW CFMW-064-GW CFMW-061-GW CFMW-059-GW	Orthophosphate as P	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130226-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130226-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-049-GW	Fluoride	980J+ ug/L	A

LDC #: 38423B6

SDG #: 460-130226-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-25-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	SW	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-130225-1)
VII.	Duplicate sample analysis	A	DUP (SDG: 460-130333-1)
VIII.	Laboratory control samples	SW	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note:
A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank
SB=Source blank
OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB23-AQ	460-130226-1	Water	03/23/17
2	CFMW-049-GW	460-130226-2	Water	03/23/17
3	CFMW-049a-GW	460-130226-3	Water	03/23/17
4	CFMW-050-GW	460-130226-4	Water	03/23/17
5	CFMW-047-GW	460-130226-5	Water	03/23/17
6	CFMW-037-GW	460-130226-6	Water	03/23/17
7	CFMW-045-GW	460-130226-7	Water	03/23/17
8	CFMW-064-GW	460-130226-8	Water	03/23/17
9	CFMW-061-GW	460-130226-9	Water	03/23/17
10	CFMW-059-GW	460-130226-10	Water	03/23/17
11	CFMW-037-GWMS	460-130226-6MS	Water	03/23/17
12	CFMW-037-GWMSD	460-130226-6MSD	Water	03/23/17
13	CFMW-037-GWDUP	460-130226-6DUP	Water	03/23/17
14	CFMW-059-GWDUP	460-130226-10DUP	Water	03/23/17
15	PBW1			
16	PBW2			

LDC #: 38423B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?		✓		
Were titrant checks performed as required? (Level IV only)				
Were balance checks performed as required? (Level IV only)				
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38423B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38423B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: KL

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2→9	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4 Hard Free CN TSS
10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4 Hard ____ TSS
QC 11, 12	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____
13	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
14	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____

Comments:

LDC #: 38423B6

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: MG
2nd Reviewer: EE

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
Y N N/A Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
Y N N/A Was a balance check conducted prior to the TDS analysis.?
Y N N/A Was the titrant normality checked?

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualifications
1	3-24-17	CCV (18:10)	PO_4-P	120 (90-110)	1→5, 7→10	J+ dets/P (all N.D.)
2	3-24-17	CCV (22:14)	PO_4-P	124 (↓)	1→13	↓ (det in 11,12)
3	3-25-17	CCV (02:02)	PO_4-P	116 (↓)	6, 11→13	↓ (↓)

Comments:

LDC #: 38423B6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: KM

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/23/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
	1		2									
Cl	120	1200										
F	104	1040	980J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38423B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	11/12	water	Cl	125 (90-110)	117 (90-110)		1→9	J+ dets/A (all dets)
	↓	↓	SO4	130 ( )	130 ( )		1→10	(dets in 2→10)
			PO4-P	135 ( )	135 (↓)		↓	(all N.D.)
2	CFMW-003-GW MS/MSD	↓	NH3-N	113 (↓)			1→10	↓ (all N.D.)

Comments:

LDC #: 38423B6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	LCS/LCSD	water	PO4-P	184 (90-110)	135 (90-110)		all	J+ dets/P (all ND)
	↓	↓	↓			31 (≤15)	↓	J/UJ/P (↓)

Comments:

LCSD.wpd

LDC #: 38423B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Free CN was recalculated. Calibration date: 3-29-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Abs. True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Free CN	Blank	0 (µg/L)	0.0	$r^2 = 0.9996$	$r^2 = 0.9996$	Y
		Standard 1	2 ( )	0.004			
		Standard 2	5 ( )	0.013			
		Standard 3	10 ( )	0.023			
		Standard 4	25 ( )	0.058			
		Standard 5	50 ( )	0.111			
		Standard 6	150 ( )	0.319			
		Standard 7	-	-			
Calibration verification	NH_3-N	1410 CCV 1	1.97 (mg/L)	2.00 (mg/L)	98	99	
Calibration verification	Cl	1810 CCV2	1.53 (mg/L)	1.50 (mg/L)	2.0 %D	2.2 %D	
Calibration verification	F	1810 CCV2	1.03 (mg/L)	1.00 (mg/L)	3.0 %D	2.8 %D	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1623 SRM	Laboratory control sample	NO_3/NO_2-N	1726 (µg/L)	1810 (µg/L)	95.4	95.4	Y
2352 11	Matrix spike sample	PO_4-P	(SSR-SR) 3363 (µg/L)	2500 (µg/L)	135	135	↓
2319/2336 13	Duplicate sample	SO_4	9585 (µg/L)	10287 (µg/L)	7	7	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38423B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: KR

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, F reported with a positive detect were recalculated and verified using the following equation:

Concentration =

$y = mx + b$
where
$m = 117591.5$
$b = -10814.6$
$dil = 1x$

Recalculation:

$1399 = 117591.5(x) - 10814.6$

$0.10386\ mg/L = x$

then $(0.10386\ mg/L)(1000\ \mu g/mg) = 103.86\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	F	104	104	Y
2	2	Total CN	87.5	87.4	
3	3	NO_3/NO_2-N	426	426	
4	4	TDS	211 (mg/L)	211 (mg/L)	
5	5	Hardness	258000	258000	
6	6	TSS	31.8 (mg/L)	31.8 (mg/L)	
7	7	Free CN	2.9	2.9	
8	8	Alkalinity	218000	218000	
9	9	Cl	977	977	
10	10	SO_4	7400	7400	

Note: methods 350.1 and 9056A are N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130333-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	460-130333-3	Water	03/24/17
CFMW-002-GW	460-130333-4	Water	03/24/17
CFMW-010-GW	460-130333-5	Water	03/24/17
CFMW-029-GW	460-130333-6	Water	03/24/17
CFMW-038-GW	460-130333-7	Water	03/24/17
CFMW-044b-GW	460-130333-9	Water	03/24/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/28/17	Trichlorofluoromethane	23.8	TRIP BLANK CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

LDC #: 38423C1 **VALIDATION COMPLETENESS WORKSHEET** Date: 4/18/17
SDG #: 460-130333-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer: EJ
2nd Reviewer: MC

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD/~~r~~ ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	< RL
VI.	Field blanks	ND	TB = 1
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	460-130225-2 MS/D
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

		Client ID	Lab ID	Matrix	Date
1	2	TRIP BLANK	460-130333-3	Water	03/24/17
2	2	CFMW-002-GW	460-130333-4	Water	03/24/17
3	2	CFMW-010-GW	460-130333-5	Water	03/24/17
4	2	CFMW-029-GW	460-130333-6	Water	03/24/17
5	2	CFMW-038-GW	460-130333-7	Water	03/24/17
6	1	CFMW-044b-GW	460-130333-9	Water	03/24/17
7					
8					
9					

Notes:

*1	MB 460-426775						
2	MB 460-426673						

LDC #: 38423C1

VALIDATION FINDINGS CHECKLIST

Reviewer: EF
2nd Reviewer: DE

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.	✓			< RL
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 38423 c1

VALIDATION FINDINGS CHECKLIST

Reviewer: PD
2nd Reviewer: PD

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38423C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	3/28/17 0831	CCV-8	KK	23.8		1-75, MB 460-426673	J+ all / A ND

CONCAL.wpd

LDC #: 38423A9

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/12/2017	F	0.6453	0.6453	0.7396	0.7396	13.3	13.3
	GCMS8		C	0.2639	0.2639	0.2818	0.2818	13.4	13.4
			CC	1.3859	1.3859	1.3706	1.3706	9.1	9.1
			JJJ	1.3367	1.3367	1.3296	1.3296	8.8	8.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423A C

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 2027	3/28/17	F (1st internal standard)	0.7396	0.7138	0.7138	3.5	3.5
			C (2nd internal standard)	0.2818	0.3047	0.3047	8.1	8.1
			CC (3rd internal standard)	1.3706	1.433	1.433	4.6	4.6
			JJJ (4th internal standard)	1.3296	1.374	1.374	3.3	3.3
2	CCV 0831	3/28/17	(1st internal standard)		0.7015	0.7015	5.1	5.1
			(2nd internal standard)		0.3165	0.3165	12.3	12.3
			(3rd internal standard)		1.432	1.432	4.5	4.5
			(4th internal standard)		1.346	1.346	1.2	1.2
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 c/

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: RA

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 6

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.7	107	107	0
1,2-Dichloroethane-d4	↓	55.9	112	112	↓
Toluene-d8	↓	48.2	96	96	↓
Bromofluorobenzene	↓	51.2	102	102	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38423A1 C

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-426775

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	20.8	NA	104	104				
Trichloroethene	↓	↓	19.5	↓	97	97				
Benzene	↓	↓	20.1	↓	101	101				
Toluene	↓	↓	20.1	↓	100	100				
Chlorobenzene	↓	↓	19.4	↓	97	97	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423C

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 6 , F :

Conc. = $\frac{4316\ (250)}{295876\ (0.7396)}$

= 4.9 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130333-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-002-GW	460-130333-4	Water	03/24/17
CFMW-010-GW	460-130333-5	Water	03/24/17
CFMW-029-GW	460-130333-6	Water	03/24/17
CFMW-038-GW	460-130333-7	Water	03/24/17
CFMW-044b-GW	460-130333-9	Water	03/24/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/29/17 (06:07)	Hexachlorocyclopentadiene Di-n-butylphthalate	24.1 22.6	All samples in SDG 460-130333-1	UJ (all non-detects) UJ (all non-detects)	A
03/29/17 (06:07)	Indeno(1,2,3-cd)pyrene	28.4	All samples in SDG 460-130333-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. Surrogate recoveries (%R) were not within QC limits for samples CFMW-044b-GW. Using professional judgment, no data were qualified when one base or one acid surrogate %R was outside the QC limits and the %R was greater than or equal to 10%.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LCS/D 460-426755 (All samples in SDG 460-130333-1)	Caprolactam	33 (≤30)	UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD RPD, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130333-1

Sample	Compound	Flag	A or P	Reason
CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW CFMW-044b-GW	Hexachlorocyclopentadiene Di-n-butylphthalate	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW CFMW-044b-GW	Caprolactam	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

LDC #: 38423C2a

SDG #: 460-130333-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/19/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r^2 ICV ± 30
IV.	Continuing calibration	SW	CCV ± 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	N	
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-002-GW	460-130333-4	Water	03/24/17
2	CFMW-010-GW	460-130333-5	Water	03/24/17
3	CFMW-029-GW	460-130333-6	Water	03/24/17
4	CFMW-038-GW	460-130333-7	Water	03/24/17
5	CFMW-044b-GW	460-130333-9	Water	03/24/17
6				
7				
8				
9				

Notes:

	MB 460-426755						

LDC #: 38423 C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: EF
2nd Reviewer: MK

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?		✓		
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38423C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: EM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38423c2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KP

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	3/29/17	CCV - 4	X	24.1		All	J- /UJ/A ND
-	0607		XX	22.6		↓	↓
+			JJJ	28.4		↓	J+ all /A ↓

LDC #: 38423C2a

VALIDATION FINDINGS WORKSHEET

Surrogate Recovery

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

- Y N N/A (N circled) Were percent recoveries (%R) for surrogates within QC limits?
- Y N N/A (N/A circled) If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?
- Y N N/A (N/A circled) If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Sample ID	Surrogate	%R (Limits)	Qualifications
	5	NBZ	109 (51-108)	no qual
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
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			( )	
			( )	
			( )	

(NBZ) = Nitrobenzene - d5
(FBP) = 2-Fluorobiphenyl
(TPH) = Terphenyl - d14
(2FP) = 2-Fluorophenol
(TBP) = 2,4,6 -Tribromophenol
(2CP) = 2-Chlorophenol - d4

LDC #: 38423C2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCSID 460-426755	MMMM	( )	( )	33 (30)	all	J/UJ/P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 38423 C2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: EK

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	3/22/2017	A	1.7541	1.7541	2.0032	2.0032	8.0	8.0
			S	0.8427	0.8427	0.9561	0.9561	12.1	12.1
			GG	1.2648	1.2648	1.3931	1.3931	10.1	10.1
			UU	0.9899	0.9899	1.1288	1.1288	6.9	6.9
			DDD	0.9245	0.9245	1.0588	1.0588	6.2	6.2
			III	1.0808	1.0808	1.0963	1.0963	6.3	6.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423c2e

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CAV 0607	3/29/17	A (1st IS)	2.0032	1.809	1.809	9.7	9.7
			S (2nd IS)	0.9561	0.8557	0.8557	10.5	10.5
			GG (3rd IS)	1.3931	1.149	1.149	17.5	17.5
			HH (4th IS)	1.1288	1.000	1.000	11.4	11.4
			DDD (5th IS)	1.0588	0.9856	0.9856	6.9	6.9
			III (6th IS)	1.0963	1.118	1.118	2.0	2.0
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 e2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 5

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	10.9	109	109	0
2-Fluorobiphenyl	↓	9.59	96	96	↓
Terphenyl-d14	↓	9.93	99	99	↓
Phenol-d5	↓	3.89	39	39	↓
2-Fluorophenol	↓	5.54	55	55	↓
2,4,6-Tribromophenol	↓	10.1	101	101	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38423C2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS / LCSD 460 - 426755

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	29.2	28.2	37	37	35	35	4	4
N-Nitroso-di-n-propylamine	↓	↓	79.8	76.1	100	100	95	95	5	5
4-Chloro-3-methylphenol			67.3	71.3	84	84	89	89	6	6
Acenaphthene			63.5	65.2	79	79	81	81	3	3
Pentachlorophenol	160.0	160	151	130	95	95	81	81	16	16
Pyrene	80	80	76.0	77.4	95	95	97	97	2	2

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423c2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-426755 A

Conc. = $\frac{481029\ (8.0)\ (2)\ (1000)}{525916\ (\cancel{1.6522})\ (250)}$ 2.003 FT

=

29.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 25, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130333-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB24-AQ	460-130333-1	Water	03/24/17
CFMW-025a-GWF	460-130333-2F	Water	03/24/17
CFMW-002-GWF	460-130333-4F	Water	03/24/17
CFMW-010-GWF	460-130333-5F	Water	03/24/17
CFMW-029-GWF	460-130333-6F	Water	03/24/17
CFMW-038-GWF	460-130333-7F	Water	03/24/17
CFMW-045a-GWF	460-130333-8F	Water	03/24/17
CFMW-044b-GWF	460-130333-9F	Water	03/24/17
CFMW-025a-GWFMS	460-130333-2FMS	Water	03/24/17
CFMW-025a-GWFMSD	460-130333-2FMSD	Water	03/24/17
CFMW-025a-GWFDUP	460-130333-2FDUP	Water	03/24/17

Samples appended with "F" were analyzed as dissolved

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB24-AQ was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. For CFMW-025a-GWFMS/MSD, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

LDC #: 38423C4a

SDG #: 460-130333-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-25-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	ND	EB = 1 (< RL)
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD Ba, Ca, Mg, Na - 4x
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 2
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-EB24-AQ	460-130333-1	Water	03/24/17
2 2	CFMW-025a-GWF	460-130333-2F	Water	03/24/17
3 2	CFMW-002-GWF	460-130333-4F	Water	03/24/17
4 2	CFMW-010-GWF	460-130333-5F	Water	03/24/17
3 5 2	CFMW-029-GWF	460-130333-6F	Water	03/24/17
3 6 2	CFMW-038-GWF	460-130333-7F	Water	03/24/17
3 7 2	CFMW-045a-GWF	460-130333-8F	Water	03/24/17
3 8 2	CFMW-044b-GWF	460-130333-9F	Water	03/24/17
9 2	CFMW-025a-GWFMS	460-130333-2FMS	Water	03/24/17
10 2	CFMW-025a-GWFMSD	460-130333-2FMSD	Water	03/24/17
11 2	CFMW-025a-GWFDUP	460-130333-2FDUP	Water	03/24/17
12 1	PBW1			
13 2	PBW2			
14 3	PBW3 (Hg)			

Notes:

LDC #: 38423C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38423C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) ≤ 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 38423C4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 9, 11	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
↓ 10	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38423C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1548 ICV	ICP/MS (Initial calibration)	Ni	40.052	40.0	100	100	Y
1407 ICV	CVAA (Initial calibration)	Hg	5.0630	5.00	101	101	↓
	ICP (Continuing calibration)						↓
1859 CCV8	ICP/MS (Continuing calibration)	Tl	10.005	10.0	100	100	↓
1544 CCV5	CVAA (Continuing calibration)	Hg	4.8130	5.00	96	96	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: EK

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1600 ICSAB	ICP interference check	Cu	190.7 (µg/L)	200 (µg/L)	95	95	Y
1840 LCS	Laboratory control sample	Sb	5.268 (µg/L)	5.00 (µg/L)	105	105	↓
1842 9	Matrix spike	Zn	(SSR-SR) 109.0 (µg/L)	100 (µg/L)	109	109	↓
1847 / 1844 11	Duplicate	Fe	293.4 (µg/L)	284.3 (µg/L)	3	3	↓
1847 / 1849 2	ICP serial dilution	Mg	22943 (µg/L)	23363 (µg/L)	1.8	1.8	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423C4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(36.633\ \mu g/L)(0.050\ L)(2)}{0.050} = 73.266\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Ca	73.3	73.3	Y
2	2	As	1.6	1.6	
3	3	Co	8.6	8.6	
4	4	Se	1.1	1.1	
5	5	Cr	7.3	7.3	
6	6	Ba	239	239	
7	7	Fe	317	317	
8	8	Zn	26.6	26.6	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 27, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130333-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB24-AQ	460-130333-1	Water	03/24/17
CFMW-025a-GW	460-130333-2	Water	03/24/17
CFMW-002-GW	460-130333-4	Water	03/24/17
CFMW-010-GW	460-130333-5	Water	03/24/17
CFMW-029-GW	460-130333-6	Water	03/24/17
CFMW-038-GW	460-130333-7	Water	03/24/17
CFMW-045a-GW	460-130333-8	Water	03/24/17
CFMW-044b-GW	460-130333-9	Water	03/24/17
CFMW-025a-GWMS	460-130333-2MS	Water	03/24/17
CFMW-025a-GWMSD	460-130333-2MSD	Water	03/24/17
CFMW-025a-GWDUP	460-130333-2DUP	Water	03/24/17
CFMW-029-GWMS	460-130333-6MS	Water	03/24/17
CFMW-029-GWMSD	460-130333-6MSD	Water	03/24/17
CFMW-029-GWDUP	460-130333-6DUP	Water	03/24/17
CFMW-038-GWDUP	460-130333-7DUP	Water	03/24/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB24-AQ was identified as an equipment blank. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-029-GWMS/MSD (CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW CFMW-045a-GW)	Chloride	133 (90-110)	130 (90-110)	J+ (all detects)	A
CFMW-029-GWMS/MSD (CFMW-029-GW CFMW-038-GW CFMW-045a-GW)	Fluoride	114 (90-110)	114 (90-110)	J+ (all detects)	A
CFMW-029-GWMS/MSD (CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW)	Sulfate	145 (90-110)	141 (90-110)	J+ (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-025a-GWMS/MSD (CFMW-EB24-AQ CFMW-025a-GW CFMW-044b-GW)	Chloride	121 (90-110)	122 (90-110)	J+ (all detects)	A
CFMW-025a-GWMS/MSD (CFMW-025a-GW CFMW-044b-GW)	Sulfate	133 (90-110)	133 (90-110)	J+ (all detects)	A
CFMW-025a-GWMS/MSD (CFMW-EB24-AQ)	Sulfate	133 (90-110)	133 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-025a-GWDUP (CFMW-025a-GW CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW CFMW-045a-GW CFMW-044b-GW)	Total suspended solids	12 (≤5)	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130333-1

Sample	Analyte	Flag	A or P	Reason
CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW CFMW-045a-GW CFMW-EB24-AQ CFMW-025a-GW CFMW-044b-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-029-GW CFMW-038-GW CFMW-045a-GW	Fluoride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW CFMW-025a-GW CFMW-044b-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-025a-GW CFMW-002-GW CFMW-010-GW CFMW-029-GW CFMW-038-GW CFMW-045a-GW CFMW-044b-GW	Total suspended solids	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130333-1

No Sample Data Qualified in this SDG

LDC #: 38423C6

SDG #: 460-130333-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-25-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	ND	EB=1 (< RL)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB24-AQ	460-130333-1	Water	03/24/17
2	CFMW-025a-GW	460-130333-2	Water	03/24/17
3	CFMW-002-GW	460-130333-4	Water	03/24/17
4	CFMW-010-GW	460-130333-5	Water	03/24/17
5	CFMW-029-GW	460-130333-6	Water	03/24/17
6	CFMW-038-GW	460-130333-7	Water	03/24/17
7	CFMW-045a-GW	460-130333-8	Water	03/24/17
8	CFMW-044b-GW	460-130333-9	Water	03/24/17
9	CFMW-025a-GWMS	460-130333-2MS	Water	03/24/17
10	CFMW-025a-GWMSD	460-130333-2MSD	Water	03/24/17
11	CFMW-025a-GWDUP	460-130333-2DUP	Water	03/24/17
12	CFMW-029-GWMS	460-130333-6MS	Water	03/24/17
13	CFMW-029-GWMSD	460-130333-6MSD	Water	03/24/17
14	CFMW-029-GWDUP	460-130333-6DUP	Water	03/24/17
15	CFMW-038-GWDUP	460-130333-7DUP	Water	03/24/17
16				

LDC #: 38423C6

SDG #: 460-130333-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-25-17

Reviewer: MG

2nd Reviewer: PA

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), TDS (SM2540C), TSS (SM2540D)

	Client ID	Lab ID	Matrix	Date
17				
18	PBW1			
19	PBW2			
20	PBW3			

Notes:

LDC #: 3842306

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: MW

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)	✓		✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38423C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 38423C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
3→8	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS Free CN
QC 9,10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
12→14	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38423C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications	
1	12/13	water	Cl	133 (90-110)	130 (90-110)		3→7	J+ dets/A	(all dets)
	↓	↓	F	114 (↓)	114 (↓)		5→7	↓	(↓)
			SO4	145 (↓)	141 (↓)		3→6	↓	(↓)
2	9/10	↓	Cl	121 (↓)	122 (↓)		1,2,8	↓	(all dets)
	↓	↓	SO4	133 (↓)	133 (↓)		↓	↓	(det in 2,8)

Comments:

LDC #: 38423C6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		11	water	TSS	12 (≤5)	2→8	J/UJ/A (all dets)

Comments:

DUP.6

LDC #: 38423C6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of NO_3/NO_2-N was recalculated. Calibration date: 3-29-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	NO_3/NO_2-N	Blank	0.0 (mg/L)	0	r = 0.9991	r = 0.9991	Y
		Standard 1	0.1 ( )	738637			
		Standard 2	0.5 ( )	3539584			
		Standard 3	1.0 ( )	6996429			
		Standard 4	1.5 ( )	10220314			
		Standard 5	2.0 ( )	13003546			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Free CN	1535 CCV2	50.86 (µg/L)	50.0 (µg/L)	102	102	
Calibration verification	Total CN	1727 CCV4	0.199 (mg/L)	0.200 (mg/L)	100	100	
Calibration verification	Cl	1037 CCV1	1.55 (mg/L)	1.50 (mg/L)	3.3 %D	3.4 %D	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423C6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: EK

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1317 LCS	Laboratory control sample	NH_3-N	1008 (µg/L)	1000 (µg/L)	101	101	Y
1733 9	Matrix spike sample	Total CN	(SSR-SR) 187 (µg/L)	200 (µg/L)	94	94	↓
0941/0941 11	Duplicate sample	TSS	61.60 (mg/L)	69.40 (mg/L)	12	12	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38423C6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: KM

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = mx + b$
where
$m = 79773.5$
$b = -4876.7$
dil = 1x

Recalculation:
~~Cl m~~ $3406 = 79773.5(x) - 4876.7$
$0.1038\ mg/L = x$
then $(0.1038\ mg/L)(1000\ \mu g/mg) = 103.8\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cl	104	104	Y
2	2	NH_3-N	81.4	81.4	
3	3	Free CN	306	306	
4	4	Total CN	1020	1020	
5	5	NO_3/NO_2-N	1610	1610	
6	6	Alkalinity	281000	281000	
7	7	Hardness	226000	226000	
8	8	TDS	208 (mg/L)	208 (mg/L)	
	↓	TSS	23.0 (mg/L)	23.0 (mg/L)	↓

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130410-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-027-GW	460-130410-6	Water	03/27/17
CFMW-011-GW	460-130410-7	Water	03/27/17
CFMW-032-GW	460-130410-8	Water	03/27/17
Trip Blank	460-130410-9	Water	03/27/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

LDC #: 38423D1

SDG #: 460-130410-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/18/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² IV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	< RL
VI.	Field blanks	ND	TB = 4
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-027-GW	460-130410-6	Water	03/27/17
2	CFMW-011-GW	460-130410-7	Water	03/27/17
3	CFMW-032-GW	460-130410-8	Water	03/27/17
4	Trip Blank	460-130410-9	Water	03/27/17
5				
6				
7				
8				

Notes:

	MB 460-427416						

LDC #: 38423D1

VALIDATION FINDINGS CHECKLIST

Reviewer:
2nd Reviewer: MR

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 38423D1

VALIDATION FINDINGS CHECKLIST

Reviewer: EJ
2nd Reviewer: MC

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38423D1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/12/2017	F	0.6453	0.6453	0.7396	0.7396	13.3	13.3
	GCMS8		C	0.2639	0.2639	0.2818	0.2818	13.4	13.4
			CC	1.3859	1.3859	1.3706	1.3706	9.1	9.1
			JJJ	1.3367	1.3367	1.3296	1.3296	8.8	8.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0950	3/31/17	F (1st internal standard)	0.7396	0.8470	0.8470	14.5	14.5
			C (2nd internal standard)	0.2818	0.3105	0.3105	10.2	10.2
			CC (3rd internal standard)	1.3706	1.487	1.487	8.5	8.5
			JJJ (4th internal standard)	1.3296	1.442	1.442	8.5	8.5
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 D1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: KN

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	52.5	105	105	0
1,2-Dichloroethane-d4	↓	54.9	110	110	↓
Toluene-d8	↓	47.3	95	95	↓
Bromofluorobenzene	↓	50.5	101	101	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38423P1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs 460 - 427416

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	21.1	20.7	106	106	104	104	2	2
Trichloroethene			19.9	20.5	99	99	103	103	3	3
Benzene			21.1	21.5	105	105	108	108	2	2
Toluene			20.4	21.0	102	102	105	105	3	3
Chlorobenzene			20.0	20.0	100	100	100	100	0	0

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423D1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. ICS 460-427416 CC

Conc. = $\frac{2657320\ (500)}{474155\ (1.3706)}$

= 20.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130410-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-027-GW	460-130410-6	Water	03/27/17
CFMW-011-GW	460-130410-7	Water	03/27/17
CFMW-032-GW	460-130410-8	Water	03/27/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
03/30/17 (00:55)	4-Nitroaniline Pyrene	22.0 21.1	All samples in SDG 460-130410-1	UJ (all non-detects) UJ (all non-detects)	A
03/30/17 (00:55)	Indeno(1,2,3-cd)pyrene	29.6	All samples in SDG 460-130410-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130410-1

Sample	Compound	Flag	A or P	Reason
CFMW-027-GW CFMW-011-GW CFMW-032-GW	4-Nitroaniline Pyrene	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

LDC #: 38423D2a

SDG #: 460-130410-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/19/17

Page: 1 of 1

Reviewer: EJ

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	A	LCS/LCSD
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-027-GW	460-130410-6	Water	03/27/17
2	CFMW-011-GW	460-130410-7	Water	03/27/17
3	CFMW-032-GW	460-130410-8	Water	03/27/17
4				
5				
6				
7				
8				

Notes:

	MB 460-426877					

LDC #: 38423D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: EF
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?				
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38423 D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38423 D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
-	3/30/17	ccv-4	OO	22.0		all	J-/UJ/A (ND)
-	0055		ZZ	21.1		↓	↓
+			JJJ	29.6		↓	J+/UJ/A ↓

CONCAL.wpd

LDC #: 38423D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	3/22/2017	A	1.7541	1.7541	2.0032	2.0032	8.0	8.0
			S	0.8427	0.8427	0.9561	0.9561	12.1	12.1
			GG	1.2648	1.2648	1.3931	1.3931	10.1	10.1
			UU	0.9899	0.9899	1.1288	1.1288	6.9	6.9
			DDD	0.9245	0.9245	1.0588	1.0588	6.2	6.2
			III	1.0808	1.0808	1.0963	1.0963	6.3	6.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV0055	3/30/17	Δ (1st IS)	2.0032	1.814	1.814	9.4	9.4
			S (2nd IS)	0.9561	0.8699	0.8699	9.0	9.0
			GG (3rd IS)	1.3931	1.134	1.134	18.6	18.6
			UU (4th IS)	1.1288	0.9823	0.9823	13.0	13.0
			DDD (5th IS)	1.0588	0.9816	0.9816	7.3	7.3
			III (6th IS)	1.0963	1.040	1.040	5.2	5.2
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423D2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.60	86	86	0
2-Fluorobiphenyl		7.89	79	79	
Terphenyl-d14		7.66	77	77	
Phenol-d5		2.76	28	28	
2-Fluorophenol		4.15	42	42	
2,4,6-Tribromophenol		7.95	80	80	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38423 D2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS/D 460 – 426877

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	19.4	19.4	24	24	24	24	0	0
N-Nitroso-di-n-propylamine			69.6	71.0	87	87	89	89	2	2
4-Chloro-3-methylphenol			57.3	59.0	72	72	74	74	3	3
Acenaphthene			64.7	67.7	81	81	85	85	5	5
Pentachlorophenol	160	160	132	139	83	83	87	87	5	5
Pyrene	80.0	80.0	66.3	66.2	83	83	83	83	0	0

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423D2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-426877 - Phenol

Conc. = $\frac{(3003531)(8.0)(2)(1000)}{(4946683)(2.0032)(250)}$
=

19.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 27, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130410-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB25-AQ	460-130410-1	Water	03/27/17
CFMW-019a-GWF	460-130410-2F	Water	03/27/17
CFMW-016a-GWF	460-130410-3F	Water	03/27/17
CFMW-053a-GWF	460-130410-4F	Water	03/27/17
CFMW-DUP9-GWF	460-130410-5F	Water	03/27/17
CFMW-027-GWF	460-130410-6F	Water	03/27/17
CFMW-011-GWF	460-130410-7F	Water	03/27/17
CFMW-032-GWF	460-130410-8F	Water	03/27/17
CFMW-016a-GWFMS	460-130410-3FMS	Water	03/27/17
CFMW-016a-GWFDUP	460-130410-3FDUP	Water	03/27/17

Samples appended with "F" were analyzed as dissolved

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB25-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB25-AQ	03/27/17	Calcium Nickel Potassium Sodium Zinc	699 ug/L 4.6 ug/L 502 ug/L 1010 ug/L 28.5 ug/L	CFMW-027-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-027-GWF	Potassium	1110 ug/L	1110J+ ug/L

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-016a-GWFMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-019a-GWF and CFMW-DUP9-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-019a-GWF	CFMW-DUP9-GWF			
Aluminum	20.6	18.2U	12 (≤30)	-	-
Arsenic	1.2	1.2	0 (≤30)	-	-
Barium	42.5	42.6	0 (≤30)	-	-
Calcium	30100	30300	1 (≤30)	-	-
Iron	61.8	65.1	5 (≤30)	-	-
Magnesium	11400	11600	2 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-019a-GWF	CFMW-DUP9-GWF			
Manganese	221	225	2 (≤30)	-	-
Nickel	1.7	1.4U	19 (≤30)	-	-
Potassium	2770	2820	2 (≤30)	-	-
Sodium	22200	22600	2 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130410-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-027-GWF	Potassium	1110J+ ug/L	A

LDC #: 38423D4a
SDG #: 460-130410-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 4-26-17
Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	< RL
VI.	Field Blanks	SW	EB = 1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (Ba, Ca, Mg, Na – 4x)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 3
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	~~D = 475~~ D = 2 + 5
XII.	Internal Standard (ICP-MS)	A	mA
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-EB25-AQ	460-130410-1	Water	03/27/17
2 2	CFMW-019a-GWF	460-130410-2F	Water	03/27/17
3 2	CFMW-016a-GWF	460-130410-3F	Water	03/27/17
4 2	CFMW-053a-GWF	460-130410-4F	Water	03/27/17
5 2	CFMW-DUP9-GWF	460-130410-5F	Water	03/27/17
6 2	CFMW-027-GWF	460-130410-6F	Water	03/27/17
7 2	CFMW-011-GWF	460-130410-7F	Water	03/27/17
8 2	CFMW-032-GWF	460-130410-8F	Water	03/27/17
9 2	CFMW-016a-GWFMS	460-130410-3FMS	Water	03/27/17
10 2	CFMW-016a-GWFDUP	460-130410-3FDUP	Water	03/27/17
11				
12 1	PBW1			
13 2	PBW2			
14 3	PBW3 (Hg)			

Notes:

LDC #: 38423D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38423D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38423D4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
QC 9, 10	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____

Comments: Mercury by CVAA if performed

LDC #: 38423D4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/27/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 6

Analyte	Blank ID	Sample Identification										
	1	Action Level	6									
Ca	699	6990										
Ni	4.6	46.0										
K	502	5020	1110J+									
Na	1010	10100										
Zn	28.5	285										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 38423D4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	2	5		
Aluminum	20.6	18.2U	12	
Arsenic	1.2	1.2	0	
Barium	42.5	42.6	0	
Calcium	30100	30300	1	
Iron	61.8	65.1	5	
Magnesium	11400	11600	2	
Manganese	221	225	2	
Nickel	1.7	1.4U	19	
Potassium	2770	2820	2	
Sodium	22200	22600	2	

V:\FIELD DUPLICATES\FD_inorganic\38423D4a.WPD

LDC #: 38423D4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1236 ICV	ICP/MS (Initial calibration)	Al	403.778	400	101	101	Y
1330 ICV	CVAA (Initial calibration)	Hg	4.9837	5.00	100	100	↓
	ICP (Continuing calibration)						↓
1657 CCV_{10}	ICP/MS (Continuing calibration)	Mn	494.810	500	99	99	↓
1507 CCV5	CVAA (Continuing calibration)	Hg	5.0391	5.00	101	101	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423D4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1249 ICSAB	ICP interference check	Ag	205.0 (µg/L)	200 (µg/L)	102	102	Y
1953 LCS	Laboratory control sample	Se	11.52 (µg/L)	10.0 (µg/L)	115	115	↓
1642 9	Matrix spike	Cu	(SSR-SR) 21.91 (µg/L)	20.0 (µg/L)	110	110	↓
1647 / 1644 10	Duplicate	Ba	262.7 (µg/L)	257.4 (µg/L)	2	2	↓
1647 / 1649 3	ICP serial dilution	Ca	56769 (µg/L)	57430 (µg/L)	1.2	1.2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 38423D4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: PC

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Ni were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(2.302\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 4.604\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Ni	4.6	4.6	Y
2	2	As	1.2	1.2	
3	3	K	892	892	
4	4	Sb	1.3	1.3	
5	5	Fe	65.1	65.1	
6	6	Co	2.5	2.5	
7	7	Mg	18 000	18000	
8	8	Cu	2.6	2.6	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 3, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130410-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB25-AQ	460-130410-1	Water	03/27/17
CFMW-019a-GW	460-130410-2	Water	03/27/17
CFMW-016a-GW	460-130410-3	Water	03/27/17
CFMW-053a-GW	460-130410-4	Water	03/27/17
CFMW-DUP9-GW	460-130410-5	Water	03/27/17
CFMW-027-GW	460-130410-6	Water	03/27/17
CFMW-011-GW	460-130410-7	Water	03/27/17
CFMW-032-GW	460-130410-8	Water	03/27/17
CFMW-016a-GWMS	460-130410-3MS	Water	03/27/17
CFMW-016a-GWMSD	460-130410-3MSD	Water	03/27/17
CFMW-016a-GWDUP	460-130410-3DUP	Water	03/27/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
03/28/17	CCV (15:11)	Orthophosphate as P	128 (90-110)	All samples in SDG 460-1304710-1	NA	-
03/28/17	CCV(18:44)	Orthophosphate as P	126 (90-110)	All samples in SDG 460-1304710-1	NA	-

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB25-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB25-AQ	03/27/17	Alkalinity	5200 ug/L	CFMW-027-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated field blanks with the following exceptions:

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-016a-GWMS/MSD (CFMW-EB25-AQ CFMW-019a-GW CFMW-016a-GW CFMW-DUP9-GW CFMW-027-GW CFMW-011-GW CFMW-032-GW)	Chloride	122 (90-110)	127 (90-110)	J+ (all detects)	A
CFMW-016a-GWMS/MSD (CFMW-019a-GW CFMW-016a-GW CFMW-053a-GW CFMW-DUP9-GW CFMW-027-GW CFMW-011-GW CFMW-032-GW)	Fluoride	113 (90-110)	-	J+ (all detects)	A
CFMW-016a-GWMS/MSD (CFMW-EB25-AQ)	Fluoride	113 (90-110)	-	NA	-
CFMW-016a-GWMS/MSD (CFMW-019a-GW CFMW-016a-GW CFMW-053a-GW CFMW-DUP9-GW CFMW-011-GW CFMW-032-GW)	Sulfate	136 (90-110)	136 (90-110)	J+ (all detects)	A
CFMW-016a-GWMS/MSD (CFMW-EB25-AQ)	Sulfate	136 (90-110)	136 (90-110)	NA	-
CFMW-016a-GWMS/MSD (All samples in SDG 460-130410-1)	Orthophosphate as P	133 (90-110)	136 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-016a-GWDUP (CFMW-019a-GW CFMW-016a-GW CFMW-053a-GW CFMW-DUP9-GW CFMW-027-GW CFMW-011-GW CFMW-032-GW)	Total suspended solids	11 (≤5)	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD (All samples in SDG 460-130410-1)	Orthophosphate as P	132 (90-110)	134 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits with the following exceptions:

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFMW-019a-GW and CFMW-DUP9-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-019a-GW	CFMW-DUP9-GW			
Alkalinity	182000 ug/L	190000 ug/L	4 (≤30)	-	-
Chloride	1180 ug/L	1740 ug/L	38 (≤30)	J (all detects)	A
Fluoride	214 ug/L	201 ug/L	6 (≤30)	-	-
Hardness	164000 ug/L	156000 ug/L	5 (≤30)	-	-
Sulfate	6680 ug/L	6730 ug/L	1 (≤30)	-	-
Total dissolved solids	199 mg/L	180 mg/L	10 (≤30)	-	-

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-019a-GW	CFMW-DUP9-GW			
Total suspended solids	95.2 mg/L	172 mg/L	57 (≤30)	J (all detects)	A

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, DUP RPD, and field duplicate RPD, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130410-1

Sample	Analyte	Flag	A or P	Reason
CFMW-EB25-AQ CFMW-019a-GW CFMW-016a-GW CFMW-DUP9-GW CFMW-027-GW CFMW-011-GW CFMW-032-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-019a-GW CFMW-016a-GW CFMW-053a-GW CFMW-DUP9-GW CFMW-027-GW CFMW-011-GW CFMW-032-GW	Fluoride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-019a-GW CFMW-016a-GW CFMW-053a-GW CFMW-DUP9-GW CFMW-011-GW CFMW-032-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-019a-GW CFMW-016a-GW CFMW-053a-GW CFMW-DUP9-GW CFMW-027-GW CFMW-011-GW CFMW-032-GW	Total suspended solids	J (all detects)	A	Duplicate sample analysis (RPD)
CFMW-019a-GW CFMW-DUP9-GW	Chloride Total suspended solids	J (all detects) J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130410-1

No Sample Data Qualified in this SDG

LDC #: 38423D6
SDG #: 460-130410-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 4-26-17
Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	SW	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	SW	LCS/LCSD/SRM
IX.	Field duplicates	SW	~~D = 4 + 5~~ D = 2 + 5
X.	Sample result verification	A	amb
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB25-AQ	460-130410-1	Water	03/27/17
2	CFMW-019a-GW	460-130410-2	Water	03/27/17
3	CFMW-016a-GW	460-130410-3	Water	03/27/17
4	CFMW-053a-GW	460-130410-4	Water	03/27/17
5	CFMW-DUP9-GW	460-130410-5	Water	03/27/17
6	CFMW-027-GW	460-130410-6	Water	03/27/17
7	CFMW-011-GW	460-130410-7	Water	03/27/17
8	CFMW-032-GW	460-130410-8	Water	03/27/17
9	CFMW-016a-GWMS	460-130410-3MS	Water	03/27/17
10	CFMW-016a-GWMSD	460-130410-3MSD	Water	03/27/17
11	CFMW-016a-GWDUP	460-130410-3DUP	Water	03/27/17
12				
13				
14	PBW1			
15	PBW2			

Notes:

LDC #: 38423D6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?		✓		
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38423D6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard ___
2.4.5	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
3,6→8	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS Free CN
QC 9.10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ Free CN
↓ 11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ___ ___

Comments: ___

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Calibration

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
Y N N/A Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
Y N N/A Was a balance check conducted prior to the TDS analysis.?
Y N N/A Was the titrant normality checked?

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualifications
1	3-28-17	CCV (15:11)	PO4-P	128 (90-110)	all	J+ dets / P (all N.D.)
2	3-28-17	CCV (18:44)	PO4-P	126 (↓)	↓	↓ (↓)

Comments:

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/27/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 6 (>10x)

Analyte	Blank ID	Action Limit	Sample Identification									
[illegible]	1		No Qual.									
Alkalinity	5200	52000										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications	
1	9/10	water	Cl	122 (90-110)	127 (90-110)		1→3, 5→8	J+ dets/A	(all dets)
	↓	↓	F	113 (↓)	↓		all	↓	(dets in 2→8)
			SO4	136 (↓)	136 (↓)		1→5, 7, 8		(dets in 2→5, 7, 8)
			PO4-P	133 (↓)	136 (↓)		all		(all N.D.)

Comments:

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		11	water	TSS	11 (≤5)	2→8	J/UJ/A (all dets)

Comments:

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	LCS/LCSD	water	PO4-P	132 (90-110)	134 (90-110)		all	J+ dets/P (all N.D.)

Comments:

LDC#: 38423D6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	2	5		
Alkalinity	182000	190000	4	
Chloride	1180	1740	38	J/UJ/A (all dets)
Fluoride	214	201	6	
Hardness	164000	156000	5	
Sulfate	6680	6730	1	
TDS (mg/L)	199	180	10	
TSS (mg/L)	95.2	172	57	J/UJ/A (all dets)

V:\FIELD DUPLICATES\FD_inorganic\38423D6.WPD

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Cl was recalculated. Calibration date: 3-7-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Cl	Blank	–	–	$r^2 = 0.9982$	$r^2 = 0.9980$	Y
		Standard 1	0.12 (mg/L)	7688			
		Standard 2	0.30 ( )	24717			
		Standard 3	1.50 ( )	109480			
		Standard 4	3.00 ( )	221229			
		Standard 5	4.50 ( )	363203			
		Standard 6	6.00 ( )	474531			
		Standard 7	–	–			
Calibration verification	NO_3/NO_2-N	1610 CCV1	1.021 (mg/L)	1.00 (mg/L)	102	102	
Calibration verification	NH_3-N	1347 CCV1	2.04 (mg/L)	2.00 (mg/L)	102	102	
Calibration verification	Total CN	1452 CCV4	0.196 (mg/L)	0.200 (mg/L)	98	not reported	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1230 SRM	Laboratory control sample	Hardness	(µg/L) 280000	(µg/L) 280000	100.0	100.0	Y
2054 9	Matrix spike sample	PO_4-P	(SSR-SR) 3323 (µg/L)	2500 (µg/L)	133	133	↓
1956/2136 11	Duplicate sample	Alk	(µg/L) 230790	(µg/L) 232806	0.9	0.9	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38423D6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: KK

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #6, Free Cyanide reported with a positive detect were recalculated and verified using the following equation:

Concentration = initial vol = 3. ml
final vol = 1.3 ml

Recalculation:

$y = mx + b$

where
$m = 492.6$
$b = -1.107$

$$\text{Free CN} = \frac{[492.6(0.160) - 1.107] \times 1.3\ \text{ml}}{3.0\ \text{ml}} = 33.674\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cl	117	117	Y
2	2	TSS	95.2 (mg/L)	95.2 (mg/L)	
3	3	Total CN	2.1	2.1	
4	4	NH_3-N	444	444	
5	5	TDS	180 (mg/L)	180 (mg/L)	
6	6	Free CN	33.7	33.7	
7	7	NO_3/NO_2-N	2610	2610	
8	8	Hardness	324000	324000	
	↓	Alkalinity	634000	634000	↓

Note: method 9056A is N.D. for all samples

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 19, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130620-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-014-GW	460-130620-1	Water	03/29/17
CFMW-015-GW	460-130620-2	Water	03/29/17
CFMW-019-GW	460-130620-3	Water	03/29/17
CFMW-021-GW	460-130620-4	Water	03/29/17
Trip Blank	460-130620-5	Water	03/29/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
04/02/17	Chloroethane 1,1,2-Trichloro-1,2,2-trifluoroethane Methyl acetate Cyclohexane	27.3 20.1 26.3 21.2	All samples in SDG 460-130620-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

LDC #: 38423E1

SDG #: 460-130620-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/18/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15 / 30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 5
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-014-GW	460-130620-1	Water	03/29/17
2	CFMW-015-GW	460-130620-2	Water	03/29/17
3	CFMW-019-GW	460-130620-3	Water	03/29/17
4	CFMW-021-GW	460-130620-4	Water	03/29/17
5	Trip Blank	460-130620-5	Water	03/29/17
6				
7				
8				
9				

Notes:

	MB 460-427745						

LDC #: 38423E1

VALIDATION FINDINGS CHECKLIST

Reviewer: EJ
2nd Reviewer: KK

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 38423E1

VALIDATION FINDINGS CHECKLIST

Reviewer:
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38423E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	4/2/17	CCV-8	D	27.3		All	J+ det/A all ND
+	1838		TTT	20.1			
+			QQQQ	26.3			
			SSSS	21.2			

CONCAL.wpd

LDC #: 38423E1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/12/2017	F	0.6453	0.6453	0.7396	0.7396	13.3	13.3
	GCMS8		C	0.2639	0.2639	0.2818	0.2818	13.4	13.4
			CC	1.3859	1.3859	1.3706	1.3706	9.1	9.1
			JJJ	1.3367	1.3367	1.3296	1.3296	8.8	8.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1838	4/2/17	F (1st internal standard)	0.7396	0.7428	0.7428	0.4	0.4
			C (2nd internal standard)	0.2818	0.3328	0.3328	18.1	18.1
			CC (3rd internal standard)	1.3706	1.481	1.481	8.0	8.0
			JJ (4th internal standard)	1.3296	1.446	1.446	8.8	8.8
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 E1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: PK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.3	107	107	0
1,2-Dichloroethane-d4	↓	54.6	109	109	↓
Toluene-d8		47.8	96	96	
Bromofluorobenzene		51.3	103	103	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38423E1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/D 460 – 42745

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	22.1	21.1	110	110	105	105	5	5
Trichloroethene	↓	↓	20.4	20.3	102	102	101	101	0	0
Benzene	↓	↓	20.7	21.3	103	103	107	107	3	3
Toluene	↓	↓	20.7	20.6	104	104	103	103	1	1
Chlorobenzene	↓	↓	20.5	19.7	102	102	98	98	4	4

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38403E1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 3 , AA

Conc. = $\frac{(1729)(50.0)}{(458025)(0.3788)}$

= 0.50 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 20, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130620-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-014-GW	460-130620-1	Water	03/29/17
CFMW-015-GW	460-130620-2	Water	03/29/17
CFMW-019-GW	460-130620-3	Water	03/29/17
CFMW-021-GW	460-130620-4	Water	03/29/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
04/03/17 (23:05)	2,4-Dinitrophenol	26.1	CFMW-014-GW	UJ (all non-detects)	A
04/03/17 (23:05)	Indeno(1,2,3-cd)pyrene	21.7	CFMW-014-GW	NA	-
04/02/17	Pyrene Di-n-octylphthalate	25.6 24.4	CFMW-015-GW CFMW-019-GW CFMW-021-GW	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS 460-427482 (CFMW-014-GW)	Benzo(a)anthracene Chrysene Dibenzofuran	71 (73-119) 67 (73-121) 65 (67-108)	NA	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS %R, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130620-1

Sample	Compound	Flag	A or P	Reason
CFMW-014-GW	2,4-Dinitrophenol	UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-015-GW CFMW-019-GW CFMW-021-GW	Pyrene Di-n-octylphthalate	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-014-GW	Benzo(a)anthracene Chrysene Dibenzofuran	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

LDC #: 38423E2a

SDG #: 460-130620-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/19/17

Page: 1 of 1

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-014-GW	460-130620-1	Water	03/29/17
2 2	CFMW-015-GW	460-130620-2	Water	03/29/17
3 2	CFMW-019-GW	460-130620-3	Water	03/29/17
4 2	CFMW-021-GW	460-130620-4	Water	03/29/17
5				
6				
7				
8				

Notes:

1	MB 460-427482						
	MB 460-427624						

LDC #: 38423E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: MC

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38423E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38423E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples FT	Qualifications
-	4/3/17	CCV-4	HH	26.1		1, ~~MB 460-427482~~	J-/UJ/A (ND)
+	2305		JJJ	21.7		↓	J+ det/A
-	4/2/17	CCV-6	ZZ	25.6		2-24,	J-/UJ/A (ND)
-			FFF	24.4		MB 460-427624	↓

CONCAL.wpd

LDC #: 38423E2q

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460 -	CCC	71 (73-119)	( )	( )	1, MB 460 -427482	J-/UJ/P ND
	427482	DDD	67 (73-121)	( )	( )	↓	↓
		JJ	65 (67-108)	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 38423E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS6	4/1/2017	A	1.9611	1.9611	2.0765	2.0765	5.5	5.5
			S	0.8719	0.8719	0.9504	0.9504	12.0	12.0
			GG	1.0493	1.0493	1.0962	1.0962	6.2	6.2
			UU	0.9753	0.9753	1.0326	1.0326	4.6	4.6
			DDD	0.9782	0.9782	1.0378	1.0378	6.2	6.2
			III	1.0165	1.0165	1.1055	1.1055	5.4	5.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: EK

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	4/2/2017	A	1.9011	1.9011	2.0907	2.0907	8.4	8.4
			S	0.8869	0.8869	0.9586	0.9586	17.6	17.6
			GG	1.2108	1.2108	1.2393	1.2393	6.7	6.7
			UU	1.0145	1.0145	1.0795	1.0795	5.8	5.8
			DDD	0.9853	0.9853	1.0591	1.0591	6.4	6.4
			III	1.0593	1.0593	1.1184	1.1184	5.0	5.0

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 2305	4/3/17	A (1st IS)	2.0907	1.887	1.887	9.8	9.8
			S (2nd IS)	0.9586	0.8587	0.8587	10.4	10.4
			GG (3rd IS)	1.2393	1.171	1.171	5.5	5.5
			UU (4th IS)	1.0795	1.031	1.031	4.5	4.5
			DDD (5th IS)	1.0591	0.9514	0.9514	10.2	10.2
			III (6th IS)	1.1184	1.025	1.025	8.4	8.4
2	CCV 1100	4/2/17	A (1st IS)	2.0765	1.973	1.973	5.0	5.0
			S (2nd IS)	0.9504	0.8594	0.8594	9.6	9.6
			GG (3rd IS)	1.0962	0.996	0.996	9.1	9.1
			UU (4th IS)	1.0326	0.9587	0.9587	7.2	7.2
			DDD (5th IS)	1.0378	0.9551	0.9551	8.0	8.0
			III (6th IS)	1.1055	1.021	1.021	7.6	7.6
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423E2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	7.10	71	71	0
2-Fluorobiphenyl		6.77	68	68	
Terphenyl-d14		5.84	58	58	
Phenol-d5		1.84	18	18	
2-Fluorophenol		2.97	30	30	
2,4,6-Tribromophenol		5.71	57	57	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38423E2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: EK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 - 427482

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	~~54.1~~ 22.0	NA	~~68~~ 27	27				
N-Nitroso-di-n-propylamine			51.8		65	65				
4-Chloro-3-methylphenol			54.1		68	68				
Acenaphthene			50.1		63	63				
Pentachlorophenol	160.0		136		85	85				
Pyrene	80.0	NA	61.6		77	77	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423E2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS, 460-427482 Phenol

Conc. = $\frac{(554125)(80)(2)(1000)}{(777857)(2.0765)(250)}$

= 22 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 1, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130620-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-014-GWF	460-130620-1F	Water	03/29/17
CFMW-015-GWF	460-130620-2F	Water	03/29/17
CFMW-019-GWF	460-130620-3F	Water	03/29/17
CFMW-021-GWF	460-130620-4F	Water	03/29/17
CFMW-032a-GWF	460-130620-6F	Water	03/29/17
CFMW-057-GWF	460-130620-7F	Water	03/29/17
CFMW-059a-GWF	460-130620-8F	Water	03/29/17
CFMW-EB27-AQ	460-130620-9	Water	03/29/17
CFMW-DUP11-GWF	460-130620-10F	Water	03/29/17

Samples appended with "F" were analyzed as dissolved

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB27-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB27-AQ	03/29/17	Calcium Sodium	555 ug/L 583 ug/L	CFMW-032a-GWF

Sample concentrations were compared to concentrations detected in the field blank. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blank.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-057-GWF and CFMW-DUP11-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-057-GWF	CFMW-DUP11-GWF			
Barium	50.8	51.0	0 (≤30)	-	-
Calcium	21900	21800	0 (≤30)	-	-
Iron	3430	3420	0 (≤30)	-	-
Magnesium	20500	20200	1 (≤30)	-	-
Manganese	74.4	74.2	0 (≤30)	-	-
Potassium	1830	1820	1 (≤30)	-	-
Sodium	3920	3850	2 (≤30)	-	-
Zinc	73.9	71.3	4 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

LDC #: 38423E4a

SDG #: 460-130620-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-26-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB= 8, ~~CFMW-EB25-AQ (SDG: 460-130410-1)~~ a
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-130507-1, 460-130691-1)
VIII.	Duplicate sample analysis	A	DUP (↓ ↓)
IX.	Serial Dilution	N	not performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D= 6+9
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-014-GWF	460-130620-1F	Water	03/29/17
2 3 1	CFMW-015-GWF	460-130620-2F	Water	03/29/17
3 3 1	CFMW-019-GWF	460-130620-3F	Water	03/29/17
4 3 1	CFMW-021-GWF	460-130620-4F	Water	03/29/17
5 1	CFMW-032a-GWF	460-130620-6F	Water	03/29/17
6 1	CFMW-057-GWF	460-130620-7F	Water	03/29/17
7 1	CFMW-059a-GWF	460-130620-8F	Water	03/29/17
8 2	CFMW-EB27-AQ	460-130620-9	Water	03/29/17
9 1	CFMW-DUP11-GWF	460-130620-10F	Water	03/29/17
10				
11				
12 1	PBW1			
13 2	PBW2			
14 3	PBW3			

Notes:

LDC #: 38423E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38423E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38423E4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: MK

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→9	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38423E4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW846 6020A/7470A)
(Y) N N/A Were field blanks identified in this SDG?
(Y) N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/29/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: (EB) Associated Samples: 5 (>10x)

Analyte	Blank ID	Sample Identification										
[illegible]	8	Action Level										
Ca	555	5550										
Na	583	5830										

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/27/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: (EB) Associated Samples: 7

Analyte	Blank ID	Sample Identification										
[illegible]	CFMW-EB25-AQ	Action Level	7									
Ca	699	6990										
Ni	4.6	46.0										
K	502	5020	1560J+									
Na	1010	10100	3800J+									
Zn	28.5	285										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 38423E4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	6	9		
Barium	50.8	51.0	0	
Calcium	21900	21800	0	
Iron	3430	3420	0	
Magnesium	20500	20200	1	
Manganese	74.4	74.2	0	
Potassium	1830	1820	1	
Sodium	3920	3850	2	
Zinc	73.9	71.3	4	

V:\FIELD DUPLICATES\FD_inorganic\38423E4a.WPD

LDC #: 38423E4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1925 ICV	ICP/MS (Initial calibration)	Cu	40.628	40.0	102	102	Y
1401 ICV	CVAA (Initial calibration)	Hg	5.0506	5.00	101	101	↓
	ICP (Continuing calibration)						↓
2304 CCV8	ICP/MS (Continuing calibration)	Be	51.675	50.0	103	103	↓
1623 CCV7	CVAA (Continuing calibration)	Hg	4.5703	5.00	91	91	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423E4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1933 ICSAB	ICP interference check	Ni	190.9 (µg/L)	200 (µg/L)	95	95	Y
2247 LCS	Laboratory control sample	Zn	48.13 (µg/L)	50.0 (µg/L)	96	96	↓
1635 CFMW-008-GWMS	Matrix spike	Hg	(SSR-SR) 0.8354 (µg/L)	1.00 (µg/L)	84	84	↓
1631 / 1633 CFMW-008-GWDUP	Duplicate	Hg	0.17 U (µg/L)	0.17 U (µg/L)	0	NC	↓
—	ICP serial dilution	—	—	—	—	—	—

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423E4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Se were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(0.824\ \mu g/L)(0.010\ L)(2)}{0.010\ L} = 1.648\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Se	1.6	1.6	Y
2	2	V	75.7	75.7	
3	3	Co	6.9	6.9	
4	4	Fe	371	371	
5	5	Cr	7.3	7.3	
6	6	Zn	73.9	73.9	
7	7	As	4.3	4.3	
8	8	Ca	555	555	
9	9	Mn	74.2	74.2	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 1, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130620-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-014-GW	460-130620-1	Water	03/29/17
CFMW-015-GW	460-130620-2	Water	03/29/17
CFMW-019-GW	460-130620-3	Water	03/29/17
CFMW-021-GW	460-130620-4	Water	03/29/17
CFMW-032a-GW	460-130620-6	Water	03/29/17
CFMW-057-GW	460-130620-7	Water	03/29/17
CFMW-059a-GW	460-130620-8	Water	03/29/17
CFMW-EB27-AQ	460-130620-9	Water	03/29/17
CFMW-DUP11-GW	460-130620-10	Water	03/29/17
CFMW-014-GWMS	460-130620-1MS	Water	03/29/17
CFMW-014-GWMSD	460-130620-1MSD	Water	03/29/17
CFMW-014-GWDUP	460-130620-1DUP	Water	03/29/17
CFMW-059a-GWMS	460-130620-8MS	Water	03/29/17
CFMW-059a-GWMSD	460-130620-8MSD	Water	03/29/17
CFMW-DUP11-GWDUP	460-130620-10DUP	Water	03/29/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
03/30/17	CCV (22:05)	Orthophosphate as P	122 (90-110)	CFMW-014-GW CFMW-032a-GW CFMW-057-GW CFMW-059a-GW CFMW-EB27-AQ CFMW-DUP11-GW	NA	-

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB27-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB27-AQ	03/29/17	Chloride	141 ug/L	CFMW-032a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-014-GWMS/MSD (CFMW-014-GW CFMW-015-GW CFMW-032a-GW CFMW-057-GW CFMW-059a-GW CFMW-EB27-AQ CFMW-DUP11-GW)	Chloride	122 (90-110)	119 (90-110)	J+ (all detects)	A
CFSWP-008-SWMS/MSD (CFMW-014-GW CFMW-015-GW CFMW-019-GW CFMW-021-GW)	Sulfate	114 (90-110)	113 (90-110)	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD (All samples in SDG 460-130620-1)	Orthophosphate as P	123 (90-110)	124 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFMW-057-GW and CFMW-DUP11-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-057-GW	CFMW-DUP11-GW			
Alkalinity	161000 ug/L	160000 ug/L	1 (≤30)	-	-
Ammonia as N	284 ug/L	110 ug/L	88 (≤30)	J (all detects)	A
Chloride	721	716 ug/L	1 (≤30)	-	-
Fluoride	137 ug/L	136 ug/L	1 (≤30)	-	-
Hardness	152000 ug/L	150000 ug/L	1 (≤30)	-	-
Total dissolved solids	128 mg/L	127 mg/L	1 (≤30)	-	-
Total suspended solids	24.1 mg/L	25.2 mg/L	4 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and field duplicate RPD, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130620-1

Sample	Analyte	Flag	A or P	Reason
CFMW-014-GW CFMW-015-GW CFMW-032a-GW CFMW-057-GW CFMW-059a-GW CFMW-EB27-AQ CFMW-DUP11-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-014-GW CFMW-015-GW CFMW-019-GW CFMW-021-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-057-GW CFMW-DUP11-GW	Ammonia as N	J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130620-1

No Sample Data Qualified in this SDG

LDC #: 38423E6

SDG #: 460-130620-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-27-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: PK

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	SW	
IV	Laboratory Blanks	A	qmb
V	Field blanks	SW	EB=8, ~~CFMW-EB25-AQ (SDG: 460-130410-1)~~
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-130969-1, 460-130507-1)
VII.	Duplicate sample analysis	A	DUP (↓)
VIII.	Laboratory control samples	SW	LCS/LCSD/SRM
IX.	Field duplicates	SW	D=6+9
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-014-GW	460-130620-1	Water	03/29/17
2	CFMW-015-GW	460-130620-2	Water	03/29/17
3	CFMW-019-GW	460-130620-3	Water	03/29/17
4	CFMW-021-GW	460-130620-4	Water	03/29/17
5	CFMW-032a-GW	460-130620-6	Water	03/29/17
6	CFMW-057-GW	460-130620-7	Water	03/29/17
7	CFMW-059a-GW	460-130620-8	Water	03/29/17
8	CFMW-EB27-AQ	460-130620-9	Water	03/29/17
9	CFMW-DUP11-GW	460-130620-10	Water	03/29/17
10	CFMW-014-GWMS	460-130620-1MS	Water	03/29/17
11	CFMW-014-GWMSD	460-130620-1MSD	Water	03/29/17
12	CFMW-014-GWDUP	460-130620-1DUP	Water	03/29/17
13	CFMW-059a-GWMS	460-130620-8MS	Water	03/29/17
14	CFMW-059a-GWMSD	460-130620-8MSD	Water	03/29/17
15	CFMW-DUP11-GWDUP	460-130620-10DUP	Water	03/29/17
16				

LDC #: 38423E6

SDG #: 460-130620-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-27-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

	Client ID	Lab ID	Matrix	Date
17				
18				
19	PBW1			
20	PBW2			

Notes:

LDC #: 38423E6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: KK

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?		✓		
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38423E6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: PR

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38423E6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→4	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN Hard TSS
5,6,7,9	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
8		pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
QC 10,11		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
12		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
13,14		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38423E6

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KK

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
Y N N/A Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
Y N N/A Was a balance check conducted prior to the TDS analysis.?
Y N N/A Was the titrant normality checked?

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualifications
1	3-30-17	CCV (22:05)	PO_4-P	122 (90-110)	1, 5→9	J+ dets/P (all N.D.)
2	3-31-17	CCV (05:56)	PO_4-P	116 (↓)	10→12	↓ (det in 10,11)

Comments:

CAL.6

LDC #: 38423E6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/29/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 5 (>10x)

Analyte	Blank ID	Action Limit	Sample Identification									
[illegible]	8		No Qual.									
Cl	141	1410										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38423E6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: RK

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	10/11	water	Cl	122 (90-110)	119 (90-110)		1, 2, 5→9	J+ dets/A (all dets)
2	CFSWP-008-S MS/MSD	W	SO_4	114 (90-110)	113 (90-110)		1→4	J+ dets/A (all dets)

Comments:

LDC #: 38423E6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	LCS/LCSD	Water	PO4-P	123 (90-110)	124 (90-110)		all	J+ dets/P (all N.D.)

Comments:

LDC#: 38423E6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	6	9		
Alkalinity	161000	160000	1	
Ammonia as N	284	110	88	J/UJ/A (all dets)
Chloride	721	716	1	
Fluoride	137	136	1	
Hardness	152000	150000	1	
TDS (mg/L	128	127	1	
TSS (mg/L)	24.1	25.2	4	

V:\FIELD DUPLICATES\FD_inorganic\38423E6.WPD

LDC #: 38423E6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of SO_4 was recalculated. Calibration date: 3-7-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	SO_4	Blank	–	–	$r^2 = 0.9972$	$r^2 = 0.9970$	Y
		Standard 1	0.6 (mg/L)	12346			
		Standard 2	1.5 ( )	70004			
		Standard 3	7.5 ( )	386992			
		Standard 4	15.0 ( )	844278			
		Standard 5	22.5 ( )	1419052			
		Standard 6	30.0 ( )	1830225			
		Standard 7	–	–			
Calibration verification	NO_3/NO_2-N	1616 CCV1	1.023 (mg/L)	1.00 (mg/L)	102	102	
Calibration verification	NH_3-N	1429 CCV3	2.03 (mg/L)	2.00 (mg/L)	102	101	
Calibration verification	Free CN	1400 CCV2	49.86 (µg/L)	50.0 (µg/L)	100	100	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

CALCLC.6

LDC #: 38423E6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	PO_4-P	3086 (µg/L)	2500 (µg/L)	123	123	Y
1751 13	Matrix spike sample	Total CN	(SSR-SR) 206 (µg/L)	200 (µg/L)	103	103	↓
1440/1440 12	Duplicate sample	TDS	772.0 (mg/L)	766.0 (mg/L)	0.8	0.8	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38423E6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments?
(Y) N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, TDS reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$TDS = \frac{(63.8409\,g - 63.8023\,g)(1000\,mg/g)}{0.050\,L} = 772.0\,mg/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	TDS	772 (mg/L)	772 (mg/L)	Y
2	2	NH_3-N	34100	34100	
3	3	Free CN	44.1	44.1	
4	4	NO_3/NO_2-N	9150	9150	
5	5	Total CN	3.9	3.9	
6	6	Alkalinity	161000	161000	
7	7	Hardness	144000	144000	
8	8	Cl	141	141	
9	9	TSS	25.2 (mg/L)	25.2 (mg/L)	

Note: method 9056A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 20, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130507-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-044-GW	460-130507-2	Water	03/28/17
CFMW-008a-GW	460-130507-3	Water	03/28/17
CFMW-DUP10-GW	460-130507-4	Water	03/28/17
CFMW-016-GW	460-130507-5	Water	03/28/17
CFMW-022-GW	460-130507-6	Water	03/28/17
Trip Blank	460-130507-7	Water	03/28/17
CFMW-018-GW	460-130507-8	Water	03/28/17
CFMW-017-GW	460-130507-9	Water	03/28/17
CFMW-007-GW	460-130507-11	Water	03/28/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
04/02/17	Chloroethane 1,1,2-Trichloro-1,2,2-trifluoroethane Methyl acetate Cyclohexane	27.3 20.1 26.3 21.2	All samples in SDG 460-130507-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples CFMW-DUP10-GW and CFMW-016-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

LDC #: 38423F1

SDG #: 460-130507-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/18/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	Δ / Δ	
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration/ICV	Δ / Δ	% RSD ≤ 15/30, r² KV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	Δ	
VI.	Field blanks	ND	TB = 4
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	N	
IX.	Laboratory control samples	Δ	LCS 10
X.	Field duplicates	ND	D = 3 + 4
XI.	Internal standards	Δ	
XII.	Compound quantitation RL/LOQ/LODs	Δ	
XIII.	Target compound identification	Δ	
XIV.	System performance	Δ	
XV.	Overall assessment of data	Δ	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-044-GW	460-130507-2	Water	03/28/17
2	CFMW-008a-GW	460-130507-3	Water	03/28/17
3	CFMW-DUP10-GW	460-130507-4	Water	03/28/17
4	CFMW-016-GW	460-130507-5	Water	03/28/17
5	CFMW-022-GW	460-130507-6	Water	03/28/17
6	Trip Blank	460-130507-7	Water	03/28/17
7	CFMW-018-GW	460-130507-8	Water	03/28/17
8	CFMW-017-GW	460-130507-9	Water	03/28/17
9	CFMW-007-GW	460-130507-11	Water	03/28/17
10				
11				
12	MB 460-427745			
13				

LDC #: 38423 F1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 38423F1

VALIDATION FINDINGS CHECKLIST

Page: 7 of 2
Reviewer: FQ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38423F1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
+	4/2/17	CCV-8	D	27.3		All	J+ all D/A all ND
+	1838		TTT	20.1			
+			QQQQ	26.3			
			SSSS	21.2			

CONCAL.wpd

LDC #: 38423F1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: KK

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/12/2017	F	0.6453	0.6453	0.7396	0.7396	13.3	13.3
	GCMS8		C	0.2639	0.2639	0.2818	0.2818	13.4	13.4
			CC	1.3859	1.3859	1.3706	1.3706	9.1	9.1
			JJJ	1.3367	1.3367	1.3296	1.3296	8.8	8.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 F1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1838	4/2/17	F (1st internal standard)	0.7396	0.7428	0.7428	0.4	0.4
			C (2nd internal standard)	0.2818	0.3328	0.3328	18.1	18.1
			CC (3rd internal standard)	1.3706	1.481	1.481	8.0	8.0
			JJJ (4th internal standard)	1.3296	1.446	1.446	8.8	8.8
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423F1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	52.3	105	105	0
1,2-Dichloroethane-d4	↓	55.8	112	112	↓
Toluene-d8		48.1	96	96	
Bromofluorobenzene		51.5	103	103	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38423 F1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: KK

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/D 460 - 427745

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	22.1	21.1	110	110	105	105	5	5
Trichloroethene	↓	↓	20.4	20.3	102	102	101	101	0	0
Benzene	↓	↓	20.7	21.3	103	103	107	107	3	3
Toluene	↓	↓	20.7	20.6	104	104	103	103	1	1
Chlorobenzene	↓	↓	20.5	19.7	102	102	98	98	4	4

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423F1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 3 , C.C

Conc. = $\frac{4063\ (50)}{4671\cancel{7}69\ (1.3706)}$

= 0.32 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: April 20, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130507-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-044-GW	460-130507-2	Water	03/28/17
CFMW-008a-GW	460-130507-3	Water	03/28/17
CFMW-DUP10-GW	460-130507-4	Water	03/28/17
CFMW-016-GW	460-130507-5	Water	03/28/17
CFMW-022-GW	460-130507-6	Water	03/28/17
CFMW-018-GW	460-130507-8	Water	03/28/17
CFMW-017-GW	460-130507-9	Water	03/28/17
CFMW-007-GW	460-130507-11	Water	03/28/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
04/01/17	Dimethylphthalate	21.8	All samples in SDG 460-130507-1	UJ (all non-detects)	A
	2,4-Dinitrophenol	28.2		UJ (all non-detects)	
	Diethylphthalate	20.1		UJ (all non-detects)	
	4-Nitroaniline	26.0		UJ (all non-detects)	
	Pyrene	24.4		UJ (all non-detects)	
	Butylbenzylphthalate	20.5		UJ (all non-detects)	

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples CFMW-DUP10-GW and CFMW-016-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130507-1

Sample	Compound	Flag	A or P	Reason
CFMW-044-GW	Dimethylphthalate	UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-008a-GW	2,4-Dinitrophenol	UJ (all non-detects)		
CFMW-DUP10-GW	Diethylphthalate	UJ (all non-detects)		
CFMW-016-GW	4-Nitroaniline	UJ (all non-detects)		
CFMW-022-GW	Pyrene	UJ (all non-detects)		
CFMW-018-GW	Butylbenzylphthalate	UJ (all non-detects)		
CFMW-017-GW				
CFMW-007-GW				

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

LDC #: 38423F2a

SDG #: 460-130507-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/19/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	ND	D = 3, 4
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-044-GW	460-130507-2	Water	03/28/17
2	CFMW-008a-GW	460-130507-3	Water	03/28/17
3	CFMW-DUP10-GW	460-130507-4	Water	03/28/17
4	CFMW-016-GW	460-130507-5	Water	03/28/17
5	CFMW-022-GW	460-130507-6	Water	03/28/17
6	CFMW-018-GW	460-130507-8	Water	03/28/17
7	CFMW-017-GW	460-130507-9	Water	03/28/17
8	CFMW-007-GW	460-130507-11	Water	03/28/17
9				
10				
11	MB 460-427197			
12				
13				

LDC #: 38423F

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: EF
2nd Reviewer: DM

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?			✓	
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38423 F2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38423P2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
–	4/1/17	CCV-4	CC	21.8		All	J-/UJ/A ND
–	0135		HH	28.2			
–			LL	20.1			
–			BB	26.0			
–			ZZ	24.4			
–			AAA	20.5			

LDC #: 38423F2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: EK

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	3/22/2017	A	1.7541	1.7541	2.0032	2.0032	8.0	8.0
			S	0.8427	0.8427	0.9561	0.9561	12.1	12.1
			GG	1.2648	1.2648	1.3931	1.3931	10.1	10.1
			UU	0.9899	0.9899	1.1288	1.1288	6.9	6.9
			DDD	0.9245	0.9245	1.0588	1.0588	6.2	6.2
			III	1.0808	1.0808	1.0963	1.0963	6.3	6.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423P2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: EK

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0135	4/1/17	A (1st IS)	2.0032	1.861	1.861	7.1	7.1
			S (2nd IS)	0.9561	0.8696	0.8696	9.0	9.0
			GG (3rd IS)	1.3931	1.141	1.141	18.1	18.1
			UU (4th IS)	1.1288	1.039	1.039	7.9	7.9
			PDD (5th IS)	1.0588	0.9576	0.9576	9.6	9.6
			III (6th IS)	1.0963	1.056	1.056	3.7	3.7
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 3842 3P2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: KK

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	7.79	78	78	0
2-Fluorobiphenyl		8.83	88	88	
Terphenyl-d14		7.66	77	77	
Phenol-d5		2.21	22	22	
2-Fluorophenol		3.71	37	37	
2,4,6-Tribromophenol		8.87	89	89	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38423F2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 – 427170

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	18.1	NA	23	23				
N-Nitroso-di-n-propylamine	↓	↓	66.2	↓	83	83				
4-Chloro-3-methylphenol	↓	↓	57.3	↓	72	72				
Acenaphthene	↓	↓	62.1	↓	78	78				
Pentachlorophenol	160.0	↓	130	↓	81	81				
Pyrene	80.0	↓	60.6	↓	76	76	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423 P2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. 2, EEE

Conc. = $\frac{(19777)(8.0)(2)(1000)}{(1015977)(0.7964)(240)}$

=

1.6 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 1, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130507-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB26-AQ	460-130507-1	Water	03/28/17
CFMW-044-GWF	460-130507-2F	Water	03/28/17
CFMW-008a-GWF	460-130507-3F	Water	03/28/17
CFMW-DUP10-GWF	460-130507-4F	Water	03/28/17
CFMW-016-GWF	460-130507-5F	Water	03/28/17
CFMW-022-GWF	460-130507-6F	Water	03/28/17
CFMW-018-GWF	460-130507-8F	Water	03/28/17
CFMW-017-GWF	460-130507-9F	Water	03/28/17
CFMW-008-GWF	460-130507-10F	Water	03/28/17
CFMW-007-GWF	460-130507-11F	Water	03/28/17
CFMW-008-GWFMS	460-130507-10FMS	Water	03/28/17
CFMW-008-GWFDUP	460-130507-10FDUP	Water	03/28/17

Samples appended with "F" were analyzed as dissolved

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB26-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB26-AQ	03/28/17	Calcium Sodium	285 ug/L 380 ug/L	CFMW-044-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-008-GWFMS, no data were qualified for Barium, Calcium, Iron, Magnesium, and Sodium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits with the following exceptions:

Diluted Sample	Analyte	%D (Limits)	Associated Samples	Flag	A or P
CFMW-008-GWF	Barium Calcium Iron Magnesium	100 (≤10) 100 (≤10) 100 (≤10) 100 (≤10)	CFMW-044-GWF CFMW-008a-GWF CFMW-DUP10-GWF CFMW-016-GWF CFMW-022-GWF CFMW-018-GWF CFMW-017-GWF CFMW-008-GWF CFMW-007-GWF	J (all detects) UJ (all non-detects)	A

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-DUP10-GWF and CFMW-016-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-DUP10-GWF	CFMW-016-GWF			
Barium	220	220	0 (≤30)	-	-
Calcium	46800	46700	0 (≤30)	-	-
Magnesium	11600	11500	1 (≤30)	-	-
Potassium	648	646	0 (≤30)	-	-
Sodium	13300	14300	7 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to serial dilution %D, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130507-1

Sample	Analyte	Flag	A or P	Reason
CFMW-044-GWF CFMW-008a-GWF CFMW-DUP10-GWF CFMW-016-GWF CFMW-022-GWF CFMW-018-GWF CFMW-017-GWF CFMW-008-GWF CFMW-007-GWF	Barium Calcium Iron Magnesium	J (all detects) UJ (all non-detects)	A	Serial dilution (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

LDC #: 38423F4a

SDG #: 460-130507-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-27-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	(< RL)
VI.	Field Blanks	SW	EB = 1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (Ba, Ca, Fe, Mg, Na - 4x)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	SW	SD: 9
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D = 4+5
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-EB26-AQ	460-130507-1	Water	03/28/17
2 2	CFMW-044-GWF	460-130507-2F	Water	03/28/17
3 2	CFMW-008a-GWF	460-130507-3F	Water	03/28/17
4 2	CFMW-DUP10-GWF	460-130507-4F	Water	03/28/17
5 2	CFMW-016-GWF	460-130507-5F	Water	03/28/17
6 2	CFMW-022-GWF	460-130507-6F	Water	03/28/17
7 2	CFMW-018-GWF	460-130507-8F	Water	03/28/17
8 2	CFMW-017-GWF	460-130507-9F	Water	03/28/17
9 3 2	CFMW-008-GWF	460-130507-10F	Water	03/28/17
10 3 2	CFMW-007-GWF	460-130507-11F	Water	03/28/17
11 3 2	CFMW-008-GWFMS	460-130507-10FMS	Water	03/28/17
12 3 2	CFMW-008-GWFDUP	460-130507-10FDUP	Water	03/28/17
13 1	PBW1			
14 2	PBW2			

Notes: 3 PBW3 (Hg)

LDC #: 38423F4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38423F4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?		✓		
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38423F4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: FA

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 11, 12	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38423F4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/28/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2 (>10x)

Analyte	Blank ID	Sample Identification										
[illegible]	1	Action Level	No Qual's.									
Ca	285	2850										
Na	380	3800										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38423F4a

VALIDATION FINDINGS WORKSHEET
ICP Serial Dilution

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A If analyte concentrations were > 50X the MDL (ICP) ,or >100X the MDL (ICP/MS), was a serial dilution analyzed?
Y N N/A Were ICP serial dilution percent differences (%D) ≤10%?
Y N N/A Is there evidence of negative interference? If yes, professional judgement will be used to qualify the data.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Diluted Sample ID	Matrix	Analyte	%D (Limits)	Associated Samples	Qualifications	
1		9	water	Ba	100 (≤10)	2 → 10	J/UJ/A	(all dets)
		↓	↓	Ca	100 (↓)	↓	↓	(↓)
				Fe	100 (↓)			(det & N.D.)
				Mg	100 (↓)			(↓)

Comments:

SDILICPMS.wpd

LDC#: 38423F4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD	Qualification (Parent Only)
	4	5		
Barium	220	220	0	
Calcium	46800	46700	0	
Magnesium	11600	11500	1	
Potassium	648	646	0	
Sodium	13300	14300	7	

V:\FIELD DUPLICATES\FD_inorganic\38423F4a.WPD

LDC #: 38423F4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1925 ICV	ICP/MS (Initial calibration)	Tl	8.151	8.00	102	102	Y
1401 ICV	CVAA (Initial calibration)	Hg	5.0506	5.00	101	101	↓
	ICP (Continuing calibration)						↓
0224 CCV15	ICP/MS (Continuing calibration)	Sb	51.364	50.0	103	103	↓
1623 CCV7	CVAA (Continuing calibration)	Hg	4.5703	5.00	91	91	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423F4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1938 ICSAB	ICP interference check	Cr	200.9 (µg/L)	200 (µg/L)	100	100	Y
0234 LCS	Laboratory control sample	As	9.696 (µg/L)	10.0 (µg/L)	97	97	↓
0236 11	Matrix spike	Cd	(SSR-SR) 10.12 (µg/L)	10.0 (µg/L)	101	101	↓
0241/0239 12	Duplicate	Fe	35562 (µg/L)	35619 (µg/L)	0.2	0.1	↓
1622/1625 9	ICP serial dilution	Na	89817 (µg/L)	93206 (µg/L)	3.8	3.8	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423F4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Na were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(190.195\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 380.39\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Na	380	380	Y
2	2	Ni	2.0	2.0	
3	3	Cu	3.5	3.5	
4	4	K	648	648	
5	5	Ba	220	220	
6	6	Fe	51.8	51.8	
7	7	Mn	5.1	5.1	
8	8	V	29.5	29.5	
9	9	Zn	228	228	
10	10	Mg	14200	14200	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 1, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130507-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB26-AQ	460-130507-1	Water	03/28/17
CFMW-044-GW	460-130507-2	Water	03/28/17
CFMW-008a-GW	460-130507-3	Water	03/28/17
CFMW-DUP10-GW	460-130507-4	Water	03/28/17
CFMW-016-GW	460-130507-5	Water	03/28/17
CFMW-022-GW	460-130507-6	Water	03/28/17
CFMW-018-GW	460-130507-8	Water	03/28/17
CFMW-017-GW	460-130507-9	Water	03/28/17
CFMW-008-GW	460-130507-10	Water	03/28/17
CFMW-007-GW	460-130507-11	Water	03/28/17
CFMW-017-GWMS	460-130507-9MS	Water	03/28/17
CFMW-017-GWMSD	460-130507-9MSD	Water	03/28/17
CFMW-008-GWMS	460-130507-10MS	Water	03/28/17
CFMW-008-GWMSD	460-130507-10MSD	Water	03/28/17
CFMW-008-GWDUP	460-130507-10DUP	Water	03/28/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrite/Nitrate as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
03/29/17	CCV (17:38)	Orthophosphate as P	129 (90-110)	CFMW-EB26-AQ CFMW-044-GW CFMW-008a-GW CFMW-DUP10-GW	NA	-
03/29/17	CCV (21:26)	Orthophosphate as P	126 (90-110)	CFMW-EB26-AQ CFMW-044-GW CFMW-008a-GW CFMW-DUP10-GW CFMW-022-GW CFMW-018-GW CFMW-017-GW CFMW-008-GW CFMW-007-GW	NA	-
03/30/17	CCV (01:30)	Orthophosphate as P	148 (90-110)	CFMW-022-GW CFMW-018-GW CFMW-017-GW CFMW-008-GW CFMW-007-GW	NA	-

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB26-AQ was identified as an equipment blank. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-008-GWMS/MSD (All samples in SDG 460-130507-1)	Chloride	112 (90-110)	123 (90-110)	J+ (all detects)	A
CFMW-008-GWMS/MSD (CFMW-008a-GW CFMW-DUP10-GW CFMW-016-GW CFMW-022-GW CFMW-018-GW CFMW-017-GW CFMW-008-GW CFMW-007-GW)	Sulfate	111 (90-110)	117 (90-110)	J+ (all detects)	A
CFMW-008-GWMS/MSD (CFMW-EB26-AQ)	Sulfate	111 (90-110)	117 (90-110)	NA	-
CFMW-008-GWMS/MSD (All samples in SDG 460-130507-1)	Orthophosphate as P	61 (90-110)	73 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-008-GWMS/MSD (All samples in SDG 460-130507-1)	Orthophosphate as P	18 (≤15)	UJ (all non-detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD (All samples in SDG 460-130507-1)	Orthophosphate as P	154 (90-110)	141 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFMW-DUP10-GW and CFMW-016-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-DUP10-GW	CFMW-016-GW			
Alkalinity	212000 ug/L	209000 ug/L	1 (≤30)	-	-
Chloride	2040 ug/L	2060 ug/L	1 (≤30)	-	-
Total cyanide	3.3 ug/L	2.3 ug/L	36 (≤30)	J (all detects)	A
Fluoride	438 ug/L	428 ug/L	2 (≤30)	-	-
Hardness	176000 ug/L	184000 ug/L	4 (≤30)	-	-
Nitrate/Nitrite as N	265 ug/L	267 ug/L	1 (≤30)	-	-
Sulfate	7560 ug/L	6970 ug/L	8 (≤30)	-	-
Total dissolved solids	234 mg/L	235 mg/L	0 (≤30)	-	-
Total suspended solids	17.9 mg/L	9.3 mg/L	63 (≤30)	J (all detects)	A

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and RPD and field duplicate RPD, data were qualified as estimated in ten samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130507-1

Sample	Analyte	Flag	A or P	Reason
CFMW-EB26-AQ CFMW-044-GW CFMW-008a-GW CFMW-DUP10-GW CFMW-016-GW CFMW-022-GW CFMW-018-GW CFMW-017-GW CFMW-008-GW CFMW-007-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-008a-GW CFMW-DUP10-GW CFMW-016-GW CFMW-022-GW CFMW-018-GW CFMW-017-GW CFMW-008-GW CFMW-007-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-EB26-AQ CFMW-044-GW CFMW-008a-GW CFMW-DUP10-GW CFMW-016-GW CFMW-022-GW CFMW-018-GW CFMW-017-GW CFMW-008-GW CFMW-007-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)(RPD)
CFMW-DUP10-GW CFMW-016-GW	Total cyanide Total suspended solids	J (all detects) J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130507-1

No Sample Data Qualified in this SDG

LDC #: 38423F6
SDG #: 460-130507-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 4-27-17
Page: 1 of 2
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	SW	
IV	Laboratory Blanks	A	
V	Field blanks	ND	EB = 1 (<RL)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-130874-1, ~~SB~~ 460-130410-1)
VII.	Duplicate sample analysis	A	DUP (↓)
VIII.	Laboratory control samples	SW	LCS/LCSD/SRM
IX.	Field duplicates	SW	D = 4+5
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB26-AQ	460-130507-1	Water	03/28/17
2	CFMW-044-GW	460-130507-2	Water	03/28/17
3	CFMW-008a-GW	460-130507-3	Water	03/28/17
4	CFMW-DUP10-GW	460-130507-4	Water	03/28/17
5	CFMW-016-GW	460-130507-5	Water	03/28/17
6	CFMW-022-GW	460-130507-6	Water	03/28/17
7	CFMW-018-GW	460-130507-8	Water	03/28/17
8	CFMW-017-GW	460-130507-9	Water	03/28/17
9	CFMW-008-GW	460-130507-10	Water	03/28/17
10	CFMW-007-GW	460-130507-11	Water	03/28/17
11	CFMW-017-GWMS	460-130507-9MS	Water	03/28/17
12	CFMW-017-GWMSD	460-130507-9MSD	Water	03/28/17
13	CFMW-008-GWMS	460-130507-10MS	Water	03/28/17
14	CFMW-008-GWMSD	460-130507-10MSD	Water	03/28/17
15	CFMW-008-GWDUP	460-130507-10DUP	Water	03/28/17
16				

LDC #: 38423F6

SDG #: 460-130507-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4-27-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

	Client ID	Lab ID	Matrix	Date
17				
18	PBW1			
19	PBW2			
20	PBW3			

Notes:

LDC #: 38423F6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: MA

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?		✓		
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38423F6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.		✓		

LDC #: 38423F6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: MU

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2,3,6,10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard Free CN TSS
4,5,7,8,9	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
QC 11,12	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN- NH_3 TKN TOC CR^{6+} ClO_4
13,14	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38423F6

VALIDATION FINDINGS WORKSHEET
Calibration

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
Y N N/A Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
Y N N/A Was a balance check conducted prior to the TDS analysis.?
Y N N/A Was the titrant normality checked?

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualifications
1	3-29-17	CCV (17:38)	PO_4-P	129 (90-110)	1→4	J+ dets /P (all N.D.)
2	3-29-17	CCV (21:26)	PO_4-P	126 (↓)	1→4, 6→10	(↓)
3	3-30-17	CCV (01:30)	PO_4-P	148 (↓)	6→10, 13→15	(det in 13,14)
4	3-30-17	CCV (05:34)	PO_4-P	128 (↓)	13→15	(↓)

Comments:

LDC #: 38423F6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications	
1	13/14	Water	Cl	112 (90-110)	123 (90-110)		all	J+ dets /A	(all dets)
	↓	↓	SO4	111 (↓)	117 (↓)		1, 3→10	↓	(det in 3→10)
			PO4-P	61 (↓)	73 (↓)		all	J-/UJ/A	(all N.D.)
	↓	↓	PO4-P			18 (≤ 15)	↓	J/UJ/A	(↓)

Comments:

MSD.6

LDC #: 38423F6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: MG
2nd Reviewer: KM

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	LCS/LCSD	water	PO4-P	154 (90-110)	141 (90-110)		all	J+ dets/P (all N.D.)

Comments:

LCSD.wpd

LDC#: 38423F6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	4	5		
Alkalinity	212000	209000	1	
Chloride	2040	2060	1	
Total Cyanide	3.3	2.3	36	J/UJ/A (all dets)
Fluoride	438	428	2	
Hardness	176000	184000	4	
Nitrate/Nitrite as N	265	267	1	
Sulfate	7560	6970	8	
TDS (mg/L)	234	235	0	
TSS (mg/L)	17.9	9.3	63	J/UJ/A (all dets)

V:\FIELD DUPLICATES\FD_inorganic\38423F6.WPD

LDC #: 38423F6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Total CN was recalculated. Calibration date: 4-3-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Total Cyanide	Blank	0.000 (mg/L)	-0.0418	r=0.99956	r=0.99991	Y
		Standard 1	0.010 ( )	0.417			
		Standard 2	0.025 ( )	1.06			
		Standard 3	0.050 ( )	2.08			
		Standard 4	0.100 ( )	4.28			
		Standard 5	0.200 ( )	8.68			
		Standard 6	0.400 ( )	16.4			
		Standard 7	-	-			
Calibration verification	NH_3-N	1351 CCV1	2.04 (mg/L)	2.00 (mg/L)	102	102	
Calibration verification	PO_4-P	2126 CCV2	3.16 (mg/L)	2.50 (mg/L)	26.4 % D	26.5 % D	
Calibration verification	Cl	2126 CCV2	1.53 (mg/L)	1.50 (mg/L)	2.0 % D	2.2 % D	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423F6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1800 LCS	Laboratory control sample	Free CN	37.30 (µg/L)	50.0 (µg/L)	75	75	Y
1633 13	Matrix spike sample	NO_3/NO_2-N	(SSR-SR) 978.5 (µg/L)	1000 (µg/L)	98	98	↓
0950/0950 15	Duplicate sample	TSS	169.6 (mg/L)	167.6 (mg/L)	1	1	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38423F6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: DP

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Total Cyanide reported with a positive detect were recalculated and verified using the following equation:

Concentration =
$Y = mx + b$
where
$m = 0.0238$
$b = 0.000325$
dil = 1x

Recalculation:
$CN\ mg/L = 0.0238(0.0953) + 0.000325$
$= 0.002593\ mg/L$
then $(0.002593\ mg/L)(1000\ \mu g/mg) = 2.593\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Total CN	2.6	2.6	Y
2	2	NH_3-N	372	372	
3	3	TDS	1800 (mg/L)	1800 (mg/L)	
4	4	NO_3/NO_2-N	265	265	
5	5	SO_4	6970	6970	
6	6	Free CN	3.4	3.4	
7	7	Alkalinity	206000	206000	
8	8	TSS	3.9 (mg/L)	3.9 (mg/L)	
9	9	Hardness	160000	160000	
10	10	F	101	101	

Note: method 9056A is N.D. for all samples

LDC #: 38423

EDD POPULATION COMPLETENESS WORKSHEET

Date: 5/3
Page: 1 of 1
2nd Reviewer: [illegible]

The LDC job number listed above was entered by BA.

	EDD Process		Comments/Action
I.	EDD Completeness	-	
Ia.	- All methods present?	Y	
Ib.	- All samples present/match report?	Y	
Ic.	- All reported analytes present?	Y	
Id.	- 10% or 100% verification of EDD?	Y	
II.	EDD Preparation/Entry	-	
IIa.	- Carryover U/J?	Y	
IIb.	- Reason Codes used? If so, note which codes.	N	
IIc.	- Additional Information (QC Level, Validator, Validated Y/N, etc.)	N	
III.	Reasonableness Checks	-	
IIIa.	- Do all qualified ND results have ND qualifier (e.g. UJ)?	Y	
IIIb.	- Do all qualified detect results have detect qualifier (e.g. J)?	Y	
IIIc.	- If reason codes are used, do all qualified results have reason code field populated, and vice versa?	N/A	
IIId.	-Does the detect flag require changing for blank qualifier? If so, are all U results marked ND?	Y/Y	
IIIe.	- Do blank concentrations in report match EDD where data was qualified due to blank contamination?	Y	
IIIf.	- Were multiple results reported due to dilutions/reanalysis? If so, were results qualified appropriately?	N/A	
IIIg.	-Are there any discrepancies between the data packet and the EDD?	N	

Notes: *see discrepancy sheet

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

May 8, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on April 18, 2017. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #38490:

SDG #	Fraction
460-130691-1, 460-130874-1, 460-130969-1	Volatiles, Semivolatiles, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

EDD

LDC #38490 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		Total CN- (335.4)		Free CN- (9016)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		TDS (2540C)		TSS (2540D)							
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-130691-1	04/18/17	05/09/17	2	0	1	0	1	0	2	0	3	0	3	0	3	0	3	0	2	0	3	0	3	0	3	0	2	0	2	0							
B	460-130874-1	04/18/17	05/09/17	-	-	-	-	8	0	-	-	8	0	8	0	8	0	8	0	-	-	8	0	8	0	8	0	8	0	8	0							
C	460-130969-1	04/18/17	05/09/17	-	-	-	-	4	0	-	-	4	0	4	0	4	0	4	0	-	-	4	0	4	0	4	0	4	0	4	0							
Total	T/CR			2	0	1	0	13	0	2	0	15	0	15	0	15	0	15	0	2	0	15	0	15	0	15	0	14	0	14	0	0	0	0	0	0	153

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 2, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130691-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-040-GW	460-130691-3	Water	03/30/17
Trip Blank	460-130691-4	Water	03/30/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
04/02/17	Chloroethane 1,1,2-Trichloro-1,2,2-trifluoroethane Methyl acetate Cyclohexane	27.3 20.1 26.3 21.2	All samples in SDG 460-130691-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-130691-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-130691-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-130691-1

No Sample Data Qualified in this SDG

LDC #: 38490A1

SDG #: 460-130691-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/22/17

Page: 1 of 1

Reviewer: EJ

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 2
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-040-GW	460-130691-3	Water	03/30/17
2	Trip Blank	460-130691-4	Water	03/30/17
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-427745						

LDC #: 38490A1

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 38490A 1

VALIDATION FINDINGS CHECKLIST

Reviewer: EZ
2nd Reviewer: EZ

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within + 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 38490A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	4/2/17	CCV-8	D	27.3		All	J+ all / A NP
+	1838		TTT	20.1		↓	↓
+			QQQQ	26.3			
+			SSSS	21.2			

CONCAL.wpd

LDC #: 38490A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 50/250 std)	Recalculated (RRF 50/250 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/12/2017	F	0.6453	0.6453	0.7396	0.7396	13.3	13.3
	GCMS8		C	0.2639	0.2639	0.2818	0.2818	13.4	13.4
			CC	1.3859	1.3859	1.3706	1.3706	9.1	9.1
			JJJ	1.3367	1.3367	1.3296	1.3296	8.8	8.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1838	4/2/17	F (1st internal standard)	0.7396	0.7428	0.7428	0.4	0.4
			C (2nd internal standard)	0.2818	0.3328	0.3328	18.1	18.1
			CC (3rd internal standard)	1.3706	1.481	1.481	8.0	8.0
			JJJ (4th internal standard)	1.3296	1.446	1.446	8.8	8.8
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	54.7	109	109	0
1,2-Dichloroethane-d4		55.4	111	111	
Toluene-d8		47.7	95	95	
Bromofluorobenzene		50.7	101	101	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 38490A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/D 460-427745

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	22.1	21.1	110	110	105	105	5	5
Trichloroethene	↓	↓	20.4	20.3	102	102	101	101	0	0
Benzene	↓	↓	20.7	21.3	103	103	107	107	3	3
Toluene	↓	↓	20.7	20.6	104	104	103	103	1	1
Chlorobenzene	↓	↓	20.5	19.7	102	102	98	98	4	4

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS4600-427745 CC

Conc. = $\frac{(272575)(50)}{(480202)(1.3706)}$

= 20.7 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 2, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130691-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-040-GW	460-130691-3	Water	03/30/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
04/05/17 (06:06)	Diethylphthalate	20.2	All samples in SDG 460-130691-1	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
LCS 460-427840	Dibenz(a,h)anthracene	157 (59-136)	All samples in SDG 460-130691-1	NA	-

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-130691-1

Sample	Compound	Flag	A or P	Reason
CFMW-040-GW	Diethylphthalate	UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-130691-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-130691-1

No Sample Data Qualified in this SDG

LDC #: 38490A2a

SDG #: 460-130691-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 4/22/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-040-GW	460-130691-3	Water	03/30/17
2				
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-427840						

LDC #: 38490 A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 38490A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?		✓		
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1.
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1.
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1.
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1.
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1.
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1.
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1.
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1.
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1.
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1.
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1.
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1.
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1.
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1.
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 2,6-Dinitrotoluene	O1.
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1.
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4 Methylphenol	Q1.
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiphene (4MDT)	R1.
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5 -Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX.	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY.	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ.	Z1.

LDC #: 38490A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	4/3/17	CCV-4	HH	26.1		MB 460-427840	J-/UJ/A (ND)
+	2305		JJ	21.7		↓	J+ det/A
-	4/5/17	CCV-4	LL	20.2		All -MB	J-/UJ/A (ND)
	0606						

CONCAL.wpd

LDC #: 38490A2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460 –	KKK	157 (59-136)	( )	( )	All	Hit / P ND
	427840		( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 38490A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	4/2/2017	A	1.9011	1.9011	2.0907	2.0907	8.4	8.4
			S	0.8869	0.8869	0.9586	0.9586	17.6	17.6
			GG	1.2108	1.2108	1.2393	1.2393	6.7	6.7
			UU	1.0145	1.0145	1.0795	1.0795	5.8	5.8
			DDD	0.9853	0.9853	1.0591	1.0591	6.4	6.4
			III	1.0593	1.0593	1.1184	1.1184	5.0	5.0

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	ccv-4 0606	4/5/17	A (1st IS)	2.0907	1.860	1.860	11.0	11.0
			S (2nd IS)	0.9586	0.8896	0.8896	7.2	7.2
			GG (3rd IS)	1.2393	1.149	1.149	7.3	7.3
			HH (4th IS)	1.0795	1.017	1.017	5.8	5.8
			DDD (5th IS)	1.0591	0.9714	0.9714	8.3	8.3
			III (6th IS)	1.1184	1.049	1.049	6.2	6.2
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.34	93	93	0
2-Fluorobiphenyl		8.92	89	89	
Terphenyl-d14		11.4	114	114	
Phenol-d5		2.34	23	23	
2-Fluorophenol		3.89	39	39	
2,4,6-Tribromophenol		8.81	88	88	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 38490A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460-427840

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	21.4	NA	27	NA				
N-Nitroso-di-n-propylamine	↓	↓	76.7	↓	96	↓				
4-Chloro-3-methylphenol	↓	↓	68.8	↓	86	↓				
Acenaphthene	↓	↓	76.5	↓	96	↓				
Pentachlorophenol	160	↓	139	↓	87	↓				
Pyrene	80.0	↓	89.6	↓	112	↓	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490A2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: ✓

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-427840 Phenol

Conc. = $\frac{(342840)(8.0)(2)(1000)}{(489870)(2.0907)(250)}$

= 21.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 4, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130691-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB28-AQ	460-130691-1	Water	03/30/17
CFMW-056a-GWF	460-130691-2F	Water	03/30/17
CFMW-040-GWF	460-130691-3F	Water	03/30/17
CFMW-056a-GWFMS	460-130691-2FMS	Water	03/30/17
CFMW-056a-GWFDUP	460-130691-2FDUP	Water	03/30/17

Samples appended with "F" were analyzed as dissolved

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB28-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB28-AQ	03/30/17	Calcium Sodium	545 ug/L 571 ug/L	CFMW-056a-GWF

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	%R (Limits)	Flag	A or P
CFMW-056a-GWFMS (CFMW-056a-GWF CFMW-040-GWF)	Silver	71 (75-125)	UJ (all non-detects)	A

For CFMW-056a-GWFMS, no data were qualified for Barium, Calcium, Magnesium, Manganese, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS %R, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130691-1

Sample	Analyte	Flag	A or P	Reason
CFMW-056a-GWF CFMW-040-GWF	Silver	UJ (all non-detects)	A	Matrix spike (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130691-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130691-1

No Sample Data Qualified in this SDG

LDC #: 38490A4a

SDG #: 460-130691-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 5-3-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: G

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=1
VII.	Matrix Spike/Matrix Spike Duplicates	SW	MS
VIII.	Duplicate sample analysis	A	DUP (Se OK by difference)
IX.	Serial Dilution	A	SD: 2
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-EB28-AQ	460-130691-1	Water	03/30/17
2 2	CFMW-056a-GWF	460-130691-2F	Water	03/30/17
3 2	CFMW-040-GWF	460-130691-3F	Water	03/30/17
4 2	CFMW-056a-GWFMS	460-130691-2FMS	Water	03/30/17
5 2	CFMW-056a-GWFDUP	460-130691-2FDUP	Water	03/30/17
6				
7				
8				
9				
10				
11				
12				
13 1	PBW1			
14 2	PBW2			

Notes:

LDC #: 38490A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38490A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38490A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 3	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 4,5	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38490A4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/30/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2 (>10x)

Analyte	Blank ID	Sample Identification											
	1	Action Level	No Qual's.										
Ca	545	5450											
Na	571	5710											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38490A4a

VALIDATION FINDINGS WORKSHEET
Matrix Spike Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Was a post digestion spike analyzed for ICP elements that did not meet the required criteria for matrix spike recovery?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Matrix Spike ID	Matrix	Analyte	%R	Associated Samples	Qualifications
1		4	Water	Ag	71 (75-125)	2, 3	J-/UJ/A (all N.D.)

Comments: #4: Ba, Ca, Mg, Mn, Na - 4x

MS.4SW

LDC #: 38490A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: CJ

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1551 ICV	ICP/MS (Initial calibration)	Mg	4044.403	4000	101	101	Y
1114 ICV	CVAA (Initial calibration)	Hg	4.64	5.00	93	93	
	ICP (Continuing calibration)						
1812 CCV5	ICP/MS (Continuing calibration)	Ag	47.182	50.0	94	94	
1122 CCV1	CVAA (Continuing calibration)	Hg	5.37	5.00	107	107	
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1603 ICSAB	ICP interference check	Co	210.8 (µg/L)	200 (µg/L)	105	105	Y
1822 LCS	Laboratory control sample	Zn	52.69 (µg/L)	50.0 (µg/L)	105	105	↓
1824 4	Matrix spike	Ag	(SSR-SR) 7.116 (µg/L)	10.0 (µg/L)	71	71	↓
1829 / 1826 5	Duplicate	Mn	424.3 (µg/L)	421.5 (µg/L)	0.7	0.7	↓
1829 / 1831 2	ICP serial dilution	Ba	214.0 (µg/L)	211.5 (µg/L)	1.2	1.2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490A4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(272.606\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 545.212\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Ca	545	545	Y
2	2	Fe	120	120	↓
3	3	K	1040	1040	↓

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 4, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130691-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB28-AQ	460-130691-1	Water	03/30/17
CFMW-056a-GW	460-130691-2	Water	03/30/17
CFMW-040-GW	460-130691-3	Water	03/30/17
CFMW-056a-GWDUP	460-130691-2DUP	Water	03/30/17
CFMW-040-GWMS	460-130691-3MS	Water	03/30/17
CFMW-040-GWMSD	460-130691-3MSD	Water	03/30/17
CFMW-040-GWDUP	460-130691-3DUP	Water	03/30/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Free Cyanide by EPA SW 846 Method 9016
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable with the following exceptions:

Date	Lab. Reference/ID	Analyte	%R (Limits)	Associated Samples	Flag	A or P
03/31/17	CCV (16:08)	Orthophosphate as P	124 (90-110)	CFMW-EB28-AQ CFMW-056a-GW CFMW-040-GW	NA	-
03/31/17	CCV (20:12)	Orthophosphate as P	115 (90-110)	CFMW-EB28-AQ CFMW-056a-GW CFMW-040-GW	NA	-

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB28-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB28-AQ	03/30/17	Chloride Nitrate/Nitrite as N	151 ug/L 7520 ug/L	CFMW-056a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-056a-GW	Nitrate/Nitrite as N	4750 ug/L	4750J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-040-GWMS/MSD (CFMW-056a-GW CFMW-040-GW)	Chloride	204 (90-110)	126 (90-110)	J+ (all detects)	A
CFMW-040-GWMS/MSD (CFMW-056a-GW CFMW-040-GW)	Sulfate	149 (90-110)	145 (90-110)	J+ (all detects)	A
CFMW-040-GWMS/MSD (CFMW-056a-GW CFMW-040-GW)	Orthophosphate as P	116 (90-110)	117 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-040-GWMS/MSD (CFMW-056a-GW CFMW-040-GW)	Chloride	20 (≤15)	J (all detects)	A

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD (All samples in SDG 460-130691-1)	Orthophosphate as P	123 (90-110)	126 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and RPD, data were qualified as estimated in two samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130691-1

Sample	Analyte	Flag	A or P	Reason
CFMW-056a-GW CFMW-040-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-056a-GW CFMW-040-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-056a-GW CFMW-040-GW	Chloride	J (all detects)	A	Matrix spike/Matrix spike duplicate (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130691-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130691-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-056a-GW	Nitrate/Nitrite as N	4750J+ ug/L	A

LDC #: 38490A6

SDG #: 460-130691-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 5-3-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Free Cyanide (EPA SW846 Method 9016), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	SW	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	SW	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB28-AQ	460-130691-1	Water	03/30/17
2	CFMW-056a-GW	460-130691-2	Water	03/30/17
3	CFMW-040-GW	460-130691-3	Water	03/30/17
4	CFMW-056a-GWDUP	460-130691-2DUP	Water	03/30/17
5	CFMW-040-GWMS	460-130691-3MS	Water	03/30/17
6	CFMW-040-GWMSD	460-130691-3MSD	Water	03/30/17
7	CFMW-040-GWDUP	460-130691-3DUP	Water	03/30/17
8				
9				
10				
11				
12				
13				
14	PBW			

Notes:

LDC #: 38490A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: G

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?		✓		
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38490A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 38490A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2.3	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard Free CN TSS
QC 4	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
↓5→7	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38490A6

VALIDATION FINDINGS WORKSHEET
Calibration

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?
Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% ?
Y N N/A Are all correlation coefficients ≥0.995 ?

LEVEL IV/D ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recaluculation Worksheet for recalulations.
Y N N/A Was a balance check conducted prior to the TDS analysis.?
Y N N/A Was the titrant normality checked?

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualifications
1	3-31-17	CCV (16:08)	PO4-P	124 (90-110)	1→3, ~~5~~	J+ dets/P (all N.D.)
2	3-31-17	CCV (20:12)	PO4-P	115 ( )	1→3, 5→7	(det in 5,6)
3	4-1-17	CCV (00:16)	PO4-P	115 ( )	5→7	( )

Comments:

CAL.6

LDC #: 38490A6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 3/30/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
[illegible]	1		2									
Cl	151	1510										
NO3/NO2-N	7520	75200	4750J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 38490A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications	
1	5/6	water	Cl	204 (90-110)	126 (90-110)		all 2,3	J+ dets/A	(all dets)
	↓	↓	SO4	149 (↓)	145 (↓)		↓	↓	(det in 2,3)
			PO4-P	116 (↓)	117 (↓)				(all N.D.)
			Cl			20 (≤15)		J/UJ/A	(all dets)

Comments:

LDC #: 38490A6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	LCS/LCSD	Water	PO4-P	123 (90-110)	126 (90-110)		all	J+ dets/P (all N.D.)

Comments:

LCSD.wpd

LDC #: 38490A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Free CN was recalculated. Calibration date: 4-6-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Abs. True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Free CN	Blank	0 (mg/L)	0.0	r = 0.9999	r = 0.9999	Y
		Standard 1	2 ( )	0.007			
		Standard 2	5 ( )	0.015			
		Standard 3	10 ( )	0.026			
		Standard 4	25 ( )	0.054			
		Standard 5	50 ( )	0.106			
		Standard 6	150 ( )	0.312			
		Standard 7	–	–			
Calibration verification	NH_3-N	1349 CCV1	2.04 (mg/L)	2.00 (mg/L)	102	102	
Calibration verification	NO_3/NO_2-N	1601 CCV1	1.035 (mg/L)	1.00 (mg/L)	104	104	
Calibration verification	Total CN	1557 CCV1	0.193 (mg/L)	0.200 (mg/L)	96	97	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

CALCLC.6

LDC #: 38490A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
2000 SRM	Laboratory control sample	Alk	86017 (µg/L)	81200 (µg/L)	105.9	105.9	Y
2239 5	Matrix spike sample	PO_4-P	(SSR-SR) 2890 (µg/L)	2500 (µg/L)	116	116	↓
0945/0945 4	Duplicate sample	Hardness	184000 (µg/L)	182000 (µg/L)	1	1	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38490A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: G

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration =
$y = mx + b$
where
$m = 79773.5$
$b = -4876.7$
dil = 1x

Recalculation:
$7205 = 79773.5(x) - 4876.7$
0.1514 mg/L $= x$
then $(0.1514 \text{ mg/L})(1000 \mu g/mg) = 151.4 \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cl	151	151	Y
	↓	NO3/NO2-N	7520	7520	↓
2	2	NH3-N	72.1	72.1	
	↓	Alkalinity	187000	187000	
	↓	TSS	88.8 (mg/L)	88.8 (mg/L)	
3	3	Total CN	288	289	
	↓	Free CN	5.7	5.7	
	↓	Hardness	218000	218000	
	↓	TDS	299 (mg/L)	299 (mg/L)	↓

Note: method 9056A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 4, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130874-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-023-SW	460-130874-1	Water	04/03/17
CFSWP-022-SW	460-130874-2	Water	04/03/17
CFSWP-018-SW	460-130874-3	Water	04/03/17
CFSWP-019-SW	460-130874-4	Water	04/03/17
CFSWP-009-SW	460-130874-5	Water	04/03/17
CFSWP-011-SW	460-130874-6	Water	04/03/17
CFSWP-012-SW	460-130874-7	Water	04/03/17
CFSWP-DUP5-SW	460-130874-8	Water	04/03/17
CFSWP-011-SWMS	460-130874-6MS	Water	04/03/17
CFSWP-011-SWMSD	460-130874-6MSD	Water	04/03/17
CFSWP-011-SWDUP	460-130874-6DUP	Water	04/03/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. For CFSWP-011-SWMS/MSD, no data were qualified for Calcium and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFSWP-012-SW and CFSWP-DUP5-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-012-SW	CFSWP-DUP5-SW			
Aluminum	27.4	37.7	32	J (all detects)	A
Barium	70.5	75.8	7	-	-
Calcium	45600	45300	1	-	-
Iron	42.4U	54.6	25	-	-
Magnesium	10300	10900	6	-	-
Manganese	6.8	7.9	15	-	-
Potassium	433	451	4	-	-
Sodium	2310	2360	2	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130874-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-012-SW CFSWP-DUP5-SW	Aluminum	J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130874-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130874-1

No Sample Data Qualified in this SDG

LDC #: 38490B4a

SDG #: 460-130874-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 5-3-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD (@ Ca, Mg - 4x)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 6
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D = 7+8
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	CFSWP-023-SW	460-130874-1	Water	04/03/17
2 1	CFSWP-022-SW	460-130874-2	Water	04/03/17
3 1	CFSWP-018-SW	460-130874-3	Water	04/03/17
4 1	CFSWP-019-SW	460-130874-4	Water	04/03/17
5 1	CFSWP-009-SW	460-130874-5	Water	04/03/17
6 1	CFSWP-011-SW	460-130874-6	Water	04/03/17
7 1	CFSWP-012-SW	460-130874-7	Water	04/03/17
8 2	CFSWP-DUP5-SW	460-130874-8	Water	04/03/17
9 1	CFSWP-011-SWMS	460-130874-6MS	Water	04/03/17
10 1	CFSWP-011-SWMSD	460-130874-6MSD	Water	04/03/17
11 1	CFSWP-011-SWDUP	460-130874-6DUP	Water	04/03/17
12				
13 1	PBW1			
14 2	PBW2			

Notes:

LDC #: 38490 84a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38490B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38490B4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 9, 11	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
↓ 10	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC#: 38490B4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: CN

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	7	8		
Aluminum	27.4	37.7	32	J/UJ/A (all dets)
Barium	70.5	75.8	7	
Calcium	45600	45300	1	
Iron	42.4U	54.6	25	
Magnesium	10300	10900	6	
Manganese	6.8	7.9	15	
Potassium	433	451	4	
Sodium	2310	2360	2	

V:\FIELD DUPLICATES\FD_inorganic\38490B4a.WPD

LDC #: 38490B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1941 ICV	ICP/MS (Initial calibration)	Mn	409.54	400	102	102	Y
0751 ICV	CVAA (Initial calibration)	Hg	5.00	5.00	100	100	↓
	ICP (Continuing calibration)						
2310 CCV6	ICP/MS (Continuing calibration)	Cr	45.81	50.0	92	92	
0839 CCV3	CVAA (Continuing calibration)	Hg	5.04	5.00	101	101	
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1958 ICSAB	ICP interference check	V	193.1 (µg/L)	200 (µg/L)	97	97	Y
2247 LCS	Laboratory control sample	Sb	23.60 (µg/L)	25.0 (µg/L)	94	gmb ~~95~~ 94	↓
2257 9	Matrix spike	Co	(SSR-SR) 23.56 (µg/L)	25.0 (µg/L)	94	94	↓
2303 / 2300 11	Duplicate	K	454.4 (µg/L)	451.0 (µg/L)	0.8	0.7	↓
2303 / 2307 6	ICP serial dilution	Ca	46558 (µg/L)	49000 (µg/L)	5.2	5.2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490B4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Cu were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(1.91\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 3.82\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cu	3.8	3.8	Y
2	2	Al	140	140	
3	3	K	700	700	
4	4	Cr	4.3	4.3	
5	5	Ba	77.1	77.1	
6	6	Mn	7.5	7.5	
7	7	Ca	45600	45600	
8	8	Fe	54.6	54.6	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 5, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130874-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-023-SW	460-130874-1	Water	04/03/17
CFSWP-022-SW	460-130874-2	Water	04/03/17
CFSWP-018-SW	460-130874-3	Water	04/03/17
CFSWP-019-SW	460-130874-4	Water	04/03/17
CFSWP-009-SW	460-130874-5	Water	04/03/17
CFSWP-011-SW	460-130874-6	Water	04/03/17
CFSWP-012-SW	460-130874-7	Water	04/03/17
CFSWP-DUP5-SW	460-130874-8	Water	04/03/17
CFSWP-011-SWMS	460-130874-6MS	Water	04/03/17
CFSWP-011-SWMSD	460-130874-6MSD	Water	04/03/17
CFSWP-011-SWDUP	460-130874-6DUP	Water	04/03/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-011-SWMS/MSD (All samples in SDG 460-130874-1)	Chloride	125 (90-110)	-	J+ (all detects)	A
CFSWP-011-SWMS/MSD (All samples in SDG 460-130874-1)	Orthophosphate as P	76 (90-110)	73 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFSWP-012-SW and CFSWP-DUP5-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFSWP-012-SW	CFSWP-DUP5-SW			
Alkalinity	172000 ug/L	172000 ug/L	0 (≤30)	-	-
Ammonia as N	72.0U ug/L	141 ug/L	65 (≤30)	J (all detects) UJ (all non-detects)	A
Chloride	2640 ug/L	2660 ug/L	1 (≤30)	-	-
Fluoride	101 ug/L	89.6 ug/L	12 (≤30)	-	-
Hardness	168000 ug/L	170000 ug/L	1 (≤30)	-	-
Sulfate	2210 ug/L	2140 ug/L	3 (≤30)	-	-
Total dissolved solids	164 mg/L	163 mg/L	1 (≤30)	-	-
Total suspended solids	1.2 mg/L	1.3 mg/L	8 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and field duplicate RPD, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130874-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-023-SW CFSWP-022-SW CFSWP-018-SW CFSWP-019-SW CFSWP-009-SW CFSWP-011-SW CFSWP-012-SW CFSWP-DUP5-SW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-023-SW CFSWP-022-SW CFSWP-018-SW CFSWP-019-SW CFSWP-009-SW CFSWP-011-SW CFSWP-012-SW CFSWP-DUP5-SW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-012-SW CFSWP-DUP5-SW	Ammonia as N	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130874-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130874-1

No Sample Data Qualified in this SDG

LDC #: 38490B6

SDG #: 460-130874-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 5-4-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: a

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrate/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D) a

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	A	DUP
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	SW	D= 7+8
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-023-SW	460-130874-1	Water	04/03/17
2	CFSWP-022-SW	460-130874-2	Water	04/03/17
3	CFSWP-018-SW	460-130874-3	Water	04/03/17
4	CFSWP-019-SW	460-130874-4	Water	04/03/17
5	CFSWP-009-SW	460-130874-5	Water	04/03/17
6	CFSWP-011-SW	460-130874-6	Water	04/03/17
7	CFSWP-012-SW	460-130874-7	Water	04/03/17
8	CFSWP-DUP5-SW	460-130874-8	Water	04/03/17
9	CFSWP-011-SWMS	460-130874-6MS	Water	04/03/17
10	CFSWP-011-SWMSD	460-130874-6MSD	Water	04/03/17
11	CFSWP-011-SWDUP	460-130874-6DUP	Water	04/03/17
12				
13				
14	PBW			

Notes:

LDC #: 38490B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38490B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38490B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1 → 8	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
QC 9,10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
↓ 11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____

Comments:

LDC #: 38490B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	9/10	water	Cl	125 (90-110)			all	J+ dets/A (all dets)
	↓	↓	PO4-P	76 (↓)	73 (90-110)		↓	J-/UJ/A (all N.D.)

Comments:

MSD.6

LDC#: 38490B6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	7	8		
Alkalinity	172000	172000	0	
Ammonia as N	72.0U	141	65	J/UJ/A (det & ND)
Chloride	2640	2660	1	
Fluoride	101	89.6	12	
Hardness	168000	170000	1	
Sulfate	2210	2140	3	
TDS (mg/L)	164	163	1	
TSS (mg/L)	1.2	1.3	8	

V:\FIELD DUPLICATES\FD_inorganic\38490B6.WPD

LDC #: 38490B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of NH_3-N was recalculated. Calibration date: 4-10-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	NH_3-N	Blank	0.0 (mg/L)	292358	r = 0.9998	r = 0.9993	Y
		Standard 1	0.1 ( )	1770755			
		Standard 2	0.5 ( )	4839636			
		Standard 3	1.0 ( )	8923571			
		Standard 4	2.0 ( )	16828468			
		Standard 5	4.0 ( )	32811348			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Total CN	1557 CCV3	0.199 (mg/L)	0.200 (mg/L)	100	100	
Calibration verification	NO_3/NO_2-N	1012 ICV	1.009 (mg/L)	1.00 (mg/L)	101	101	
Calibration verification	PO_4-P	1248 CCV1	2.51 (mg/L)	2.50 (mg/L)	0.4 %D	0.5 %D	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1379 SRM	Laboratory control sample	TDS	742 (mg/L)	740 (mg/L)	100.3	100.8	Y
1350 9	Matrix spike sample	NH_3-N	(SSR-SR) 1059 (µg/L)	1000 (µg/L)	106	106	↓
1041/1049 11	Duplicate sample	Alk	171373 (µg/L)	170781 (µg/L)	0.3	0.3	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 38490 B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Total CN reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = mx + b$
where
$m = 0.0234$
$b = -0.00139$
dil = 1x

Recalculation:
$CN\ mg/L = 0.0234(0.384) - 0.00139 = 0.007596\ mg/L$

then $(0.007596\ mg/L)(1000\ \mu g/mg) = 7.596\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Total Cyanide	7.6	7.6	Y
2	2	TSS	1.6 (mg/L)	1.6 (mg/L)	
3	3	NO3 / NO3-N	117	117	
4	4	Hardness	180000	180000	
5	5	SO4	2360	2360	
6	6	Alkalinity	171000	171000	
7	7	TDS	164 (mg/L)	164 (mg/L)	
8	8	NH3-N	141	141	

Note: method 9056A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 5, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130969-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-001-SW	460-130969-1	Water	04/04/17
CFSWP-002-SW	460-130969-2	Water	04/04/17
CFSWP-008-SW	460-130969-3	Water	04/04/17
CFSWP-017-SW	460-130969-4	Water	04/04/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

Although the low level check standard exceeded QC limits for Calcium, no data was qualified since all results were greater than 2x the reporting limit.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution was not performed for this SDG.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-130969-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-130969-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-130969-1

No Sample Data Qualified in this SDG

LDC #: 38490C4a

SDG #: 460-130969-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 5-4-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-130874-1)
VIII.	Duplicate sample analysis	A	DUP (↓)
IX.	Serial Dilution	N	not performed
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	CFSWP-001-SW	460-130969-1	Water	04/04/17
2 1	CFSWP-002-SW	460-130969-2	Water	04/04/17
3 2	CFSWP-008-SW	460-130969-3	Water	04/04/17
4 2	CFSWP-017-SW	460-130969-4	Water	04/04/17
5				
6				
7				
8				
9				
10				
11				
12				
13 1	PBW1			
14 2	PBW2			

Notes:

LDC #: 38490C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 38490C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?		✓		
Were all percent differences (%Ds) < 10%?			✓	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			✓	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38490C4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→4	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 38490C4a

VALIDATION FINDINGS WORKSHEET
Calibration

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all instruments calibrated daily, each set-up time, and were the proper number of standards used?

Y N N/A Were all initial and continuing calibration verification percent recoveries (%R) within the control limits of 90-110% for all analytes except mercury (80-120%) and cyanide (85-115%)?

LEVEL IV ONLY:

Y N N/A Was a midrange cyanide standard distilled?

Y N N/A Are all correlation coefficients ≥0.995?

Y N N/A Were recalculated results acceptable? See Level IV Initial and Continuing Calibration Recalculation Worksheet for recalculations.

#	Date	Calibration ID	Analyte	%R	Associated Samples	Qualification of Data
1	4-7-17	CRI (23:40)	Ca	132 (70-130)	all	No Qual. (dets > 2x RL)

Comments:

LDC #: 38490C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
2330 ICV	ICP/MS (Initial calibration)	Al	412.50	400	103	103	Y
0751 ICV	CVAA (Initial calibration)	Hg	5.00	5.00	100	100	↓
	ICP (Continuing calibration)						
0458 CCV8	ICP/MS (Continuing calibration)	Se	49.36	50.0	99	99	
0820 CCV2	CVAA (Continuing calibration)	Hg	5.03	5.00	101	101	
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
0000 ICSAB	ICP interference check	Cu	183.5 (µg/L)	200 (µg/L)	92	92	Y
0345 LCS	Laboratory control sample	As	44.18 (µg/L)	50.0 (µg/L)	88	88	↓
0812 CFSWP-011-SWMS	Matrix spike	Hg	(SSR-SR) 1.02 (µg/L)	1.00 (µg/L)	102	102	↓
0807/0809 CFSWP-011-SWDUP	Duplicate	Hg	0.17 U (µg/L)	0.17 U (µg/L)	0	NC	↓
–	ICP serial dilution	–	–	–	–	–	–

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 38490C4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Sb were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(0.32\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 0.64\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Sb	0.64	0.64	Y
2	2	Fe	137	137	
3	3	Mn	4.6	4.6	
4	4	Ba	94.4	94.4	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: May 5, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-130969-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-001-SW	460-130969-1	Water	04/04/17
CFSWP-002-SW	460-130969-2	Water	04/04/17
CFSWP-008-SW	460-130969-3	Water	04/04/17
CFSWP-017-SW	460-130969-4	Water	04/04/17
CFSWP-001-SWMS	460-130969-1MS	Water	04/04/17
CFSWP-001-SWMSD	460-130969-1MSD	Water	04/04/17
CFSWP-001-SWDUP	460-130969-1DUP	Water	04/04/17
CFSWP-008-SWMS	460-130969-3MS	Water	04/04/17
CFSWP-008-SWMSD	460-130969-3MSD	Water	04/04/17
CFSWP-008-SWDUP	460-130969-3DUP	Water	04/04/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide by EPA Method 335.4
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorus by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-008-SWMS/MSD (All samples in SDG 38490C6)	Sulfate	114 (90-110)	113 (90-110)	J+ (all detects)	A
CFSWP-008-SWMS/MSD (All samples in SDG 38490C6)	Orthophosphate as P	114 (90-110)	116 (90-110)	NA	-

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
CFSWP-008-SWDUP (All samples in SDG 460-130969-1)	Total dissolved solids	8 (≤5)	-	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Materials

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-130969-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-001-SW CFSWP-002-SW CFSWP-008-SW CFSWP-017-SW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-001-SW CFSWP-002-SW CFSWP-008-SW CFSWP-017-SW	Total dissolved solids	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-130969-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-130969-1

No Sample Data Qualified in this SDG

LDC #: 38490C6

SDG #: 460-130969-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 5-4-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	SW	DUP (SDG: 460-130874-1)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-001-SW	460-130969-1	Water	04/04/17
2	CFSWP-002-SW	460-130969-2	Water	04/04/17
3	CFSWP-008-SW	460-130969-3	Water	04/04/17
4	CFSWP-017-SW	460-130969-4	Water	04/04/17
5	CFSWP-001-SWMS	460-130969-1MS	Water	04/04/17
6	CFSWP-001-SWMSD	460-130969-1MSD	Water	04/04/17
7	CFSWP-001-SWDUP	460-130969-1DUP	Water	04/04/17
8	CFSWP-008-SWMS	460-130969-3MS	Water	04/04/17
9	CFSWP-008-SWMSD	460-130969-3MSD	Water	04/04/17
10	CFSWP-008-SWDUP	460-130969-3DUP	Water	04/04/17
11				
12				
13				
14	PBW			

Notes:

LDC #: 3849OC6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 38490C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 38490C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→4	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
QC 5,6	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
7	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
8,9	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
↓ 10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 38490C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: Q

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A — Was a matrix spike analyzed for each matrix in this SDG?
Y (N) N/A — Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.
(Y) N N/A — Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:
(Y) N N/A — Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	8/9	water	SO_4	114 (90-110)	113 (90-110)		all	J+ dets/A (all dets)
	↓	↓	PO_4-P	114 (↓)	116 (↓)		↓	↓ (all N.D.)

Comments:

LDC #: 38490C6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		10	water	TDS	8 (≤5)	all	J/UJ/A (all dets)

Comments:

DUP.6

LDC #: 38490C6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of Total CN was recalculated. Calibration date: 4-9-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Total Cyanide	Blank	0.000 (mg/L)	0.0660	r=0.99966	r=0.99993	Y
		Standard 1	0.010 ( )	0.483			
		Standard 2	0.025 ( )	1.09			
		Standard 3	0.050 ( )	2.18			
		Standard 4	0.100 ( )	4.43			
		Standard 5	0.200 ( )	8.86			
		Standard 6	0.400 ( )	16.8			
		Standard 7	–	–			
Calibration verification	NH_3-N	1215 CCV1	1.99 (mg/L)	2.00 (mg/L)	100	99	
Calibration verification	NO_3/NO_2-N	1134 ICV	1.017 (mg/L)	1.00 (mg/L)	102	102	
Calibration verification	SO_4	1300 CCV1	7.01 (mg/L)	7.50 (mg/L)	-6.5 %D	-6.5 %D	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

CALCLC.6

LDC #: 38490C6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1405 LCS	Laboratory control sample	F	961.8 (µg/L)	1000 (µg/L)	96	96	Y
1146 5	Matrix spike sample	NO_3/NO_2-N	(SSR-SR) 964.4 (µg/L)	1000 (µg/L)	96	96	↓
1200/1200 7	Duplicate sample	Hardness	86000 (µg/L)	88000 (µg/L)	2	2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 38490C6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$\text{Hardness} = \frac{(4.3\ \text{ml})(0.020\ \text{N})(50\,000)(1000\ \mu g/mg)}{50.0\ \text{ml}} = 86\,000\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Hardness	86000	86000	Y
	↓	F	84.2	84.2	↓
2	2	TDS	87.0 (mg/L)	87.0 (mg/L)	↓
	↓	TSS	8.5 (↓)	8.5 (↓)	↓
3	3	NO_3/NO_2-N	100	100	↓
	↓	NH_3-N	86.0	86.0	↓
4	4	Alkalinity	89100	89100	↓

Note: methods 9056A and 335.4 are N.D. for all samples

RECALC.6

LDC #: 38490

EDD POPULATION COMPLETENESS WORKSHEET

Date: 5/5

Page: 1 of 1

2nd Reviewer: [illegible]

The LDC job number listed above was entered by BA.

	EDD Process		Comments/Action
I.	EDD Completeness	-	
Ia.	- All methods present?	Y	
Ib.	- All samples present/match report?	Y	
Ic.	- All reported analytes present?	Y	
Id.	- 10% or 100% verification of EDD?	Y	
II.	EDD Preparation/Entry	-	
IIa.	- Carryover U/J?	Y	
IIb.	- Reason Codes used? If so, note which codes.	N	
IIc.	- Additional Information (QC Level, Validator, Validated Y/N, etc.)	N	
III.	Reasonableness Checks	-	
IIIa.	- Do all qualified ND results have ND qualifier (e.g. UJ)?	Y	
IIIb.	- Do all qualified detect results have detect qualifier (e.g. J)?	Y	
IIIc.	- If reason codes are used, do all qualified results have reason code field populated, and vice versa?	N/A	
IIId.	-Does the detect flag require changing for blank qualifier? If so, are all U results marked ND?		
IIIe.	- Do blank concentrations in report match EDD where data was qualified due to blank contamination?		
IIIf.	- Were multiple results reported due to dilutions/reanalysis? If so, were results qualified appropriately?		
IIIg.	-Are there any discrepancies between the data packet and the EDD?	N	

Notes: *see discrepancy sheet

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

July 27, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on July 3, 2017. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #39011:

SDG #	Fraction
460-135182-1, 460-135255-1 460-135338-1, 460-135444-1 460-135619-1	Volatiles, Semivolatiles, Chlorinated Pesticides, Polychlorinated Biphenyls, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

EDD LDC #39011 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Pest. (8081B)		PCBs (8082A)		Metals (6020A /7470A)		D.Metals (6020A /7470A)																					
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-135182-1	07/03/17	07/25/17	-	-	-	-	-	-	-	-	7	0	7	0																				
B	460-135255-1	07/03/17	07/25/17	-	-	-	-	-	-	-	-	5	0	4	0																				
C	460-135338-1	07/03/17	07/25/17	-	-	-	-	-	-	-	-	9	0	9	0																				
D	460-135444-1	07/03/17	07/25/17	2	0	1	0	1	0	1	0	5	0	5	0																				
E	460-135619-1	07/03/17	07/25/17	4	0	3	0	-	-	-	-	6	0	5	0																				
Total	T/CR			6	0	4	0	1	0	1	0	32	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74

EDD LDC #39011 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		Diss. F (300.0)		Total CN- (335.4)		Free CN- (9016)		D.Total CN- (335.4)		D.Free CN- (9016)		DOC (9060A)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		S= (4500 -S2 F)		TDS (2540C)		TSS (2540D)					
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-135182-1	07/03/17	07/25/17	7	0	7	0	7	0	7	0	7	0	-	-	7	0	-	-	7	0	7	0	7	0	7	0	7	0	7	0	7	0		
B	460-135255-1	07/03/17	07/25/17	5	0	5	0	5	0	4	0	5	0	3	0	5	0	3	0	4	0	5	0	5	0	5	0	5	0	4	0	4	0		
C	460-135338-1	07/03/17	07/25/17	9	0	9	0	9	0	9	0	9	0	4	0	9	0	4	0	9	0	9	0	9	0	9	0	9	0	9	0	9	0		
D	460-135444-1	07/03/17	07/25/17	5	0	5	0	5	0	5	0	5	0	1	0	5	0	1	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0		
E	460-135619-1	07/03/17	07/25/17	6	0	6	0	6	0	5	0	6	0	5	0	5	0	5	0	-	-	6	0	6	0	6	0	-	-	5	0	5	0		
Total	T/CR			32	0	32	0	32	0	30	0	32	0	13	0	31	0	13	0	25	0	32	0	32	0	32	0	26	0	30	0	30	0	0	0	0	422

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs V:\LOGIN\Roux Associates\Columbia Falls\39011ST-Water.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135182-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-009-SW	460-135182-1	Water	06/12/17
CFSWP-010-SW	460-135182-2	Water	06/12/17
CFSWP-011-SW	460-135182-3	Water	06/12/17
CFSWP-012-SW	460-135182-4	Water	06/12/17
CFSWP-013-SW	460-135182-5	Water	06/12/17
CFSWP-016-SW	460-135182-6	Water	06/12/17
CFSWP-DUP6-SW	460-135182-7	Water	06/12/17
CFSWP-009-SWF	460-135182-1F	Water	06/12/17
CFSWP-010-SWF	460-135182-2F	Water	06/12/17
CFSWP-011-SWF	460-135182-3F	Water	06/12/17
CFSWP-012-SWF	460-135182-4F	Water	06/12/17
CFSWP-013-SWF	460-135182-5F	Water	06/12/17
CFSWP-016-SWF	460-135182-6F	Water	06/12/17
CFSWP-DUP6-SWF	460-135182-7F	Water	06/12/17
CFSWP-011-SWMS	460-135182-3MS	Water	06/12/17
CFSWP-011-SWDUP	460-135182-3DUP	Water	06/12/17
CFSWP-011-SWFMS	460-135182-3FMS	Water	06/12/17
CFSWP-011-SWFDUP	460-135182-3FDUP	Water	06/12/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFSWP-011-SWMS, no data were qualified for Calcium and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFSWP-011-SWFMS, no data were qualified for Barium, Calcium, and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFSWP-016-SW and CFSWP-DUP6-SW and samples CFSWP-016-SWF and CFSWP-DUP6-SWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-016-SW	CFSWP-DUP6-SW			
Aluminum	85.5	66.8	25 (≤30)	-	-
Barium	98.8	99.4	1 (≤30)	-	-
Calcium	50500	51000	1 (≤30)	-	-
Copper	1.9	1.4U	30 (≤30)	-	-
Iron	129	54.7	81 (≤30)	J (all detects)	A
Magnesium	12200	12400	2 (≤30)	-	-
Manganese	14.7	14.0	5 (≤30)	-	-
Potassium	477	479	0 (≤30)	-	-
Sodium	2200	2200	0 (≤30)	-	-
Zinc	13.5	7.0U	63 (≤30)	J (all detects) UJ (all non-detects)	A

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-016-SWF	CFSWP-DUP6-SWF			
Barium	93.5	99.8	7 (≤30)	-	-
Calcium	50300	50600	1 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-016-SWF	CFSWP-DUP6-SWF			
Magnesium	11400	11400	0 (≤30)	-	-
Manganese	3.4	3.2	6 (≤30)	-	-
Potassium	439	436	1 (≤30)	-	-
Sodium	2070	2020	2 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135182-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-016-SW CFSWP-DUP6-SW	Iron Zinc	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135182-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135182-1

No Sample Data Qualified in this SDG

LDC #: 39011A4a

SDG #: 460-135182-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-17-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS #15) Ca, Mg - 4x #17) Ba, Ca, Mg - 4x
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 3, 10
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D=6+7, D=13+14
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

		Client ID	Lab ID	Matrix	Date
1	1	CFSWP-009-SW	460-135182-1	Water	06/12/17
2	1	CFSWP-010-SW	460-135182-2	Water	06/12/17
3	1	CFSWP-011-SW	460-135182-3	Water	06/12/17
4	1	CFSWP-012-SW	460-135182-4	Water	06/12/17
5	1	CFSWP-013-SW	460-135182-5	Water	06/12/17
6	1	CFSWP-016-SW	460-135182-6	Water	06/12/17
7	1	CFSWP-DUP6-SW	460-135182-7	Water	06/12/17
8	2	CFSWP-009-SWF	460-135182-1F	Water	06/12/17
9	2	CFSWP-010-SWF	460-135182-2F	Water	06/12/17
10	2	CFSWP-011-SWF	460-135182-3F	Water	06/12/17
11	2	CFSWP-012-SWF	460-135182-4F	Water	06/12/17
12	2	CFSWP-013-SWF	460-135182-5F	Water	06/12/17
13	2	CFSWP-016-SWF	460-135182-6F	Water	06/12/17
14	2	CFSWP-DUP6-SWF	460-135182-7F	Water	06/12/17
15	1	CFSWP-011-SWMS	460-135182-3MS	Water	06/12/17

LDC #: 39011A4a

SDG #: 460-135182-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-17-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16 1	CFSWP-011-SWDUP	460-135182-3DUP	Water	06/12/17
17 2	CFSWP-011-SWFMS	460-135182-3FMS	Water	06/12/17
18 2	CFSWP-011-SWFDUP	460-135182-3FDUP	Water	06/12/17
19				
20				
21				
22 1	PBW1			
23 2	PBW2			

Notes:

LDC #: 39011A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39011A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 39011A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 14	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 15→18	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC#: 39011A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	6	7		
Aluminum	85.5	66.8	25	
Barium	98.8	99.4	1	
Calcium	50500	51000	1	
Copper	1.9	1.4U	30	
Iron	129	54.7	81	J/UJ/A (all dets)
Magnesium	12200	12400	2	
Manganese	14.7	14.0	5	
Potassium	477	479	0	
Sodium	2200	2200	0	
Zinc	13.5	7.0U	63	J/UJ/A (det & ND)

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39011A4a.WPD

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	13	14		
Barium	93.5	99.8	7	
Calcium	50300	50600	1	
Magnesium	11400	11400	0	
Manganese	3.4	3.2	6	
Potassium	439	436	1	
Sodium	2070	2020	2	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39011A4a.WPD

LDC #: 39011A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: Q

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1331 ICV	ICP/MS (Initial calibration)	V	39.327	40.0	98	98	Y
1405 ICV	CVAA (Initial calibration)	Hg	4.8087	5.00	96	96	↓
	ICP (Continuing calibration)						↓
1733 CCV	ICP/MS (Continuing calibration)	Ni	51.067	50.0	102	102	↓
1607 CCV	CVAA (Continuing calibration)	Hg	4.9936	5.00	100	100	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1343 ICSAB	ICP interference check	Se	102.7 (µg/L)	100 (µg/L)	103	103	Y
1743 LCS	Laboratory control sample	Cu	51.73 (µg/L)	50.0 (µg/L)	103	103	↓
1748 15	Matrix spike	Sb	(SSR-SR) 25.73 (µg/L)	25.0 (µg/L)	103	103	↓
1753 / 1750 16	Duplicate	Mg	12146 (µg/L)	11884 (µg/L)	2	2	↓
1753 / 1755 3	ICP serial dilution	Ca	50600 (µg/L)	49338 (µg/L)	2.5	2.5	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011A4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for # 1, Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(32.205\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 64.410\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Al	64.4	64.4	Y
2	2	Mn	3.1	3.1	
3	3	Na	2210	2210	
4	4	Ca	50000	50000	
5	5	Zn	14.1	14.1	
6	6	Ba mg	98.8 ~~93.5~~	98.8	
7	7	Fe	54.7	54.7	
8	8	As	0.69	0.70	
9	9	Ba	85.2	85.2	
10	10	K	419	419	
11	11	Ca	48700	48700	
12	12	Mn	3.2	3.2	
13	13	Na	2070	2070	
14	14	Mg	11400	11400	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135182-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-009-SW	460-135182-1	Water	06/12/17
CFSWP-010-SW	460-135182-2	Water	06/12/17
CFSWP-011-SW	460-135182-3	Water	06/12/17
CFSWP-012-SW	460-135182-4	Water	06/12/17
CFSWP-013-SW	460-135182-5	Water	06/12/17
CFSWP-016-SW	460-135182-6	Water	06/12/17
CFSWP-DUP6-SW	460-135182-7	Water	06/12/17
CFSWP-011-SWMS	460-135182-3MS	Water	06/12/17
CFSWP-011-SWMSD	460-135182-3MSD	Water	06/12/17
CFSWP-011-SWDUP	460-135182-3DUP	Water	06/12/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Cyanide by EPA Method 335.4
Dissolved Organic Carbon by EPA SW 846 Method 9060A
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Sulfide by Standard Method 4500-S2 F
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-011-SWMS/MSD (All samples in SDG 460-135182-1)	Chloride Sulfate Dissolved fluoride	130 (90-110) 119 (90-110) 119 (90-110)	125 (90-110) 117 (90-110) 119 (90-110)	J+ (all detects) J+ (all detects) J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
CFSWP-011-SWDUP (All samples in SDG 460-135182-1)	Total dissolved solids	7 (≤5)	-	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFSWP-016-SW and CFSWP-DUP6-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFSWP-016-SW	CFSWP-DUP6-SW			
Alkalinity	185000 ug/L	185000 ug/L	0 (≤30)	-	-
Chloride	1620 ug/L	1600 ug/L	1 (≤30)	-	-
Fluoride	135 ug/L	137 ug/L	1 (≤30)	-	-
Dissolved fluoride	131 ug/L	138 ug/L	5 (≤30)	-	-
Hardness	180000 ug/L	180000 ug/L	0 (≤30)	-	-
Nitrate/Nitrite as N	113 ug/L	131 ug/L	15 (≤30)	-	-
Sulfate	1990 ug/L	1980 ug/L	1 (≤30)	-	-
Total dissolved solids	210 mg/L	221 mg/L	5 (≤30)	-	-
Dissolved organic carbon	1130 ug/L	1150 ug/L	2 (≤30)	-	-
Total suspended solids	4.4 mg/L	4.0 mg/L	10 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135182-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-009-SW CFSWP-010-SW CFSWP-011-SW CFSWP-012-SW CFSWP-013-SW CFSWP-016-SW CFSWP-DUP6-SW	Chloride Sulfate Dissolved fluoride	J+ (all detects) J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-009-SW CFSWP-010-SW CFSWP-011-SW CFSWP-012-SW CFSWP-013-SW CFSWP-016-SW CFSWP-DUP6-SW	Total dissolved solids	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135182-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135182-1

No Sample Data Qualified in this SDG

LDC #: 39011A6

SDG #: 460-135182-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-17-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Cyanide (EPA Method 335.4), DOC (EPA SW846 Method 9060A), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), Sulfide (SM4500-S2 F), TDS (SM2540C), TSS (SM2540D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	(< RL)
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	SW	D=6+7
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-009-SW	460-135182-1	Water	06/12/17
2	CFSWP-010-SW	460-135182-2	Water	06/12/17
3	CFSWP-011-SW	460-135182-3	Water	06/12/17
4	CFSWP-012-SW	460-135182-4	Water	06/12/17
5	CFSWP-013-SW	460-135182-5	Water	06/12/17
6	CFSWP-016-SW	460-135182-6	Water	06/12/17
7	CFSWP-DUP6-SW	460-135182-7	Water	06/12/17
8	CFSWP-011-SWMS	460-135182-3MS	Water	06/12/17
9	CFSWP-011-SWMSD	460-135182-3MSD	Water	06/12/17
10	CFSWP-011-SWDUP	460-135182-3DUP	Water	06/12/17
11				
12				
13	PBW1			
14	PBW2			

Notes:

LDC #: 39011A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39011A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 39011A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [signature]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→7	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis. F $S^=$ Hard TSS dis. CN DOC
QC 8,9	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4 dis. F $S^=$ ____ dis. CN DOC
↓ 10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis. F Hard TSS
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 ____ ____

Comments: _____

LDC #: 39011A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	8/9	water	Cl	130 (90-110)	125 (90-110)		all	J+ dets/A (all dets)
	↓	↓	SO4	119 (↓)	117 (↓)		↓	↓ (↓)
	↓	↓	dis. F	119 (↓)	119 (↓)		↓	↓ (↓)

Comments:

LDC #: 39011A6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y (N) N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		10	Water	TDS	7 (≤5)	all	J/UJ/A (all dets)

Comments:

LDC#: 39011A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [signature]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	6	7		
Alkalinity	185000	185000	0	
Chloride	1620	1600	1	
Fluoride	135	137	1	
Dissolved Fluoride	131	138	5	
Hardness	180000	180000	0	
Nitrate/Nitrite as N	113	131	15	
Sulfate	1990	1980	1	
TDS (mg/L)	210	221	5	
Dissolved Organic Carbon	1130	1150	2	
TSS (mg/L)	4.4	4.0	10	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39011A6.WPD

LDC #: 39011A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of NH_3-N was recalculated. Calibration date: 6-19-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	NH_3-N	Blank	0.0 (mg/L)	287674	r = 0.9980	r = 0.9973	Y
		Standard 1	0.1 ( )	1489651			
		Standard 2	0.5 ( )	4093965			
		Standard 3	1.0 ( )	7812884			
		Standard 4	2.0 ( )	16278861			
		Standard 5	4.0 ( )	28577146			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	Total CN	1257 CCV	0.200 (mg/L)	0.200 (mg/L)	100	100	
Calibration verification	NO_3/NO_2-N	1523 ICV	1.02 (mg/L)	1.00 (mg/L)	102	102	
Calibration verification	TOC for DOC	0957 ICV	49.65 (mg/L)	50.0 (mg/L)	99	99	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
HLCS	Laboratory control sample	Total CN	197 (µg/L)	200 (µg/L)	98	99	Y
8	Matrix spike sample	dissolved F	(SSR-SR) 1187 (µg/L)	1000 (µg/L)	119	119	↓
10	Duplicate sample	TDS	199 (mg/L)	185 (mg/L)	7	7	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$\text{Hardness} = \frac{(9.4\ \text{ml})(0.020\ \text{N})(50000)(1000\ \mu g/mg)}{50\ \text{ml}} = 188\,000\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Hardness	188000	188000	Y
2	2	Cl	1640	1640	
3	3	DOC	1230	1230	
4	4	TDS	212 (mg/L)	212 (mg/L)	
5	5	NO_3/NO_2-N	113	113	
6	6	TSS	4.4 (mg/L)	4.4 (mg/L)	
7	7	Alk	185000	185000	

Note: methods 335.4, 350.1, SM4500-S2F and 9056A are N.D. for Level IV samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 20, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135255-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-014-SW	460-135255-1	Water	06/13/17
CFSWP-015-SW	460-135255-2	Water	06/13/17
CFSWP-025-SW	460-135255-3	Water	06/13/17
CFSWP-DUP7-SW	460-135255-4	Water	06/13/17
CFSWP-FB4-AQ	460-135255-5	Water	06/13/17
CFSWP-014-SWF	460-135255-1F	Water	06/13/17
CFSWP-015-SWF	460-135255-2F	Water	06/13/17
CFSWP-025-SWF	460-135255-3F	Water	06/13/17
CFSWP-DUP7-SWF	460-135255-4F	Water	06/13/17
CFSWP-025-SWMS	460-135255-3MS	Water	06/13/17
CFSWP-025-SWDUP	460-135255-3DUP	Water	06/13/17
CFSWP-025-SWFMS	460-135255-3FMS	Water	06/13/17
CFSWP-025-SWFDUP	460-135255-3FDUP	Water	06/13/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFSWP-FB4-AQ was identified as a field blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFSWP-FB4-AQ	06/13/17	Calcium Sodium	442 ug/L 426 ug/L	CFSWP-014-SW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFSWP-014-SW	Sodium	2240 ug/L	2240J+ ug/L

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFSWP-025-SWMS, no data were qualified for Calcium and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFSWP-025-SWFMS, no data were qualified for Barium, Calcium, and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFSWP-015-SW and CFSWP-DUP7-SW and samples CFSWP-015-SWF and CFSWP-DUP7-SWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-015-SW	CFSWP-DUP7-SW			
Aluminum	45.6	40.0	13 (≤30)	-	-
Barium	97.5	97.1	0 (≤30)	-	-
Calcium	51600	51700	0 (≤30)	-	-
Magnesium	12600	12700	1 (≤30)	-	-
Manganese	12.5	13.0	4 (≤30)	-	-
Potassium	469	466	1 (≤30)	-	-
Sodium	2250	2270	1 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFSWP-015-SWF	CFSWP-DUP7-SWF			
Barium	93.0	96.3	3 (≤30)	-	-
Calcium	50500	50100	1 (≤30)	-	-
Magnesium	11700	11700	0 (≤30)	-	-
Manganese	3.5	3.2	9 (≤30)	-	-
Potassium	434	429	1 (≤30)	-	-
Sodium	1960	1940	1 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135255-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135255-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135255-1

Sample	Analyte	Modified Final Concentration	A or P
CFSWP-014-SW	Sodium	2240J+ ug/L	A

LDC #: 39011B4a

SDG #: 460-135255-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-18-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	FB = 5
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-135182-1) #10: Ca, Mg - 4x #12: Ba, Ca, Mg - 4x
VIII.	Duplicate sample analysis	A	DUP (↓) Ca
IX.	Serial Dilution	A	SD: 3, 8
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D = 2+4, D = 7+9
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 3 1	CFSWP-014-SW	460-135255-1	Water	06/13/17
2 3 1	CFSWP-015-SW	460-135255-2	Water	06/13/17
3 1	CFSWP-025-SW	460-135255-3	Water	06/13/17
4 3 1	CFSWP-DUP7-SW	460-135255-4	Water	06/13/17
5 3 1	CFSWP-FB4-AQ	460-135255-5	Water	06/13/17
6 2	CFSWP-014-SWF	460-135255-1F	Water	06/13/17
7 2	CFSWP-015-SWF	460-135255-2F	Water	06/13/17
8 4 2	CFSWP-025-SWF	460-135255-3F	Water	06/13/17
9 2	CFSWP-DUP7-SWF	460-135255-4F	Water	06/13/17
10 1	CFSWP-025-SWMS	460-135255-3MS	Water	06/13/17
11 1	CFSWP-025-SWDUP	460-135255-3DUP	Water	06/13/17
12 4 2	CFSWP-025-SWFMS	460-135255-3FMS	Water	06/13/17
13 4 2	CFSWP-025-SWFDUP	460-135255-3FDUP	Water	06/13/17
14 1	PBW1			
15 2	PBW2			
3	PBW3 (Hg)			
4	PBW4 (↓)			

LDC #: 39011B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39011B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39011B4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: ✓

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 9	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 10→13	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 39011B4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: C

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/13/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: _____ Associated Samples: 1

Analyte	Blank ID	Sample Identification										
	5	Action Level	1									
Ca	442	4420										
Na	426	4260	2240J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 39011B4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	2	4		
Aluminum	45.6	40.0	13	
Barium	97.5	97.1	0	
Calcium	51600	51700	0	
Magnesium	12600	12700	1	
Manganese	12.5	13.0	4	
Potassium	469	466	1	
Sodium	2250	2270	1	

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Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	7	9		
Barium	93.0	96.3	3	
Calcium	50500	50100	1	
Magnesium	11700	11700	0	
Manganese	3.5	3.2	9	
Potassium	434	429	1	
Sodium	1960	1940	1	

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LDC #: 39011B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1331 ICV	ICP/MS (Initial calibration)	Pb	40.459	40.0	101	101	Y
1405 ICV	CVAA (Initial calibration)	Hg	4.8087	5.00	96	96	↓
	ICP (Continuing calibration)						↓
1803 CCV	ICP/MS (Continuing calibration)	Cr	51.064	50.0	102	102	↓
1629 CCV	CVAA (Continuing calibration)	Hg	4.8706	5.00	97	97	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1343 ICSAB	ICP interference check	Zn	99.15 (µg/L)	100 (µg/L)	99	99	Y
1743 LCS	Laboratory control sample	Cd	25.12 (µg/L)	25.0 (µg/L)	100	100	↓
1822 10	Matrix spike	Tl	(SSR-SR) 21.26 (µg/L)	20.0 (µg/L)	106	106	↓
1827 / 1825 11	Duplicate	Al	49.45 (µg/L)	46.55 (µg/L)	6	6	↓
1827 / 1829 3	ICP serial dilution	Ca	51089 (µg/L)	52604 (µg/L)	3.0	3.0	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 39011B4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(16.871\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 33.742\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Al	33.7	33.7	Y
2	2	Na	2250	2250	
3	3	Mg	12400	12400	
4	4	Ca	51700	51700	
5	5	Na	426	426	
6	6	Mn	2.7	2.7	
7	7	K	434	434	
8	8	Na	2010	2010	
9	9	Ba	96.3	96.3	

Note: method 7470A is N.D. for Level IV samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 20, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135255-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-014-SW	460-135255-1	Water	06/13/17
CFSWP-015-SW	460-135255-2	Water	06/13/17
CFSWP-025-SW	460-135255-3	Water	06/13/17
CFSWP-DUP7-SW	460-135255-4	Water	06/13/17
CFSWP-FB4-AQ	460-135255-5	Water	06/13/17
CFSWP-025-SWMS	460-135255-3MS	Water	06/13/17
CFSWP-025-SWMSD	460-135255-3MSD	Water	06/13/17
CFSWP-025-SWDUP	460-135255-3DUP	Water	06/13/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Dissolved Organic Carbon by EPA SW 846 Method 9060A
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Sulfide by Standard Method 4500-S2 F
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFSWP-014-SW was identified as a field blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFSWP-014-SW	06/13/17	Chloride Nitrate/ Nitrite as N	122 ug/L 108 ug/L	CFSWP-014-SW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFSWP-014-SW	Nitrate/ Nitrite as N	144 ug/L	144J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-025-SWMS/MSD (CFSWP-014-SW CFSWP-015-SW CFSWP-025-SW CFSWP-DUP7-SW)	Chloride	126 (90-110)	131 (90-110)	J+ (all detects)	A
CFSWP-025-SWMS/MSD (CFSWP-014-SW CFSWP-015-SW CFSWP-025-SW CFSWP-DUP7-SW)	Sulfate Dissolved fluoride	112 (90-110) -	112 (90-110) 111 (90-110)	J+ (all detects) J+ (all detects)	A
CFSWP-025-SWMS/MSD (CFSWP-014-SW CFSWP-015-SW CFSWP-025-SW CFSWP-DUP7-SW)	Nitrate/Nitrite as N	83 (90-110)	-	J- (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFSWP-015-SW and CFSWP-DUP7-SW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFSWP-015-SW	CFSWP-DUP7-SW			
Alkalinity	186000 ug/L	186000 ug/L	0 (≤30)	-	-
Chloride	1640 ug/L	1620 ug/L	1 (≤30)	-	-
Fluoride	135 ug/L	136 ug/L	1 (≤30)	-	-
Dissolved fluoride	121 ug/L	130 ug/L	7 (≤30)	-	-
Hardness	180000 ug/L	184000 ug/L	2 (≤30)	-	-
Nitrate/Nitrite as N	120 ug/L	120 ug/L	0 (≤30)	-	-
Sulfate	1960 ug/L	1890 ug/L	4 (≤30)	-	-
Total dissolved solids	179 mg/L	184 mg/L	3 (≤30)	-	-
Dissolved organic carbon	1250 ug/L	1230 ug/L	2 (≤30)	-	-
Total suspended solids	2.1 mg/L	1.8 mg/L	15 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in four samples.

Due to field blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135255-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-014-SW CFSWP-015-SW CFSWP-025-SW CFSWP-DUP7-SW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-014-SW CFSWP-015-SW CFSWP-025-SW CFSWP-DUP7-SW	Sulfate Dissolved fluoride	J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-014-SW CFSWP-015-SW CFSWP-025-SW CFSWP-DUP7-SW	Nitrate/Nitrite as N	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135255-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135255-1

Sample	Analyte	Modified Final Concentration	A or P
CFSWP-014-SW	Nitrate/ Nitrite as N	144J+ ug/L	A

LDC #: 39011B6

SDG #: 460-135255-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-18-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: G

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide ~~(EPA Metyhod 335.~~4), DOC (EPA SW846 Method 9060A), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), Sulfide (SM4500-S2 F), TDS (SM2540C), TSS (SM2540D) Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

mg

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	(< RL)
V	Field blanks	SW	FB = 5
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	A	DUP (#8: TSS OK by difference)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	SW	D = 2+4
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-014-SW	460-135255-1	Water	06/13/17
2	CFSWP-015-SW	460-135255-2	Water	06/13/17
3	CFSWP-025-SW	460-135255-3	Water	06/13/17
4	CFSWP-DUP7-SW	460-135255-4	Water	06/13/17
5	CFSWP-FB4-AQ	460-135255-5	Water	06/13/17
6	CFSWP-025-SWMS	460-135255-3MS	Water	06/13/17
7	CFSWP-025-SWMSD	460-135255-3MSD	Water	06/13/17
8	CFSWP-025-SWDUP	460-135255-3DUP	Water	06/13/17
9				
10				
11				
12	PBW1			
13	PBW2			

Notes:

LDC #: 39011B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: G

Method: Inorganics (EPA Method See cover

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39011B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39011B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: CW

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1,2,4	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F Free CN $S^=$ Hard
3	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F $S^=$ Hard
5	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 $S^=$ Hard
1,2,4	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 TSS dis CN dis Free CN DOC
3	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 TSS dis CN DOC
5	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis CN
QC 6,7	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F $S^=$
8	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F Hard
6,7	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis CN DOC
8	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 TSS
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39011B6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/13/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 1

Analyte	Blank ID	Action Limit	Sample Identification									
	5		1									
Cl	122	1220										
NO3/NO2-N	108	1080	144J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39011B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications	
1	6/7	Water	Cl	126 (90-110)	131 (90-110)		all 1-4	J+ dets/A	(all dets)
	↓	↓	SO4	112 (↓)	112 (↓)		↓ ↓	↓	(det in 1→4)
			dis. F		111 (↓)		1→4		(all dets)
			NO3/NO2-N	83 (↓)			all 1-4	J-/UJ/A	(↓)

Comments:

LDC#: 39011B6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: G

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	2	4		
Alkalinity	186000	186000	0	
Chloride	1640	1620	1	
Fluoride	135	136	1	
Dissolved Fluoride	121	130	7	
Hardness	180000	184000	2	
Nitrate/Nitrite as N	120	120	0	
Sulfate	1960	1890	4	
TDS (mg/L)	179	184	3	
Dissolved Organic Carbon	1250	1230	2	
TSS (mg/L)	2.1	1.8	15	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39011B6.WPD

LDC #: 39011B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: C

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Free CN was recalculated. Calibration date: 6-20-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Abs. True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Free CN	Blank	0 (mg/L)	0.0	r=1.000	r=1.000	Y
		Standard 1	2 ( )	0.007			
		Standard 2	5 ( )	0.014			
		Standard 3	10 ( )	0.023			
		Standard 4	25 ( )	0.054			
		Standard 5	50 ( )	0.104			
		Standard 6	150 ( )	0.303			
		Standard 7	-	-			
Calibration verification	NH_3-N	1353 ICV	1.982 (mg/L)	2.00 (mg/L)	99	99	
Calibration verification	TOC for DOC	1328 ICV	49.47 (mg/L)	50.0 (mg/L)	99	99	
Calibration verification	NO_3/NO_2-N	1541 CCV1	1.013 (mg/L)	1.00 (mg/L)	101	101	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

CALCLC.6

LDC #: 39011B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See Cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	Sulfide	6630 (µg/L)	8820 (µg/L)	75	75	Y
6	Matrix spike sample	PO_4-P	(SSR-SR) 2291 (µg/L)	2500 (µg/L)	92	92	↓
8	Duplicate sample	TSS	4.40 (mg/L)	3.60 (mg/L)	20	20	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: C

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, DOC reported with a positive detect were recalculated and verified using the following equation:

Concentration =
$Y = mx + b$
where
$m =$ ~~504.8~~ 5.044
$b = 0.3898$
dil = 1x

Recalculation:
$7.327 = 5.044(x) + 0.3898$
$1.3753\ mg/L = x$
then $(1.375\ mg/L)(1000\ \mu g/mg) = 1375\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	DOC	1380	1380	Y
	↓	Alk	182000	182000	↓
2	2	TDS	179 (mg/L)	179 (mg/L)	
	↓	Hardness	180000	180000	
3	3	TSS	4.4 (mg/L)	4.4 (mg/L)	
4	4	NO_3/NO_2-N	120	120	
5	5	Cl	122	122	

Note: methods 335.4 350.1 9016, 9056A and SM4500S2F are N.D. for all samples

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 20, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135338-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-001-SW	460-135338-1	Water	06/14/17
CFSWP-002-SW	460-135338-2	Water	06/14/17
CFSWP-003-SW	460-135338-3	Water	06/14/17
CFSWP-004-SW	460-135338-4	Water	06/14/17
CFSWP-005-SW	460-135338-5	Water	06/14/17
CFSWP-006-SW	460-135338-6	Water	06/14/17
CFSWP-007-SW	460-135338-7	Water	06/14/17
CFSWP-008-SW	460-135338-8	Water	06/14/17
CFSWP-017-SW	460-135338-9	Water	06/14/17
CFSWP-001-SWF	460-135338-1F	Water	06/14/17
CFSWP-002-SWF	460-135338-2F	Water	06/14/17
CFSWP-003-SWF	460-135338-3F	Water	06/14/17
CFSWP-004-SWF	460-135338-4F	Water	06/14/17
CFSWP-005-SWF	460-135338-5F	Water	06/14/17
CFSWP-006-SWF	460-135338-6F	Water	06/14/17
CFSWP-007-SWF	460-135338-7F	Water	06/14/17
CFSWP-008-SWF	460-135338-8F	Water	06/14/17
CFSWP-017-SWF	460-135338-9F	Water	06/14/17
CFSWP-008-SWMS	460-135338-8MS	Water	06/14/17
CFSWP-008-SWDUP	460-135338-8DUP	Water	06/14/17
CFSWP-001-SWMS	460-135338-1MS	Water	06/14/17
CFSWP-001-SWDUP	460-135338-1DUP	Water	06/14/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFSWP-008-SWMS, no data were qualified for Calcium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFSWP-001-SWMS, no data were qualified for Calcium and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

The results for the dissolved metals sample analysis were greater than the total metals sample analysis as follows:

Analyte	Concentration (ug/L)	
	CFSWP-003-SWF	CFSWP-003-SW
Copper	26.4	1.4U
Nickel	32.2	1.4U

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135338-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135338-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135338-1

No Sample Data Qualified in this SDG

LDC #: 39011C4a
SDG #: 460-135338-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7-19-17

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	#19: Ca - 4x; #21: Ca, Mg - 4x; MS (SDG: 460-135255-1, 460-135182-1)
VIII.	Duplicate sample analysis	A	DUP (↓)
IX.	Serial Dilution	A	SD: 8, 10 (↓)
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	SW	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFSWP-001-SW	460-135338-1	Water	06/14/17
2 1	CFSWP-002-SW	460-135338-2	Water	06/14/17
3 1	CFSWP-003-SW	460-135338-3	Water	06/14/17
4 1	CFSWP-004-SW	460-135338-4	Water	06/14/17
5 1	CFSWP-005-SW	460-135338-5	Water	06/14/17
6 2	CFSWP-006-SW	460-135338-6	Water	06/14/17
7 2	CFSWP-007-SW	460-135338-7	Water	06/14/17
8 2	CFSWP-008-SW	460-135338-8	Water	06/14/17
9 2	CFSWP-017-SW	460-135338-9	Water	06/14/17
10 3	CFSWP-001-SWF	460-135338-1F	Water	06/14/17
11 3	CFSWP-002-SWF	460-135338-2F	Water	06/14/17
12 3	CFSWP-003-SWF	460-135338-3F	Water	06/14/17
13 3	CFSWP-004-SWF	460-135338-4F	Water	06/14/17
14 3	CFSWP-005-SWF	460-135338-5F	Water	06/14/17
15 3	CFSWP-006-SWF	460-135338-6F	Water	06/14/17

LDC #: 39011C4a

SDG #: 460-135338-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-19-17

Reviewer: MG

2nd Reviewer: ✓

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16 3	CFSWP-007-SWF	460-135338-7F	Water	06/14/17
17 3	CFSWP-008-SWF	460-135338-8F	Water	06/14/17
18 3	CFSWP-017-SWF	460-135338-9F	Water	06/14/17
19 2	CFSWP-008-SWMS	460-135338-8MS	Water	6/14/17
20 2	CFSWP-008-SWDUP	460-135338-8DUP	Water	6/14/17
21 3	CFSWP-001-SWFMS	460-135338-1FMS	Water	6/14/17
22 3	CFSWP-001-SWFDUP	460-135338-1F DUP	Water	6/14/17
23	1 PBW1			

Notes: 2 PBW2

3 PBW3

LDC #: 39011C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39011C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 39011C4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→18	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 19→22	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 39011C4a

VALIDATION FINDINGS WORKSHEET
Sample Result Verification

Reviewer: MG
2nd Reviewer: a

METHOD: Trace metals (EPA SW 846 6010/6020/7000)

— (µg/L) —

#	Sample ID	Analyte	Dissolved Result (units)	Total Result ~~Rt~~ (units)	Finding	Qualifications
1	3/12	Cu	26.4	1.4 U	dissolved > total	text
	↓	Ni	32.2	1.4 U	↓	↓

Comments:

LDC #: 39011C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: Q

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
0256 ICV	ICP/MS (Initial calibration)	Tl	8.03	8.00	100	100	Y
1405 ICV	CVAA (Initial calibration)	Hg	4.8087	5.00	96	96	↓
	ICP (Continuing calibration)						↓
0406 CCV2	ICP/MS (Continuing calibration)	Co	48.46	50.0	97	97	↓
1545 CCV	CVAA (Continuing calibration)	Hg	4.9957	5.00	100	100	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: C

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
0312 ICSAB	ICP interference check	As	102.7 (µg/L)	100 (µg/L)	103	103	Y
0336 LCS	Laboratory control sample	V	10.34 (µg/L)	10.0 (µg/L)	103	103	↓
0339 21	Matrix spike	Ni	(SSR-SR) 19.56 (µg/L)	20.0 (µg/L)	98	98	↓
0346/0342 22	Duplicate	Mg	4893 (µg/L)	4318 (µg/L)	12	12	↓
0346/0349 10	ICP serial dilution	Ca	19721 (µg/L)	20038 (µg/L)	1.6	1.6	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011C4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: C

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Pb were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(0.283\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 0.566\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Pb	0.57	0.57	Y
2	2	Ba	68.3	68.3	
3	3	Al	746	746	
4	4	Mn	23.9	23.9	
5	5	Fe	704	704	
6	6	Cu	1.7	1.69	
7	7	Ca	19300	19300	
8	8	K	242	242	
9	9	Al	26.6	26.6	
10	10	Mg	4890	4890	
11	11	K	246	246	
12	12	Ni	32.2	32.2	
13	13	Ca	19900	19900	
14	14	Na	14300	14300	
15	15	Cu	3.0	3.02	
16	16	Ba	64.0	64.0	
17	17	K	237	237	
18	18	Mg	4560	4560	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 20, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135338-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-001-SW	460-135338-1	Water	06/14/17
CFSWP-002-SW	460-135338-2	Water	06/14/17
CFSWP-003-SW	460-135338-3	Water	06/14/17
CFSWP-004-SW	460-135338-4	Water	06/14/17
CFSWP-005-SW	460-135338-5	Water	06/14/17
CFSWP-006-SW	460-135338-6	Water	06/14/17
CFSWP-007-SW	460-135338-7	Water	06/14/17
CFSWP-008-SW	460-135338-8	Water	06/14/17
CFSWP-017-SW	460-135338-9	Water	06/14/17
CFSWP-001-SWMS	460-135338-1MS	Water	06/14/17
CFSWP-001-SWMSD	460-135338-1MSD	Water	06/14/17
CFSWP-001-SWDUP	460-135338-1DUP	Water	06/14/17
CFSWP-003-SWMS	460-135338-3MS	Water	06/14/17
CFSWP-003-SWMSD	460-135338-3MSD	Water	06/14/17
CFSWP-017-SWMS	460-135338-9MS	Water	06/14/17
CFSWP-017-SWMSD	460-135338-9MSD	Water	06/14/17
CFSWP-017-SWDUP	460-135338-9DUP	Water	06/14/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Dissolved Organic Carbon by EPA SW 846 Method 9060A
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Sulfide by Standard Method 4500-S2 F
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-017-SWMS/MSD (All samples in SDG 460-135338-1)	Chloride Sulfate	112 (90-110) -	111 (90-110) 111 (90-110)	J+ (all detects) J+ (all detects)	A
CFSWP-011-SWMS/MSD (All samples in SDG 460-135338-1)	Dissolved fluoride	119 (90-110)	119 (90-110)	J+ (all detects)	A
CFSWP-003-SWMS/MSD (All samples in SDG 460-135338-1)	Nitrate/Nitrite as N	126 (90-110)	126 (90-110)	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135338-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-001-SW CFSWP-002-SW CFSWP-003-SW CFSWP-004-SW CFSWP-005-SW CFSWP-006-SW CFSWP-007-SW CFSWP-008-SW CFSWP-017-SW	Chloride Sulfate Dissolved fluoride Nitrate/Nitrite as N	J+ (all detects) J+ (all detects) J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135338-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135338-1

No Sample Data Qualified in this SDG

LDC #: 39011C6 **VALIDATION COMPLETENESS WORKSHEET** Date: 7-19-17
SDG #: 460-135338-1 Level IV Page: 1 of 2
Laboratory: Test America, Inc. Reviewer: MG
2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide ~~(EPA Metyhod 335.4)~~, DOC (EPA SW846 Method 9060A), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), Sulfide (SM4500-S2 F), TDS (SM2540C), TSS (SM2540D) Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)
MG

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	(< RL)
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-135182-1)
VII.	Duplicate sample analysis	A	DUP (↓ , 460-135255-~~B~~-1)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-001-SW	460-135338-1	Water	06/14/17
2	CFSWP-002-SW	460-135338-2	Water	06/14/17
3	CFSWP-003-SW	460-135338-3	Water	06/14/17
4	CFSWP-004-SW	460-135338-4	Water	06/14/17
5	CFSWP-005-SW	460-135338-5	Water	06/14/17
6	CFSWP-006-SW	460-135338-6	Water	06/14/17
7	CFSWP-007-SW	460-135338-7	Water	06/14/17
8	CFSWP-008-SW	460-135338-8	Water	06/14/17
9	CFSWP-017-SW	460-135338-9	Water	06/14/17
10	CFSWP-001-SWMS	460-135338-1MS	Water	06/14/17
11	CFSWP-001-SWMSD	460-135338-1MSD	Water	06/14/17
12	CFSWP-001-SWDUP	460-135338-1DUP	Water	06/14/17
13	CFSWP-003-SWMS	460-135338-3MS	Water	06/14/17
14	CFSWP-003-SWMSD	460-135338-3MSD	Water	06/14/17
15	CFSWP-017-SWMS	460-135338-9MS	Water	06/14/17

LDC #: 39011C6 **VALIDATION COMPLETENESS WORKSHEET** Date: 7-19-17

SDG #: 460-135338-1 Level IV Page: 2 of 2

Laboratory: Test America, Inc. Reviewer: MG

2nd Reviewer: ✓

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Motyhod 335.4);~~ DOC (EPA SW846 Method 9060A), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), Sulfide (SM4500-S2 F), TDS (SM2540C), TSS (SM2540D) Free CN, Diss. Free CN (9016)

	Client ID	Lab ID	Matrix	Date
16	CFSWP-017-SWMSD	460-135338-9MSD	Water	06/14/17
17	CFSWP-017-SWDUP	460-135338-9DUP	Water	06/14/17
18				
19				
20				
21	PBW 1			
22	PBW 2			

Notes:

LDC #: 39011C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39011C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: C

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 39011C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→9	W	pH (TDS) (Cl) (F) (NO3/NO2) (SO4) (PO4) (ALK) (CN-) (NH3) TKN TOC CR6+ ClO4 (dis. F) (S=) (Hard) (TSS)
1,2,7→9	↓	pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4 (dis CN) (DOC)
3→6	↓	pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4 (dis CN) (DOC) (Free CN) (dis. CN) Free
QC 10,11	↓	pH TDS Cl F NO3 NO2 SO4 PO4 ALK (CN-) NH3 TKN TOC CR6+ ClO4 (DOC)
12	↓	pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4 (Hard)
13,14	↓	pH TDS Cl F (NO3/NO2) SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
15→17	↓	pH TDS (Cl) (F) NO3 NO2 (SO4) (PO4) ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4
		pH TDS Cl F NO3 NO2 SO4 PO4 ALK CN- NH3 TKN TOC CR6+ ClO4

Comments:

LDC #: 39011C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	15/16	water	Cl	112 (90-110)	111 (90-110)		all	J+ dets /A (all dets)
	↓	↓	SO4	↓	111 (↓)		↓	(↓)
2	CFSWP-011-SW MS/MSD	↓	dis. F	119 (↓)	119 (↓)		↓	(↓)
3	13/14	↓	NO3/NO2-N	126 (↓)	126 (↓)		↓	(↓)

Comments:

LDC #: 39011C6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of DOC was recalculated. Calibration date: 6-18-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	TOC for DOC	Blank	0 (mg/L)	1.013	r^2 = 1.0000	r^2 = 1.0000	Y
		Standard 1	1 ( )	5.198			
		Standard 2	10 ( )	50.39			
		Standard 3	100 ( )	504.8			
		Standard 4	-	-			
		Standard 5	-	-			
		Standard 6	-	-			
		Standard 7	-	-			
Calibration verification	PO_4-P	0528 CCV	2.53 (mg/L)	2.50 (mg/L)	1.2 %D	1.2 %D	
Calibration verification	NH_3-N	1456 CCV	2.15 (mg/L)	2.00 (mg/L)	108	107	
Calibration verification	Total CN	1428 CCV	0.199 (mg/L)	0.200 (mg/L)	100	100	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011C6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
SRM	Laboratory control sample	TSS	80.0 (mg/L)	81.0 (mg/L)	98.8	98.8	Y
10	Matrix spike sample	Total CN	(SSR-SR) 201 (µg/L)	200 (µg/L)	100	101	↓
12	Duplicate sample	Hardness	72000 (µg/L)	72000 (µg/L)	0	0	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39011C6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: C

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for # 5, Free CN reported with a positive detect were recalculated and verified using the following equation:

Concentration =

$y = mx + b$
where
$m = 491.5$
$b = -0.8202$
$V_i = 3.0\ ml$ $V_f = 1.3\ ml$

Recalculation:

$$\frac{[491.5\ (0.216) - 0.8202] \times 1.3\ ml}{3.0\ ml} = 45.649\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	NO3/NO2-N	124	124	Y
2	2	dissolved F	109	109	
3	3	dissolved Total CN	12.5	12.5	
4	4	Alk	76000	76000	
5	5	Free CN	45.6	45.6	
6	6	TSS	70.5 (mg/L)	70.5 (mg/L)	
7	7	DOC	1100	1100	
8	8	Hardness	70000	70000	
9	9	TDS	74.0 (mg/L)	74.0 (mg/L)	

Note: methods 9056A, 350.1 and SM4500S2F are N.D. for Level IV samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135444-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-024-SW	460-135444-5	Water	06/15/17
Trip Blank	460-135444-6	Water	06/15/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/20/17	Chloroethane	22.2	All samples in SDG 460-135444-1	UJ (all non-detects)	A
	Methyl acetate	20.7		UJ (all non-detects)	
	Methylene chloride	20.5		UJ (all non-detects)	
	Methyl-tert-butyl ether	21.1		UJ (all non-detects)	
	trans-1,2-Dichloroethene	27.3		UJ (all non-detects)	
	cis-1,2-Dichloroethene	22.9		UJ (all non-detects)	
	1,1,1-Trichloroethane	20.1		UJ (all non-detects)	

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/21/17	Bromomethane Methyl acetate	20.6 20.8	All samples in SDG 460-135444-1	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-135444-1

Sample	Compound	Flag	A or P	Reason
CFSWP-024-SW Trip Blank	Chloroethane Methyl acetate Methylene chloride Methyl-tert-butyl ether trans-1,2-Dichloroethene cis-1,2-Dichloroethene 1,1,1-Trichloroethane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Initial calibration verification (%D)
CFSWP-024-SW Trip Blank	Bromomethane Methyl acetate	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

LDC #: 39011D1

SDG #: 460-135444-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/15/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A SW	% RSD ≤ 15 / 30, r^2 ICV ≥ 70
IV.	Continuing calibration	SW	CCV ≥ 70
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 2
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CY
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-024-SW	460-135444-5	Water	06/15/17
2	Trip Blank	460-135444-6	Water	06/15/17
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-444813						

LDC #: 39011D1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39011D1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39011 D1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
-	6/20/17	CV -8	D	22.2	all	J- / UJ/A all ND
-	1944		QQQQ	20.7		
-			E	20.5		
-			LL	21.1		
-			PPP	27.3		
-			QQQ	22.9		
-			N	20.1		

ICVvoa.wpd

LDC #: 39011D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/21/17	CCV-8	B	20.6		All	J-/UJ/A ND
-	0733		QQQQ	20.8		↓	↓

CONCAL.wpd

LDC #: 39011D1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/20/2017	F	0.7447	0.7447	0.7968	0.7968	14.9	14.9
	GCMS8		C	0.3586	0.3586	0.4095	0.4095	9.8	9.8
			CC	1.5076	1.5076	1.5483	1.5483	9.3	9.3
			JJJ	1.4016	1.4016	1.3986	1.3986	7.8	7.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0733	6/21/17	F (1st internal standard)	0.7968	0.7607	0.7607	4.5	4.5
			C (2nd internal standard)	0.4095	0.3566	0.3566	12.9	12.9
			CC (3rd internal standard)	1.5483	1.549	1.549	0.0	0.0
			JJJ (4th internal standard)	1.3986	1.352	1.352	3.3	3.3
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	50.8	102	102	0
1,2-Dichloroethane-d4	↓	45.7	91	91	↓
Toluene-d8		47.5	95	95	
Bromofluorobenzene		49.6	99	99	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39011D1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/D 460-444813

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	16.2	15.7	81	81	78	78	4	4
Trichloroethene	↓	↓	17.8	17.2	89	89	86	86	4	4
Benzene	20.0	20.0	18.5	18.2	92	92	91	91	1	1
Toluene	↓	↓	18.7	18.1	93	93	91	91	3	3
Chlorobenzene	↓	↓	18.9	18.4	94	94	92	92	2	2

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #1, F:

Conc. = (8611)(250.0) / (223146)(0.7968)

=

12 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135444-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-024-SW	460-135444-5	Water	06/15/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/23/17	Dibenzo(a,h)anthracene	22.0	All samples in SDG 460-135444-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

LDC #: 39011D2a

SDG #: 460-135444-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/17/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS LP
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-024-SW	460-135444-5	Water	06/15/17
2				
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-444194						

LDC #: 39011 D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any percent recoveries (%R) was less than 10%, was a reanalysis performed to confirm %R ?			✓	

LDC #: 39011D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracane	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.

LDC #: 39011D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	6/19/17	CCV	KKK	30.7		MB 460-444194	J+ det /A ND
	0208						
+	6/23/17	CCV	↓	22.0		all - MB	J+ det /A ND
	1125						

CONCAL.wpd

LDC #: 39611D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	6/16/2017	A	1.6281	1.6281	1.6550	1.6550	2.1	2.1
			S	1.0198	1.0198	0.9965	0.9965	13.5	13.5
			DD	1.7846	1.7846	1.7490	1.7490	9.4	9.4
			UU	1.0105	1.0105	1.0306	1.0306	14.2	14.2
			DDD	1.1289	1.1289	1.1369	1.1369	4.2	4.2
			III	1.0451	1.0451	1.0127	1.0127	6.2	6.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0208	6/19/17	A (1st IS)	1.6550	1.794	1.794	8.4	8.4
			S (2nd IS)	0.9965	0.9656	0.9656	3.1	3.1
			DD (3rd IS)	1.7490	1.675	1.675	4.2	4.2
			UU (4th IS)	1.0306	1.031	1.031	0.0	0.0
			DDD (5th IS)	1.1369	1.110	1.110	2.4	2.4
			III (6th IS)	1.0127	1.097	1.097	8.3	8.3
2	CCV 1125	6/23/17	(1st IS)		1.880	1.880	13.6	13.6
			(2nd IS)		1.011	1.011	1.5	1.5
			(3rd IS)		1.796	1.796	2.7	2.7
			(4th IS)		0.9748	0.9748	5.4	5.4
			(5th IS)		1.041	1.041	8.4	8.5
			(6th IS)		1.004	1.004	0.8	0.8
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270~~C~~D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.79	88	88	0
2-Fluorobiphenyl		8.68	87	87	
Terphenyl-d14		7.99	80	80	
Phenol-d5		3.00	30	30	
2-Fluorophenol		4.61	46	46	
2,4,6-Tribromophenol		9.37	94	94	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39011D2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: WS ID 460 - 444194

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80	80	29.8	28.8	37	37	36	36	3	3
N-Nitroso-di-n-propylamine	↓	↓	62.0	63.2	78	78	79	79	2	2
4-Chloro-3-methylphenol	↓	↓	61.5	61.5	77	77	77	77	0	0
Acenaphthene	↓	↓	62.6	60.9	78	78	76	76	3	3
Pentachlorophenol	160	160	138	131	86	86	82	82	5	5
Pyrene	80	80	66.0	67.3	83	83	84	84	2	2

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT

2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #1 . III

Conc. = $\frac{46637\ (8.0)\ (2)\ (1000)}{764827\ (1.0127)\ (250)}$

=

3.9 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Chlorinated Pesticides

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135444-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-024-SW	460-135444-5	Water	06/15/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Chlorinated Pesticides by Environmental Protection Agency (EPA) SW 846 Method 8081B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

The individual 4,4'-DDT and Endrin breakdowns (%BD) were less than or equal to 15.0%.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

Retention time windows were established as required by the method.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Compound Quantitation

All compound quantitations met validation criteria.

XII. Target Compound Identification

All target compound identifications met validation criteria.

XIII. System Performance

The system performance was acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Chlorinated Pesticides - Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Chlorinated Pesticides - Laboratory Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Chlorinated Pesticides - Field Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

LDC #: 39011D3a

SDG #: 460-135444-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/15/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC Chlorinated Pesticides (EPA SW846 Method 8081B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC Instrument Performance Check	A	
III.	Initial calibration/ICV	A / A	% RSD / ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes /13	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/LCSD
X.	Field duplicates	N	
XI.	Compound quantitation/RL/LOQ/LODs	A	
XII.	Target compound identification	A	
XIII.	System Performance	A	
XIV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-024-SW	460-135444-5	Water	06/15/17
2				
3				
4				
5				
6				
7				
8				
9				
10				

Notes:

	MB 460-44440						

LDC #: 39011D3a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Pesticides (EPA SW 846 Method 8081)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/ECD instrument performance check				
Was the instrument performance found to be acceptable?	✓			
Were Evaluation mix standards analyzed prior to the initial calibration and at beginning of each 12-hour shift?	✓			
Were endrin and 4,4'-DDT breakdowns ≤ 15% for individual breakdown in the Evaluation mix standards?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?			✓	
Were the RT windows properly established?	✓			
IIIb. Initial calibration verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
IV. Continuing calibration				
Was a continuing calibration analyzed daily?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
Were all the retention times within the acceptance windows?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes/Internal Standards				
Were all surrogate percent recovery (%R) within the QC limits?	✓			

LDC #: 39011D3a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
If the percent recovery (%R) of one or more surrogates was outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any percent recovery (%R) was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
Were internal standard area counts within ± 50% of the average area calculated during calibration?	✓			
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Compound quantitation				
Were compound quantitation and RLs adjusted to reflect all sample dilutions, dry weight factors, and clean-up activities applicable to level IV validation?	✓			
Were relative percent difference (RPD) of the results between two columns ≤ 40%?	✓			
XII. Target compound identification				
Were the retention times of reported detects within the RT windows?	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: Pesticide/PCBs (EPA SW 846 Method 8081/8082)

A. alpha-BHC	I. Dieldrin	Q. Endrin ketone	Y. Aroclor-1242	GG. Chlordane
B. beta-BHC	J. 4,4'-DDE	R. Endrin aldehyde	Z. Aroclor-1248	HH. Chlordane (Technical)
C. delta-BHC	K. Endrin	S. alpha-Chlordane	AA. Aroclor-1254	II. Arochlor 1262
D. gamma-BHC	L. Endosulfan II	T. gamma-Chlordane	BB. Aroclor-1260	JJ. Aroclor 1268
E. Heptachlor	M. 4,4'-DDD	U. Toxaphene	CC. 2,4'-DDD	KK. Oxychlordane
F. Aldrin	N. Endosulfan sulfate	V. Aroclor-1016	DD. 2,4'-DDE	LL. trans-Nonachlor
G. Heptachlor epoxide	O. 4,4'-DDT	W. Aroclor-1221	EE. 2,4'-DDT	MM. cis-Nonachlor
H. Endosulfan I	P. Methoxychlor	X. Aroclor-1232	FF. Hexachlorobenzene	NN.

Notes:_____

LDC #: 39011D3a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC Pesticides (EPA SW 846 Method 8081)

The calibration factors (CF) and relative standard deviation (%RSD) were recalculated using the following calculations:

CF = A/C
Average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where: A = Area of compound
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported CF (100 std)	Recalculated CF (100 std)	Reported CF (initial)	Recalculated CF (intial)	Reported %RSD	Recalculated %RSD
1	ICAL	6/8/17	4,4'-DDT calp1	0.9857	0.9857	1.0289	1.0289	3.8	3.8
			↓ calp2	0.9848	0.9848	1.0243	1.0243	4.3	4.3
			Methoxychlor calp1	0.5499	0.5499	0.5710	0.5710	5.5	5.5
			↓ calp2	0.5490	0.5490	0.5745	0.5745	5.3	5.3
2									
3									
4									

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D3a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC Pesticides (EPA SW 846 Method 8081)

Percent difference (%D) = 100 * (N - C)/N

Where: N = Initial Calibration Factor or Nominal Amount (ng)
C = Calibration Factor from Continuing Calibration Standard or Calculated Amount (ng)

Standard ID	Calibration Date/Time	Compound	Average CF/ CCV Conc	Reported CF/Conc CCV	Recalculated CF/Conc CCV	Reported %D	Recalculated %D
P4022743	6/20/17	4,4 'DDT- CLP2	100	104	103.7	3.7	3.7
0748		Methoxychlor ↓	100	103	103.2	3.2	3.2
		↓ CLP1	100	105	104.7	4.7	4.7
		↓ ↓	100	109	109.1	9.1	9.1

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D3a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC Pesticides (EPA SW 846 Method 8081)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #1

Surrogate	Column	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Tetrachloro-m-xylene	CLP2	100	75.8	76	76	0
Tetrachloro-m-xylene	CLP1	↓	70.6	71	71	↓
Decachlorobiphenyl	CLP2	↓	62.9	63	63	↓
Decachlorobiphenyl	CLP1	↓	50.0	50	50	↓

Sample ID:

Surrogate	Column	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Tetrachloro-m-xylene						
Tetrachloro-m-xylene						
Decachlorobiphenyl						
Decachlorobiphenyl						

Sample ID:

Surrogate	Column	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Tetrachloro-m-xylene						
Tetrachloro-m-xylene						
Decachlorobiphenyl						
Decachlorobiphenyl						

Sample ID:

Surrogate	Column	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Tetrachloro-m-xylene						
Tetrachloro-m-xylene						
Decachlorobiphenyl						
Decachlorobiphenyl						

Notes:

LDC #: 39011D3a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicate Results Verification

Page: 1 of 1
Reviewer: EZ
2nd Reviewer: a

METHOD: GC Pesticides (EPA SW 846 Method 8081A)

The percent recoveries (%R) and Relative Percent difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100* (SSC-SC)/SA

Where: SSC = Spiked sample concentration
SA = Spike added
SC = Concentration

RPD = I LCS - LCSD I * 2/(LCS + LCSD)

LCS = Laboratory control sample percent recovery
LCSD = Laboratory control sample duplicate percent recovery

LCS/LCSD samples: LCS/D 460 44440)

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS		LCSD		LCS/LCSD	
					Percent Recovery		Percent Recovery		RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
gamma-BHC	0.80	0.80	0.586	~~0.713~~ 0.656	73	73	~~89~~ 82	82	~~13~~ 11	11
4,4'-DDT	↓	↓	0.628	0.713	79	79	89	89	13	13

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D3a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC Pesticides (EPA SW 846 Method 8081A)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-444401 4,4'-DDT

$$\text{Conc.} = \frac{62159245\ (100)\ (1)}{38468170\ (1.0289)(250)}$$

= 0.628 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Polychlorinated Biphenyls

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135444-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-024-SW	460-135444-5	Water	06/15/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Biphenyls (PCBs) by Environmental Protection Agency (EPA) SW 846 Method 8082A

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Retention time windows were established as required by the method.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates/Internal Standards

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

All internal standard areas and retention times were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

All compound quantitations met validation criteria.

XI. Target Compound Identification

All target compound identifications met validation criteria.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Polychlorinated Biphenyls - Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Polychlorinated Biphenyls - Laboratory Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Polychlorinated Biphenyls - Field Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

LDC #: 39011D3b
SDG #: 460-135444-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7/15/17
Page: 1 of 1
Reviewer:
2nd Reviewer:

METHOD: GC Polychlorinated Biphenyls (EPA SW846 Method 8082A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 20
III.	Continuing calibration	A	CW ≤ 20
IV.	Laboratory Blanks	A	
V.	Field blanks	A	
VI.	Surrogate spikes /13	A	
VII.	Matrix spike/Matrix spike duplicates	N	CS
VIII.	Laboratory control samples	A	LCS 1D
IX.	Field duplicates	N	
X.	Compound quantitation/RL/LOQ/LODs	A	
XI.	Target compound identification	A	
XII.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-024-SW	460-135444-5	Water	06/15/17
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Notes:

	MB 460-444410						

LDC #: 39011D3b

VALIDATION FINDINGS CHECKLIST

Reviewer: FZ
2nd Reviewer: [illegible]

Method: ✓ GC ____ HPLC

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
IIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥0.990?	✓		✓	
Were the RT windows properly established?	✓			
IIb. Initial calibration verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
III. Continuing calibration				
Was a continuing calibration analyzed daily?	✓			
Were all percent differences (%D) ≤ 20% or percent recoveries (%R) 80-120%?	✓			
Were all the retention times within the acceptance windows?	✓			
IV. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. Field blanks				
Were field blanks identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VI. Surrogate spikes				
Were all surrogate percent recovery (%R) within the QC limits?	✓			
If the percent recovery (%R) of one or more surrogates was outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	

LDC #: 39011D3b

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
X. Compound quantitation				
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Target compound identification				
Were the retention times of reported detects within the RT windows?	✓			
XII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

LDC #: 39011D36

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC ✓ HPLC _____

The calibration factors (CF) and relative standard deviation (%RSD) were recalculated using the following calculations:

CF = A/C
Average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where: A = Area of compound
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported CF (1000 std)	Recalculated CF (1000 std)	Reported CF (initial)	Recalculated CF (intial)	Reported %RSD	Recalculated %RSD
1	ICAL	4/21/17	PCB 1260-2 ol	0.0622	0.0622	0.0663	0.0663	12.1	12.1
			↓ dLP1	0.1149	0.1149	0.1163	0.1163	3.5	3.5
2									
3									
4									

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D3b

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: Q

METHOD: GC ✓ HPLC _____

The percent difference (%D) of the initial calibration average Calibration Factors (CF) and the continuing calibration CF were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. CF -CF)/ave.CF

Where: ave. CF = initial calibration average CF
CF = continuing calibration CF
A = Area of compound
C = Concentration of compound

#	Standard ID	Calibration Date	Compound	Average CF(ICAL)/ CCV Conc.	Reported CF/ Conc. CCV	Recalculated CF/ Conc. CCV	Reported %D	Recalculated %D
1	CCV 1747	6/20/17	PCB 1260-2 CLP2	1000	1010	1013.7	1.4	1.4
			↓ CLP1	1000	896	895.6	10.4	10.4
2								
3								
4								

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D36

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer: [illegible]

METHOD: ✓ GC __ HPLC

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: _____

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
DCB	CLP 2	100	57.6	58	58	0
↓	CLP 1	↓	50.1	50	50	0

Sample ID: _____

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC #: 39011D36

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: ✓ GC ___ HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

%Recovery = 100 * (SSC/SA)
RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

Where SSC = Spiked sample concentration; LCS = Laboratory Control Sample; SA = Spike added; LCSD = Laboratory Control Sample duplicate

LCS/LCSD samples: LCS 460-444410

Compound	Spike Added (ug/L)		Spike Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
Gasoline (8015)										
Diesel (8015)										
Benzene (8021B)										
Methane (RSK-175)										
2,4-D (8151)										
Dinoseb (8151)										
Naphthalene (8310)										
Anthracene (8310)										
HMX (8330)										
2,4,6-Trinitrotoluene (8330)										
Phorate (8141A)										
Malathion (8141A)										
Formaldehyde (8315A)										
Aroclor 1260	4.0	4.0	5.48	5.31	137	137	133	133	3	3

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39611D36

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: ✓ GC __ HPLC

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds within 10% of the reported results?

Concentration= (A)(Fv)(Df) / (RF)(Vs or Ws)(%S/100)

A= Area or height of the compound to be measured
Fv= Final Volume of extract
Df= Dilution Factor
RF= Average response factor of the compound In the initial calibration
Vs= Initial volume of the sample
Ws= Initial weight of the sample
%S= Percent Solid

Example:

Sample ID. LCS Compound Name Aroclor 1260

Concentration = 1370 (1) / (250) =

5.48 ug/L

#	Sample ID	Compound	Reported Concentrations ( )	Recalculated Results Concentrations ( )	Qualifications
	1260-2 =	136834 (20)	1260-1	= 1351.4	
		31409 (0.0663)	2	= 1314.2	
			3	= 1300.9	
		= 1314.2	4	= 1366.6	
			5	= 1394.6	
			6	= 1404.3	
			7	= 1401.5	
			8	= 1426.5	
				1370.0	

Comments:

SAMPCLC_r1.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 20, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135444-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-018-SW	460-135444-1	Water	06/15/17
CFSWP-019-SW	460-135444-2	Water	06/15/17
CFSWP-020-SW	460-135444-3	Water	06/15/17
CFSWP-021-SW	460-135444-4	Water	06/15/17
CFSWP-024-SW	460-135444-5	Water	06/15/17
CFSWP-018-SWF	460-135444-1F	Water	06/15/17
CFSWP-019-SWF	460-135444-2F	Water	06/15/17
CFSWP-020-SWF	460-135444-3F	Water	06/15/17
CFSWP-021-SWF	460-135444-4F	Water	06/15/17
CFSWP-024-SWF	460-135444-5F	Water	06/15/17
CFSWP-020-SWMS	460-135444-3MS	Water	06/15/17
CFSWP-020-SWDUP	460-135444-3DUP	Water	06/15/17
CFSWP-018-SWFMS	460-135444-1FMS	Water	06/15/17
CFSWP-018-SWFDUP	460-135444-1FDUP	Water	06/15/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFSWP-018-SWFMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

LDC #: 39011D4a

SDG #: 460-135444-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-19-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: G

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	N	
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-135255-1) #13: Ba, Ca, Mg, Na-4;
VIII.	Duplicate sample analysis	A	DUP (↓) #14: Fe OK by dif.
IX.	Serial Dilution	A	SD: 6
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

		Client ID	Lab ID	Matrix	Date
1	1	CFSWP-018-SW	460-135444-1	Water	06/15/17
2	1	CFSWP-019-SW	460-135444-2	Water	06/15/17
3	1	CFSWP-020-SW	460-135444-3	Water	06/15/17
4	1	CFSWP-021-SW	460-135444-4	Water	06/15/17
5	2	CFSWP-024-SW	460-135444-5	Water	06/15/17
6	3	CFSWP-018-SWF	460-135444-1F	Water	06/15/17
7	3	CFSWP-019-SWF	460-135444-2F	Water	06/15/17
8	3	CFSWP-020-SWF	460-135444-3F	Water	06/15/17
9	3	CFSWP-021-SWF	460-135444-4F	Water	06/15/17
10	3	CFSWP-024-SWF	460-135444-5F	Water	06/15/17
11	1	CFSWP-020-SWMS	460-135444-3MS	Water	06/15/17
12	1	CFSWP-020-SWDUP	460-135444-3DUP	Water	06/15/17
13	3	CFSWP-018-SWFMS	460-135444-1FMS	Water	06/15/17
14	3	CFSWP-018-SWFDUP	460-135444-1FDUP	Water	06/15/17
15					

LDC #: 39011D4a

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-19-17

SDG #: 460-135444-1

Page: 2 of 2

Laboratory: Test America, Inc.

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16				
17 1	PBW1			
18 2	PBW2			
19 3	PBW3			

Notes:

LDC #: 39011D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39011D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 39011D4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 10	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 11, 12	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
↓ 13, 14	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 39011D4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
2242 ICV	ICP/MS (Initial calibration)	Sb	40.55	40.0	101	101	Y
1458 ~~1434~~ ICV	CVAA (Initial calibration)	Hg	4.9183	5.00	98	98	↓
	ICP (Continuing calibration)						↓
0000 CCV	ICP/MS (Continuing calibration)	Cu	48.11	50.0	96	96	↓
1737 CCV	CVAA (Continuing calibration)	Hg	4.8402	5.00	97	97	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: 9

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
2259 ICSAB	ICP interference check	Cr	197.9 (µg/L)	200 (µg/L)	99	99	Y
0013 LCS	Laboratory control sample	Pb	5.02 (µg/L)	5.00 (µg/L)	100	100	↓
0017 13	Matrix spike	As	(SSR-SR) 20.38 (µg/L)	20.0 (µg/L)	102	102	↓
0023 / 0020 14	Duplicate	K	969.6 (µg/L)	951.1 (µg/L)	2	2	↓
0023 / 0027 6	ICP serial dilution	Mg	14833 (µg/L)	15359 (µg/L)	3.5	3.5	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Cu were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(2.666\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 5.332\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cu	5.3	5.33	Y
2	2	Mg	13300	13300	
3	3	Ba	275	275	
4	4	Zn	9.1	9.09	
5	5	Sb	7.7	7.74	
6	6	Fe	60.5	60.4	
7	7	Na	3670	3670	
8	8	K	619	619	
9	9	As	0.93	0.92	
10	10	Ni	22.1	22.1	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 20, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135444-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFSWP-018-SW	460-135444-1	Water	06/15/17
CFSWP-019-SW	460-135444-2	Water	06/15/17
CFSWP-020-SW	460-135444-3	Water	06/15/17
CFSWP-021-SW	460-135444-4	Water	06/15/17
CFSWP-024-SW	460-135444-5	Water	06/15/17
CFSWP-018-SWMS	460-135444-1MS	Water	06/15/17
CFSWP-018-SWMSD	460-135444-1MSD	Water	06/15/17
CFSWP-018-SWDUP	460-135444-1DUP	Water	06/15/17
CFSWP-019-SWMS	460-135444-2MS	Water	06/15/17
CFSWP-019-SWMSD	460-135444-2MSD	Water	06/15/17
CFSWP-019-SWDUP	460-135444-2DUP	Water	06/15/17
CFSWP-020-SWMS	460-135444-3MS	Water	06/15/17
CFSWP-020-SWMSD	460-135444-3MSD	Water	06/15/17
CFSWP-024-SWMS	460-135444-5MS	Water	06/15/17
CFSWP-024-SWMSD	460-135444-5MSD	Water	06/15/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Dissolved Organic Carbon by EPA SW 846 Method 9060A
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Sulfide by Standard Method 4500-S2 F
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFSWP-019-SWMS/MSD (All samples in SDG 460-135444-1)	Chloride Sulfate	111 (90-110) 117 (90-110)	113 (90-110) 117 (90-110)	J+ (all detects) J+ (all detects)	A
CFSWP-024-SWMS/MSD (CFSWP-024-SW)	Fluoride	131 (90-110)	132 (90-110)	J+ (all detects)	A
CFSWP-024-SWMS/MSD (All samples in SDG 460-135444-1)	Chloride Sulfate	124 (90-110) 113 (90-110)	129 (90-110) 112 (90-110)	J+ (all detects) J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135444-1

Sample	Analyte	Flag	A or P	Reason
CFSWP-018-SW CFSWP-019-SW CFSWP-020-SW CFSWP-021-SW CFSWP-024-SW	Chloride Sulfate	J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFSWP-024-SW	Fluoride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135444-1

No Sample Data Qualified in this SDG

LDC #: 39011D6

SDG #: 460-135444-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-19-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide ~~(EPA Metyhod 335.4)~~, DOC (EPA SW846 Method 9060A), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), Sulfide (SM4500-S2 F), TDS (SM2540C), TSS (SM2540D) Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

MG

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	(< RL)
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-135701-1)
VII.	Duplicate sample analysis	A	DUP (SDG: 460-135619-1, 460-135338-1)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFSWP-018-SW	460-135444-1	Water	06/15/17
2	CFSWP-019-SW	460-135444-2	Water	06/15/17
3	CFSWP-020-SW	460-135444-3	Water	06/15/17
4	CFSWP-021-SW	460-135444-4	Water	06/15/17
5	CFSWP-024-SW	460-135444-5	Water	06/15/17
6	CFSWP-018-SWMS	460-135444-1MS	Water	06/15/17
7	CFSWP-018-SWMSD	460-135444-1MSD	Water	06/15/17
8	CFSWP-018-SWDUP	460-135444-1DUP	Water	06/15/17
9	CFSWP-019-SWMS	460-135444-2MS	Water	06/15/17
10	CFSWP-019-SWMSD	460-135444-2MSD	Water	06/15/17
11	CFSWP-019-SWDUP	460-135444-2DUP	Water	06/15/17
12	CFSWP-020-SWMS	460-135444-3MS	Water	06/15/17
13	CFSWP-020-SWMSD	460-135444-3MSD	Water	06/15/17
14	CFSWP-024-SWMS	460-135444-5MS	Water	06/15/17
15	CFSWP-024-SWMSD	460-135444-5MSD	Water	06/15/17

LDC #: 39011D6

SDG #: 460-135444-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-19-17

Page: 2 of 2

Reviewer: MG

2nd Reviewer: [signature]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), DOC (EPA SW846 Method 9060A), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), Sulfide (SM4500-S2 F), TDS (SM2540C), TSS (SM2540D) Free CN, Diss. Free CN (9016)

gmG

	Client ID	Lab ID	Matrix	Date
gmG 16	~~CFSWP-024-SWDUP~~	~~460-135444-5DUP~~	~~Water~~	~~08/15/17~~
17				
18				
19				
20	PBW 1			
21	PBW2			

Notes:

LDC #: 39011D6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39011D6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 39011D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→5	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F S= Hard TSS
1,2,4,5	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis CN DOC
3	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis CN DOC Free CN dis. CN Free
QC 6,7	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 DOC
8	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
9→11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
12,13	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
14,15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39011D6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications	
1	9/10	water	Cl	111 (90-110)	113 (90-110)		all	J+ dets/A	(all dets)
	↓	↓	SO4	117 ( )	117 ( )		↓	↓	(↓)
2	14/15	↓	Cl	124 ( )	129 ( )		~~8~~ All	↓	(det)
	↓	↓	F	131 ( )	132 ( )		~~6~~ 5		(↓)
			SO4	113 (↓)	112 (↓)		~~6~~ All		(↓)

Comments:

LDC #: 39011D6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of NO_3/NO_2-N was recalculated. Calibration date: 6-21-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	NO_3/NO_2-N	Blank	0.0 (mg/L)	0	r = 0.9997	r = 0.9997	Y
		Standard 1	0.1 ( )	605389			
		Standard 2	0.5 ( )	2885171			
		Standard 3	1.0 ( )	5740596			
		Standard 4	1.5 ( )	8432640			
		Standard 5	2.0 ( )	10944768			
		Standard 6	–	–			
		Standard 7	–	–			
Calibration verification	TOC for DOC	0925 ICV	49.70 (mg/L)	150 (mg/L)	99	99	
Calibration verification	Total CN	1321 CCV	0.196 (mg/L)	0.200 (mg/L)	98	98	
Calibration verification	NH_3-N	1456 CCV	2.15 (mg/L)	2.00 (mg/L)	108	107	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: Q

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	Free CN	39.8 (µg/L)	50.0 (µg/L)	80	80	Y
6	Matrix spike sample	DOC	(SSR-SR) 150324 (µg/L)	150000 (µg/L)	100	100	↓
8	Duplicate sample	Alk	232500 (µg/L)	233500 (µg/L)	0.4	0.4	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39011D6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [signature]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments?
(Y) N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, Total CN reported with a positive detect were recalculated and verified using the following equation:

Concentration =
$Y = mx + b$
where
$m = 0.0209$
$b = -0.00152$
dil = 1x

Recalculation:
$CN = 0.0209\,(3.76) - 0.00152$
$= 0.07706$ mg/L
then $(0.07706\ mg/L)(1000\ \mu g/mg) = 77.06\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Total CN	77.2	77.1	Y
	↓	Alk	233000	233000	↓
2	2	SO4	3140	3140	
	↓	TSS	18.4 (mg/L)	18.4 (mg/L)	
3	3	Free CN	2.1	2.1	
	↓	NH3-N	126	126	
4	4	NO3/NO2-N	137	137	
	↓	TDS	252 (mg/L)	252 (mg/L)	
5	5	Hardness	50000	50000	
	↓	DOC	12700	12700	↓

Note: methods 9056A and SM4500 S2 F are ND. for all samples

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135619-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-033-GW	460-135619-2	Water	06/19/17
CFMW-034-GW	460-135619-4	Water	06/19/17
CFMW-007-GW	460-135619-6	Water	06/19/17
TRIP BLANK	460-135619-7	Water	06/19/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
04/14/17	Dichlorodifluoromethane Chloroethane	29.0 22.0	All samples in SDG 460-135619-1	UJ (all non-detects) UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/24/17	Acetone	23.3	TRIP BLANK	J- (all detects)	A
06/24/17	Dichlorodifluoromethane Carbon disulfide Acetone Bromoform 1,2-Dibromo-3-chloropropane	23.8 21.7 33.6 25.4 22.6	CFMW-033-GW CFMW-034-GW CFMW-007-GW	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Compound	Concentration	Associated Samples
Trip Blank	06/19/17	Acetone	8.3 ug/L	CFMW-033-GW CFMW-034-GW CFMW-007-GW

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-135619-1

Sample	Compound	Flag	A or P	Reason
CFMW-033-GW CFMW-034-GW CFMW-007-GW TRIP BLANK	Dichlorodifluoromethane Chloroethane	UJ (all non-detects) UJ (all non-detects)	A	Initial calibration verification (%D)
TRIP BLANK	Acetone	J- (all detects)	A	Continuing calibration (%D)
CFMW-033-GW CFMW-034-GW CFMW-007-GW	Dichlorodifluoromethane Carbon disulfide Acetone Bromoform 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

LDC #: 39011E1

SDG #: 460-135619-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/17/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / Δ	
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration/ICV	A SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	Δ	
VI.	Field blanks	SW	TB = 4
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	Δ	LCS LD
X.	Field duplicates	N	
XI.	Internal standards	Δ	
XII.	Compound quantitation RL/LOQ/LODs	Δ	
XIII.	Target compound identification	Δ	
XIV.	System performance	Δ	
XV.	Overall assessment of data	Δ	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 2	CFMW-033-GW	460-135619-2	Water	06/19/17
2 2	CFMW-034-GW	460-135619-4	Water	06/19/17
3 2	CFMW-007-GW	460-135619-6	Water	06/19/17
4 1	TRIP BLANK	460-135619-7	Water	06/19/17
5				
6				
7				
8				

Notes:

1	MB 460-445572						
2	MB 460-445646						

LDC #: 39011E1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) > 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?	✓			
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39011E1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39011E1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
-	4/14/17	RW-13	JJ	29.0	All	-J/UJ/A ND
-	0948		D	22.0	↓	↓

ICVvoa.wpd

LDC #: 39011E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/24/17	CCV	F	23.3		~~AA~~ 4,	J-/UJ/A ~~ND+Det~~
	0836					MB 460-445646 5572	P7
-	6/24/17	CCV	JJ	23.8		1 → 3,	J-/UJ/A ~~ND+Det~~
-	2241		G	21.7		MB 460-445646	↓
-			F	33.6		↓	↓
-			X	25.4		↓	↓
-			MM	22.6		↓	↓

LDC #: 39011E1

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target compounds detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/19/17
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 1→3 (ND)

Compound	Blank ID	Sample Identification								
	4									
F	8.3									

Blank units: _____ **Associated sample units:** _____
Sampling date: _____
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: _____ Associated Samples: _____

Compound	Blank ID	Sample Identification								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as Methylene chloride, Acetone, 2-Butanone and Carbon disulfide that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

LDC #: 39011t1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	4/14/2017	D	8.4672	8.4672	8.5310	8.5310	9.3	9.3
	GCMS13		Z	1.5912	1.5912	1.6314	1.6314	7.8	7.8
			C	0.2852	0.2852	0.3018	0.3018	10.0	10.0
			CC	1.3695	1.3695	1.4451	1.4451	5.4	5.4
			JJJ	1.3073	1.3073	1.3534	1.3534	4.1	4.1

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0936	6/24/17	D (1st internal standard)	8.5310	8.913	8.913	4.5	4.5
			Z (2nd internal standard)	1.6314	1.689	1.689	3.5	3.5
			C (3rd internal standard)	0.3018	0.3359	0.3359	11.3	11.3
			CC (4th internal standard)	1.4451	1.621	1.621	12.2	12.2
2			WJ (1st internal standard)	1.3534	1.519	1.519	12.2	12.2
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3	CCV 2241	6/24/17	D (1st internal standard)	8.5310	9.490	9.490	11.2	11.2
			Z (2nd internal standard)	1.6314	1.421	1.421	12.9	12.9
			C (3rd internal standard)	0.3018	0.2728	0.2728	9.6	9.6
			CC (4th internal standard)	1.4451	1.383	1.383	4.3	4.3
4			WJ (1st internal standard)	1.3534	1.262	1.262	6.7	6.7
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	48.6	97	97	0
1,2-Dichloroethane-d4	↓	45.6	91	91	↓
Toluene-d8	↓	49.7	99	99	↓
Bromofluorobenzene	↓	44.4	89	89	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 3901/E1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/O 460-445572

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	18.2	18.7	91	91	93	93	3	3
Trichloroethene	↓	↓	20.6	19.9	103	103	99	99	3	3
Benzene	↓	↓	21.9	22.1	110	110	111	111	1	1
Toluene	↓	↓	21.3	21.6	107	107	108	108	1	1
Chlorobenzene	↓	↓	21.4	21.5	107	107	108	108	1	1

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 4, F:

Conc. = ( ) ( ) ( ) / ( ) ( ) ( ) ( )

= 8.33 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification
	10837 (250) = 0.7871 (X)		-0.0000	378 (X^2)	
	413211				
		X = 8.33 ug/L			

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135619-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-033-GW	460-135619-2	Water	06/19/17
CFMW-034-GW	460-135619-4	Water	06/19/17
CFMW-007-GW	460-135619-6	Water	06/19/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/25/17	Hexachlorocyclopentadiene	32.0	CFMW-033-GW CFMW-034-GW	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/23/17	2,4-Dinitrophenol	28.7	CFMW-007-GW	UJ (all non-detects)	A
06/23/17	Di-n-octylphthalate	24.5	CFMW-007-GW	NA	-

Date	Compound	%D	Associated Samples	Flag	A or P
06/27/17	Nitrobenzene Hexachlorobutadiene	22.2 20.4	CFMW-033-GW CFMW-034-GW	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Compound	Flag	A or P
CFMW-033-GW	2-Fluoranthenol Phenol-d5	61 (25-58) 47 (14-39)	Phenol 2-Methylphenol 2-Nitrophenol 2,4-Dimethylphenol 2,4-Dichlorophenol 4-Chloro-3-methylphenol 2,4,6-Trichlorophenol 2,4,5-Trichlorophenol 2,4-Dinitrophenol 4-Nitrophenol 4,6-Dinitro-2-methylphenol Pentachlorophenol 3&4-Methylphenol C1-Phenanthrenes/Anthracenes	NA	-
CFMW-034-GW	2-Fluoranthenol Phenol-d5	67 (25-58) 51 (14-39)	Phenol 2-Methylphenol 2-Nitrophenol 2,4-Dimethylphenol 2,4-Dichlorophenol 4-Chloro-3-methylphenol 2,4,6-Trichlorophenol 2,4,5-Trichlorophenol 2,4-Dinitrophenol 4-Nitrophenol 4,6-Dinitro-2-methylphenol Pentachlorophenol 3&4-Methylphenol C1-Phenanthrenes/Anthracenes	NA	-

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
LCS 460-445350	2,4-Dinitrophenol 4,6-Dinitro-2-methylphenol	37 (45-125) 55 (59-132)	All samples in SDG 460-135619-1	UJ (all non-detects) UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D and LCS %R, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-135619-1

Sample	Compound	Flag	A or P	Reason
CFMW-033-GW CFMW-034-GW	Hexachlorocyclopentadiene	UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-007-GW	2,4-Dinitrophenol	UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-033-GW CFMW-034-GW	Nitrobenzene Hexachlorobutadiene	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-033-GW CFMW-034-GW CFMW-007-GW	2,4-Dinitrophenol 4,6-Dinitro-2-methylphenol	UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

LDC #: 39011E2a

SDG #: 460-135619-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/17/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	N	
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-033-GW	460-135619-2	Water	06/19/17
2	CFMW-034-GW	460-135619-4	Water	06/19/17
3	CFMW-007-GW	460-135619-6	Water	06/19/17
4				
5				
6				
7				
8				

Notes:

	MB 460-445350						

LDC #: 39011E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓	✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 39011E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

ACIDS

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o''-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.

LDC #: 39011E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤30 %D ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Associated Samples	Qualifications
–	6/25/17 1719	ICV-6	X	32.0	1, 2	J-/UJ/A (ND)

ICVsvoa.wpd

LDC #: 39011E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: Q

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/23/17	ccv-14	HH	28.7		3	J-/UJ/A ND
+	2339		FFF	24.5		↓	J+ dit/A
+	6/25/17 11:52	ccv-4	MMMM	21.5		MB 460-445350	J+ dit/A ND
-	6/27/17 0717	ccv-6	L	22.2		1, 2	J-/UJ/A ND
-			U	20.4		↓	↓

CONCAL.wpd

LDC #: 39011E2a

VALIDATION FINDINGS WORKSHEET
Surrogate Recovery

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were percent recoveries (%R) for surrogates within QC limits?
Y N N/A If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?
Y N N/A If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Sample ID	Surrogate	%R (Limits)	Qualifications
	1	2FP	61 (25-58)	J+ det /P ND All Acids
		PHL	47 (14-39)	↓
			( )	
			( )	
			( )	
			( )	
	2	↓	67 (↓)	J+ det /P ND All Acids
			51 ( )	↓
			( )	
			( )	
			( )	See list
			( )	
			( )	
			( )	
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			( )	
			( )	

(NBZ) = Nitrobenzene - d5
(FBP) = 2-Fluorobiphenyl
(TPH) = Terphenyl - d14
(2FP) = 2-Fluorophenol
(TBP) = 2,4,6 -Tribromophenol
(2CP) = 2-Chlorophenol - d4
(PHL) = Phenol - d5

LDC #: 39011Eda

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS 460-445350	HH	37 (45-125)	( )	( )	All	J-/UJ/P ND
		PP	55 (59-132)	( )	( )	↓	↓
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 39011E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	6/16/2017	A	1.6281	1.6281	1.6550	1.6550	2.1	2.1
			S	1.0198	1.0198	0.9965	0.9965	13.5	13.5
			DD	1.7846	1.7846	1.7490	1.7490	9.4	9.4
			UU	1.0105	1.0105	1.0306	1.0306	14.2	14.2
			DDD	1.1289	1.1289	1.1369	1.1369	4.2	4.2
			III	1.0451	1.0451	1.0127	1.0127	6.2	6.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS6	6/25/2017	A	1.8332	1.8332	1.8390	1.8390	3.5	3.5
			S	1.0092	1.0092	0.9151	0.9151	7.3	7.3
			DD	1.6831	1.6831	1.6210	1.6210	3.8	3.8
			UU	0.9349	0.9349	0.9013	0.9013	4.8	4.8
			DDD	0.9290	0.9290	0.9673	0.9673	6.2	6.2
			III	1.1785	1.1785	1.0842	1.0842	7.2	7.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS14	6/15/2017	A	1.7719	1.7719	1.6606	1.6606	7.1	7.1
			S	1.0300	1.0300	1.0145	1.0145	2.9	2.9
			DD	1.9765	1.9765	1.9297	1.9297	2.0	2.0
			UU	1.1229	1.1229	1.1089	1.1089	2.8	2.8
			DDD	1.1357	1.1357	1.1935	1.1935	3.3	3.3
			III	1.1363	1.1363	1.0470	1.0470	12.3	12.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	ccv 2339	6/23/17	Δ (1st IS)	1.6606	1.747	1.747	5.2	5.2
			S (2nd IS)	1.0145	1.041	1.041	2.6	2.6
			DD (3rd IS)	1.9297	1.992	1.992	3.2	3.2
			NN (4th IS)	1.1089	1.129	1.129	1.8	1.8
			DDD (5th IS)	1.1935	1.137	1.137	4.7	4.7
			III (6th IS)	1.0470	1.193	1.193	14.0	14.0
2	ccv 1130	6/25/17	Δ (1st IS)	1.6550	1.837	1.837	11.0	11.0
			S (2nd IS)	0.9965	0.9876	0.9876	0.9	0.9
			DD (3rd IS)	1.7490	1.810	1.810	3.5	3.5
			NN (4th IS)	1.0306	0.9934	0.9934	3.6	3.6
			DDD (5th IS)	1.1369	1.055	1.055	7.2	7.2
			III (6th IS)	1.0127	1.019	1.019	0.6	0.6
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 3901/E2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.17	82	82	0
2-Fluorobiphenyl	↓	7.21	72	72	↓
Terphenyl-d14	↓	8.04	80	80	↓
Phenol-d5	↓	2.60	26	26	↓
2-Fluorophenol	↓	4.04	40	40	↓
2,4,6-Tribromophenol	↓	8.05	81	81	↓
2-Chlorophenol-d4	↓	↓	↓	↓	↓
1,2-Dichlorobenzene-d4	↓	↓	↓	↓	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39011E2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: C

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460 – 445350

Compound	Spike Added (ng/L)		Spike Concentration (ng/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80	NA	20.8	NA	26	26				
N-Nitroso-di-n-propylamine	↓	↓	60.7	↓	76	76				
4-Chloro-3-methylphenol	↓	↓	54.0	↓	68	68				
Acenaphthene	↓	↓	57.6	↓	72	72				
Pentachlorophenol	160	↓	111	↓	69	69				
Pyrene	80	↓	55.4	↓	69	69	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 3901/E2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-445352

Conc. = $\frac{(122492)(8.0)(2)(1000)}{(226431)(1.6606)(250)}$

=

20.8

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 24, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135619-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB29-AQ	460-135619-1	Water	06/19/17
CFMW-033-GW	460-135619-2	Water	06/19/17
CFMW-003a-GW	460-135619-3	Water	06/19/17
CFMW-034-GW	460-135619-4	Water	06/19/17
CFMW-001-GW	460-135619-5	Water	06/19/17
CFMW-007-GW	460-135619-6	Water	06/19/17
CFMW-033-GWF	460-135619-2F	Water	06/19/17
CFMW-003a-GWF	460-135619-3F	Water	06/19/17
CFMW-034-GWF	460-135619-4F	Water	06/19/17
CFMW-001-GWF	460-135619-5F	Water	06/19/17
CFMW-007-GWF	460-135619-6F	Water	06/19/17
CFMW-033-GWFMS	460-135619-2FMS	Water	06/19/17
CFMW-033-GWFDUP	460-135619-2FMSD	Water	06/19/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB29-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB29-AQ	06/19/17	Calcium Sodium	309 ug/L 583 ug/L	CFMW-003a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-033-GWFMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

LDC #: 39011E4a
SDG #: 460-135619-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7-20-17
Page: 1 of 2
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-135701-1) #12: Ba, Ca, Mg, Na 4x
VIII.	Duplicate sample analysis	A	DUP (↓)
IX.	Serial Dilution	A	SD: 7
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-EB29-AQ	460-135619-1	Water	06/19/17
2 1	CFMW-033-GW	460-135619-2	Water	06/19/17
3 1	CFMW-003a-GW	460-135619-3	Water	06/19/17
3 4 1	CFMW-034-GW	460-135619-4	Water	06/19/17
3 5 1	CFMW-001-GW	460-135619-5	Water	06/19/17
3 6 1	CFMW-007-GW	460-135619-6	Water	06/19/17
7 2	CFMW-033-GWF	460-135619-2F	Water	06/19/17
8 2	CFMW-003a-GWF	460-135619-3F	Water	06/19/17
9 2	CFMW-034-GWF	460-135619-4F	Water	06/19/17
10 2	CFMW-001-GWF	460-135619-5F	Water	06/19/17
11 2	CFMW-007-GWF	460-135619-6F	Water	06/19/17
12 2	CFMW-033-GWFMS	460-135619-2FMS	Water	06/19/17
13 2	CFMW-033-GWFDUP	460-135619-2FMSD	Water	06/19/17
14				
15				

LDC #: 39011E4a

SDG #: 460-135619-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-20-17

Reviewer: MG

2nd Reviewer: ✓

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16 1	PBW1			
17 2	PBW2			
18 3	PBW3 (Hg)			

Notes:

LDC #: 39011E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: G

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39011E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39011E4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→11	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
QC 12, 13	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____

Comments: Mercury by CVAA if performed

LDC #: 39011E4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/19/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 3 (>10x)

Analyte	Blank ID	Sample Identification										
	1	Action Level	No Qual's.									
Ca	309	3090										
Na	583	5830										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39011E4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: Q

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
2303 ICV	ICP/MS (Initial calibration)	Be	40.08	40.0	100	100	Y
1326 ICV	CVAA (Initial calibration)	Hg	4.8560	5.00	97	97	↓
	ICP (Continuing calibration)						↓
0033 CCV	ICP/MS (Continuing calibration)	Tl	9.88	10.0	99	99	↓
1550 CCV	CVAA (Continuing calibration)	Hg	4.9145	5.00	98	98	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
2319 ICSAB	ICP interference check	Cd	97.55 (µg/L)	100 (µg/L)	98	98	Y
0046 LCS	Laboratory control sample	Zn	48.66 (µg/L)	50.0 (µg/L)	97	97	↓
0049 12	Matrix spike	Ni	(SSR-SR) 18.24 (µg/L)	20.0 (µg/L)	91	91	↓
0056 / 0052 13	Duplicate	Fe	75.82 (µg/L)	88.14 (µg/L)	15	15	↓
0056 / 0059 7	ICP serial dilution	Na	38437 (µg/L)	41102 (µg/L)	6.9	6.9	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(154.446\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 308.89\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Ca	309	309	Y
2	2	Na	44900	44900	↓
3	3	Pb	1.2	1.2	↓
4	4	Al	59.5	59.5	↓
5	5	Zn	7.7	7.69	↓
6	6	Mn	249	249	↓
7	7	Fe	75.8	75.8	↓
8	8	Se	1.1	1.10	↓
9	9	Ba	157	157	↓
10	10	As	0.84	0.84	↓
11	11	K	632	632	↓

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 24, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135619-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB29-AQ	460-135619-1	Water	06/19/17
CFMW-033-GW	460-135619-2	Water	06/19/17
CFMW-003a-GW	460-135619-3	Water	06/19/17
CFMW-034-GW	460-135619-4	Water	06/19/17
CFMW-001-GW	460-135619-5	Water	06/19/17
CFMW-007-GW	460-135619-6	Water	06/19/17
CFMW-EB29-AQMS	460-135619-1MS	Water	06/19/17
CFMW-EB29-AQMSD	460-135619-1MSD	Water	06/19/17
CFMW-003a-GWDUP	460-135619-3DUP	Water	06/19/17
CFMW-034-GWDUP	460-135619-4DUP	Water	06/19/17
CFMW-001-GWMS	460-135619-5MS	Water	06/19/17
CFMW-001-GWMSD	460-135619-5MSD	Water	06/19/17
CFMW-007-GWMS	460-135619-6MS	Water	06/19/17
CFMW-007-GWMSD	460-135619-6MSD	Water	06/19/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
CFMW-EB29-AQ	Orthophosphate as P	48.10 hours	48 hours	UJ (all non-detects)	P

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB29-AQ was identified as a field blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB29-AQ	06/19/17	Chloride	249 ug/L	CFMW-003a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-007-GWMS/MSD (CFMW-033-GW CFMW-034-GW CFMW-001-GW CFMW-007-GW)	Chloride	114 (90-110)	112 (90-110)	J+ (all detects)	A
CFMW-007-GWMS/MSD (CFMW-033-GW CFMW-003a-GW CFMW-034-GW CFMW-001-GW CFMW-007-GW)	Sulfate	125 (90-110)	129 (90-110)	J+ (all detects)	A
CFMW-007-GWMS/MSD (CFMW-033-GW CFMW-003a-GW CFMW-034-GW CFMW-001-GW CFMW-007-GW)	Orthophosphate as P	86 (90-110)	87 (90-110)	UJ (all non-detects)	A
CFMW-001-GWMS/MSD (CFMW-033-GW CFMW-003a-GW CFMW-034-GW CFMW-001-GW CFMW-007-GW)	Ammonia as N	111 (90-110)	-	NA	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to technical holding time and MS/MSD %R, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135619-1

Sample	Analyte	Flag	A or P	Reason
CFMW-EB29-AQ	Orthophosphate as P	UJ (all non-detects)	P	Technical holding times
CFMW-033-GW CFMW-034-GW CFMW-001-GW CFMW-007-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-033-GW CFMW-003a-GW CFMW-034-GW CFMW-001-GW CFMW-007-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-033-GW CFMW-003a-GW CFMW-034-GW CFMW-001-GW CFMW-007-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135619-1

No Sample Data Qualified in this SDG

LDC #: 39011E6

SDG #: 460-135619-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-20-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

9016 Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	SW	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-135701-1, 460-135444-1)
VII.	Duplicate sample analysis	A	DUP (↓)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB29-AQ	460-135619-1	Water	06/19/17
2	CFMW-033-GW	460-135619-2	Water	06/19/17
3	CFMW-003a-GW	460-135619-3	Water	06/19/17
4	CFMW-034-GW	460-135619-4	Water	06/19/17
5	CFMW-001-GW	460-135619-5	Water	06/19/17
6	CFMW-007-GW	460-135619-6	Water	06/19/17
7	CFMW-EB29-AQMS	460-135619-1MS	Water	06/19/17
8	CFMW-EB29-AQMSD	460-135619-1MSD	Water	06/19/17
9	CFMW-003a-GWDUP	460-135619-3DUP	Water	06/19/17
10	CFMW-034-GWDUP	460-135619-4DUP	Water	06/19/17
11	CFMW-001-GWMS	460-135619-5MS	Water	06/19/17
12	CFMW-001-GWMSD	460-135619-5MSD	Water	06/19/17
13	CFMW-007-GWMS	460-135619-6MS	Water	06/19/17
14	CFMW-007-GWMSD	460-135619-6MSD	Water	06/19/17
15				

LDC #: 39011E6

SDG #: 460-135619-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-20-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

Free CN, Diss. Free CN (9016)

	Client ID	Lab ID	Matrix	Date
16				
17				
18	PBW1			
19	PBW2			

Notes:

LDC #: 39011E6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.		✓		
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39011E6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39011E6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2→6	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS
2→6	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN- NH_3 TKN TOC CR^{6+} ClO_4 dis CN Free CN dis Free CN
QC 7, 8	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
9	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F
10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
11, 12	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
13, 14	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39011E6

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: MG
2nd reviewer:

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:		9056 A					
Parameters:		PO4-P					
Technical holding time:		48 hr					
Sample ID	**Sampling date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Analysis date**	**Qualifier**
1	07:10 6-19-17	07:16 9-21-17	(48.10 hr)				J-/UJ/P (N.D.)

LDC #: 39011E6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/19/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: (EB) Associated Samples: 3 (>10x)

Analyte	Blank ID	Action Limit	Sample Identification									
	1		No Qual.									
Cl	249	2490										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39011E6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: Q

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	13/14	water	Cl	114 (90-110)	112 (90-110)		~~1~~, 2,4→6	J+ dets/A (all dets)
		↓	SO4	125 ( )	129 (↓)		all 2-6	↓ (det in 2→6)
			PO4-P	86 ( )	87 (↓)		↓ 2-6	J-/UJ/A (all N.D.)
2	11/12	↓	NH3-N	111 (↓)			all	J+ dets/A (all N.D.)

Comments:

LDC #: 39011E6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: C

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of F was recalculated. Calibration date: 6-8-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	F	Blank	-	-	r^2=0.9970	r^2=0.9970	Y
		Standard 1	0.08 (mg/L)	8620			
		Standard 2	0.20 ( )	22443			
		Standard 3	1.00 ( )	116304			
		Standard 4	2.00 ( )	251350			
		Standard 5	3.00 ( )	403623			
		Standard 6	4.00 ( )	561712			
		Standard 7	-	-			
Calibration verification	Total CN	1153 CCV	0.181 (mg/L)	0.200 (mg/L)	90	91	
Calibration verification	NH_3-N	1630 CCV	1.99 (mg/L)	2.00 (mg/L)	100	99	
Calibration verification	Free CN	CCV2	46.93 (µg/L)	50.0 (µg/L)	94	94	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39011E6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCSSRM	Laboratory control sample	NO_3/NO_2-N	1746 (µg/L)	1810 (µg/L)	96	96	Y
13	Matrix spike sample	PO_4-P	(SSR-SR) 2156 (µg/L)	2500 (µg/L)	86	86	↓
10	Duplicate sample	Alk	248901 (µg/L)	248828 (µg/L)	0	0	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39011E6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: G

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for # 1, Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration =
$y = mx + b$
where
$m = 91637.82$
$b = -8763.36$
dil = 1x

Recalculation:
$14021 = 91637.82(x) - 8763.36$
$0.2486\ mg/L = x$
then $(0.2486\ mg/L)(1000\ \mu g/mg) = 248.6\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cl	249	249	Y
2	2	TSS	2.1 (mg/L)	2.1 (mg/L)	
	↓	Total CN	181	181	
3	3	NO3/NO2-N	145	145	
	↓	Hardness	124000	124000	
4	4	Free CN	24.9	24.9	
5	5	Alk	214000	214000	
6	6	TDS	178 (mg/L)	178 (mg/L)	↓

Note: methods 9056A and 350.1 are N.D. for all samples

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

July 28, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on July 6, 2017. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #39033:

SDG #	Fraction
460-135701-1, 460-135818-1 460-135884-1, 460-135989-1 460-136063-1	Volatiles, Semivolatiles, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

Level IV 10,657 pages-DL

Attachment 1

EDD

LDC #39033 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		Diss. F (300.0)		Total CN- (335.4)		Free CN- (9016)		D.Total CN- (335.4)		D.Free CN- (9016)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		TDS (2540C)		TSS (2540D)	
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-135701-1	07/06/17	07/27/17	8	0	7	0	10	0	9	0	10	0	10	0	10	0	9	0	10	0	8	0	9	0	8	0	10	0	10	0	10	0	9	0	9	0
B	460-135818-1	07/06/17	07/27/17	9	0	8	0	11	0	10	0	11	0	11	0	11	0	10	0	11	0	9	0	10	0	9	0	11	0	11	0	11	0	10	0	10	0
C	460-135884-1	07/06/17	07/27/17	3	0	2	0	7	0	6	0	7	0	7	0	7	0	6	0	7	0	2	0	6	0	2	0	7	0	7	0	7	0	6	0	6	0
D	460-135989-1	07/06/17	07/27/17	6	0	5	0	8	0	7	0	8	0	8	0	8	0	7	0	8	0	7	0	7	0	7	0	8	0	8	0	8	0	7	0	7	0
E	460-136063-1	07/06/17	07/27/17	8	0	7	0	10	0	9	0	10	0	10	0	10	0	9	0	10	0	8	0	9	0	8	0	10	0	10	0	10	0	9	0	9	0
Total	T/CR			34	0	29	0	46	0	41	0	46	0	46	0	46	0	41	0	46	0	34	0	41	0	34	0	46	0	46	0	46	0	41	0	41	704

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs V:\LOGIN\Roux Associates\Columbia Falls\39033ST-Water.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 17, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135701-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	460-135701-2	Water	06/20/17
CFMW-018-GW	460-135701-5	Water	06/20/17
CFMW-037-GW	460-135701-6	Water	06/20/17
CFMW-032-GW	460-135701-7	Water	06/20/17
CFMW-042-GW	460-135701-8	Water	06/20/17
CFMW-DUP12-GW	460-135701-9	Water	06/20/17
CFMW-040-GW	460-135701-10	Water	06/20/17
CFMW-035-GW	460-135701-11	Water	06/20/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
04/14/17	Dichlorodifluoromethane Chloroethane	29.0 22.0	All samples in SDG 460-135701-1	UJ (all non-detects) UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/26/17	Bromomethane Cyclohexane	22.5 22.1	All samples in SDG 460-135701-1	NA	-
06/26/17	Acetone Bromoform 1,2-Dibromo-3-chloropropane	27.3 28.3 32.4	All samples in SDG 460-135701-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-445995 (All samples in SDG 460-135701-1)	Trichlorofluoromethane	-	70 (71-143)	UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples CFMW-032-GW and CFMW-DUP12-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D and LCS/LCSD %R, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-135701-1

Sample	Compound	Flag	A or P	Reason
TRIP BLANK CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW	Dichlorodifluoromethane Chloroethane	UJ (all non-detects) UJ (all non-detects)	A	Initial calibration verification (%D)
TRIP BLANK CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW	Acetone Bromoform 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
TRIP BLANK CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW	Trichlorofluoromethane	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-135701-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-135701-1

No Sample Data Qualified in this SDG

LDC #: 39033A1

SDG #: 460-135701-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/13/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A, SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 1
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS ID
X.	Field duplicates	ND	D = 4, 6
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	TRIP BLANK	460-135701-2	Water	06/20/17
2	CFMW-018-GW	460-135701-5	Water	06/20/17
3	CFMW-037-GW	460-135701-6	Water	06/20/17
4	CFMW-032-GW D	460-135701-7	Water	06/20/17
5	CFMW-042-GW	460-135701-8	Water	06/20/17
6	CFMW-DUP12-GW D	460-135701-9	Water	06/20/17
7	CFMW-040-GW	460-135701-10	Water	06/20/17
8	CFMW-035-GW	460-135701-11	Water	06/20/17
9				
10				
11	MB 460-445995			
12				
13				

LDC #: 39033A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39033A1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39033A 1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: O

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
-	4/14/17	ICV-13	JJ	29.0	All	J- /UJ/A ND
-	0948		D	22.0	↓	↓

ICVvoa.wpd

LDC #: 39633A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	6/26/17	cal	B	22.5		All	J+ all /A all ND
-	22:19		F	27.3			J-/UJ /A
+			SSSS	22.1			J+ all /A
-			X	28.3			J-/UJ /A
-			MM	32.4			

CONCAL.wpd

LDC #: 39033A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCSD 460-445995	KK	( )	70 (71-143)	( )	all	J-/UJ/P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 39033A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	4/14/2017	D	8.4672	8.4672	8.5310	8.5310	9.3	9.3
	GCMS13		Z	1.5912	1.5912	1.6314	1.6314	7.8	7.8
			C	0.2852	0.2852	0.3018	0.3018	10.0	10.0
			CC	1.3695	1.3695	1.4451	1.4451	5.4	5.4
			JJJ	1.3073	1.3073	1.3534	1.3534	4.1	4.1

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 2219	6/26/17	D (1st internal standard)	8.5310	10.09	10.09	18.2	18.2
			Z (2nd internal standard)	1.6314	1.470	1.470	9.9	9.9
			C (3rd internal standard)	0.3018	0.3108	0.3108	3.0	3.0
			CC (4th internal standard)	1.4451	1.483	1.483	2.6	2.6
2			JJJ (1st internal standard)	1.3534	1.340	1.340	1.0	1.0
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: ✓

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #5

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	53.4	107	107	0
1,2-Dichloroethane-d4	↓	49.4	99	99	↓
Toluene-d8	↓	52.3	105	105	↓
Bromofluorobenzene	↓	48.0	96	96	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39033A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs ID 460-415995

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	18.1	17.2	90	90	86	86	5	5
Trichloroethene	↓	↓	19.7	19.2	99	99	96	96	3	3
Benzene	↓	↓	20.9	20.2	105	105	101	101	3	3
Toluene	↓	↓	20.3	19.7	102	102	98	98	3	3
Chlorobenzene	↓	↓	20.5	20.2	102	102	101	101	1	1

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-445995 - CC

Conc. = $\frac{(412359)(50.0)(\quad)}{(70148)(1.445)(\quad)(\quad)}$

= 20.3 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135701-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-018-GW	460-135701-5	Water	06/20/17
CFMW-037-GW	460-135701-6	Water	06/20/17
CFMW-032-GW	460-135701-7	Water	06/20/17
CFMW-042-GW	460-135701-8	Water	06/20/17
CFMW-DUP12-GW	460-135701-9	Water	06/20/17
CFMW-040-GW	460-135701-10	Water	06/20/17
CFMW-035-GW	460-135701-11	Water	06/20/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/25/17	Hexachlorocyclopentadiene Dibenzo(a,h)anthracene Benzo(g,h,i)perylene	28.9 44.2 32.0	All samples in SDG 460-135701-1	NA	-
06/25/17	2,4-Dinitrophenol 4-Nitroaniline	23.7 24.7	All samples in SDG 460-135701-1	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-445464 (All samples in SDG 460-135701-1)	Bis(2-chloroethoxy)methane Isophorone	106 (67-104) 109 (55-105)	107 (67-104) -	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples CFMW-032-GW and CFMW-DUP12-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-135701-1

Sample	Compound	Flag	A or P	Reason
CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW	2,4-Dinitrophenol 4-Nitroaniline	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-135701-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-135701-1

No Sample Data Qualified in this SDG

LDC #: 39033A2a

SDG #: 460-135701-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/13/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	SW	LCS/LD
X.	Field duplicates	ND	D = 3, 5
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-018-GW	460-135701-5	Water	06/20/17
2	CFMW-037-GW	460-135701-6	Water	06/20/17
3	CFMW-032-GW D	460-135701-7	Water	06/20/17
4	CFMW-042-GW	460-135701-8	Water	06/20/17
5	CFMW-DUP12-GW D	460-135701-9	Water	06/20/17
6	CFMW-040-GW	460-135701-10	Water	06/20/17
7	CFMW-035-GW	460-135701-11	Water	06/20/17
8				
9				

Notes:

	MB 460-445464						

LDC #: 39033A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any percent recoveries (%R) was less than 10%, was a reanalysis performed to confirm %R ?			✓	

LDC #: 39033A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o"-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1.
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1.
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1.
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1.
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1.
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.

LDC #: 39033A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	6/25/17	CCV	X	28.9		All	J+ det ND
-	0004		HH	23.7			J-/UJ/A
-			OO	24.7			
+			KKK	44.2			J+ det
+			LLL	32.0			

CONCAL.wpd

LDC #: 39033A2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	lcs/D 460	P	106 (67-104)	107 (67-104)	( )	All	Jdet /P ND
	-445464	M	109 (55-105)	( )	( )	↓	↓
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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LDC #: 39033A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	6/16/2017	A	1.6281	1.6281	1.6550	1.6550	2.1	2.1
			S	1.0198	1.0198	0.9965	0.9965	13.5	13.5
			DD	1.7846	1.7846	1.7490	1.7490	9.4	9.4
			UU	1.0105	1.0105	1.0306	1.0306	14.2	14.2
			DDD	1.1289	1.1289	1.1369	1.1369	4.2	4.2
			III	1.0451	1.0451	1.0127	1.0127	6.2	6.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0004	6/25/17	Δ (1st IS)	1.6550	1.713	1.713	3.5	3.5
			S (2nd IS)	0.9965	1.026	1.026	3.0	3.0
			DD (3rd IS)	1.7490	1.692	1.692	3.2	3.2
			UU (4th IS)	1.0306	1.040	1.040	1.0	1.0
			DDD (5th IS)	1.1369	1.058	1.058	7.0	7.0
			III (6th IS)	1.0127	0.9914	0.9914	2.1	2.1
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270~~C~~D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 7

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	8.13	81	81	0
2-Fluorobiphenyl	↓	6.46	65	65	↓
Terphenyl-d14	↓	7.99	80	80	↓
Phenol-d5	↓	2.60	26	26	↓
2-Fluorophenol	↓	3.91	39	39	↓
2,4,6-Tribromophenol	↓	7.30	73	73	↓
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39033A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS / LCSD 460-445464

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80		26.4	26.0	33	33	33	33	1	1
N-Nitroso-di-n-propylamine	↓		89.0	83.8	111	111	105	105	6	6
4-Chloro-3-methylphenol	80		76.4	70.0	95	95	88	88	9	9
Acenaphthene	↓		64.7	79.8	81	81	100	100	21	21
Pentachlorophenol	160		160	161	100	100	101	101	1	1
Pyrene	80		73.5	72.4	92	92	91	91	1	1

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033A2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270~~C~~) D

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-445464 LCS

Conc. = $\frac{(275870)(8.0)(2)(1000)}{(404395)(1.6550)(250)}$

=

26.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135701-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB30-AQ	460-135701-1	Water	06/20/17
CFMW-012a-GW	460-135701-3	Water	06/20/17
CFMW-008-GW	460-135701-4	Water	06/20/17
CFMW-018-GW	460-135701-5	Water	06/20/17
CFMW-037-GW	460-135701-6	Water	06/20/17
CFMW-032-GW	460-135701-7	Water	06/20/17
CFMW-042-GW	460-135701-8	Water	06/20/17
CFMW-DUP12-GW	460-135701-9	Water	06/20/17
CFMW-040-GW	460-135701-10	Water	06/20/17
CFMW-035-GW	460-135701-11	Water	06/20/17
CFMW-012a-GWF	460-135701-3F	Water	06/20/17
CFMW-008-GWF	460-135701-4F	Water	06/20/17
CFMW-018-GWF	460-135701-5F	Water	06/20/17
CFMW-037-GWF	460-135701-6F	Water	06/20/17
CFMW-032-GWF	460-135701-7F	Water	06/20/17
CFMW-042-GWF	460-135701-8F	Water	06/20/17
CFMW-DUP12-GWF	460-135701-9F	Water	06/20/17
CFMW-040-GWF	460-135701-10F	Water	06/20/17
CFMW-035-GWF	460-135701-11F	Water	06/20/17
CFMW-012a-GWMS	460-135701-3MS	Water	06/20/17
CFMW-012a-GWDUP	460-135701-3DUP	Water	06/20/17
CFMW-012a-GWFMS	460-135701-3FMS	Water	06/20/17
CFMW-012a-GWFDUP	460-135701-3FDUP	Water	06/20/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB30-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB30-AQ	06/20/17	Aluminum Calcium Sodium	87.3 ug/L 349 ug/L 798 ug/L	CFMW-012a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-012a-GW	Aluminum Sodium	292 ug/L 6620 ug/L	292J+ ug/L 6620J+ ug/L

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-012a-GWMS, no data were qualified for Calcium and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFMW-012a-GWFMS, no data were qualified for Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-032-GW and CFMW-DUP12-GW and samples CFMW-032-GWF and CFMW-DUP12-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-032-GW	CFMW-DUP12-GW			
Aluminum	131	169	25 (≤30)	-	-
Barium	156	158	1 (≤30)	-	-
Calcium	42900	42800	0 (≤30)	-	-
Chromium	1.6	2.1	27 (≤30)	-	-
Cobalt	1.4	1.5	7 (≤30)	-	-
Copper	2.1	2.2	5 (≤30)	-	-
Iron	407	446	9 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-032-GW	CFMW-DUP12-GW			
Magnesium	11900	12000	1 (≤30)	-	-
Manganese	83.2	84.3	1 (≤30)	-	-
Potassium	2300	2350	2 (≤30)	-	-
Sodium	198000	200000	1 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-032-GWF	CFMW-DUP12-GWF			
Barium	146	145	1 (≤30)	-	-
Calcium	42800	42300	1 (≤30)	-	-
Copper	1.4	1.4U	0 (≤30)	-	-
Iron	209	206	1 (≤30)	-	-
Magnesium	10500	10400	1 (≤30)	-	-
Manganese	74.0	72.2	2 (≤30)	-	-
Potassium	2380	2270	5 (≤30)	-	-
Sodium	159000	160000	1 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135701-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135701-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135701-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-012a-GW	Aluminum Sodium	292J+ ug/L 6620J+ ug/L	A

LDC #: 39033A4a

SDG #: 460-135701-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-20-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB = 1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: ~~LS~~ 460-135818-1) #20: Ca, Mg-4x #22: Ca, Mg, Na-4 X
VIII.	Duplicate sample analysis	A	DUP (↓)
IX.	Serial Dilution	A	SD: 2, 11
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D = 6+8, D = 15+17
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

		Client ID	Lab ID	Matrix	Date
1	1	CFMW-EB30-AQ	460-135701-1	Water	06/20/17
2	1	CFMW-012a-GW	460-135701-3	Water	06/20/17
3	1	CFMW-008-GW	460-135701-4	Water	06/20/17
4	1	CFMW-018-GW	460-135701-5	Water	06/20/17
5	1	CFMW-037-GW	460-135701-6	Water	06/20/17
6	1	CFMW-032-GW	460-135701-7	Water	06/20/17
7	1	CFMW-042-GW	460-135701-8	Water	06/20/17
8	1	CFMW-DUP12-GW	460-135701-9	Water	06/20/17
9	1	CFMW-040-GW	460-135701-10	Water	06/20/17
10	1	CFMW-035-GW	460-135701-11	Water	06/20/17
11	2	CFMW-012a-GWF	460-135701-3F	Water	06/20/17
12	2	CFMW-008-GWF	460-135701-4F	Water	06/20/17
13	2	CFMW-018-GWF	460-135701-5F	Water	06/20/17
14	2	CFMW-037-GWF	460-135701-6F	Water	06/20/17
15	2	CFMW-032-GWF	460-135701-7F	Water	06/20/17

LDC #: 39033A4a
SDG #: 460-135701-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7-20-17

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16 2	CFMW-042-GWF	460-135701-8F	Water	06/20/17
17 2	CFMW-DUP12-GWF	460-135701-9F	Water	06/20/17
18 2	CFMW-040-GWF	460-135701-10F	Water	06/20/17
3 19 2	CFMW-035-GWF	460-135701-11F	Water	06/20/17
20 1	CFMW-012a-GWMS	460-135701-3MS	Water	06/20/17
21 1	CFMW-012a-GWDUP	460-135701-3DUP	Water	06/20/17
22 2	CFMW-012a-GWFMS	460-135701-3FMS	Water	06/20/17
23 2	CFMW-012a-GWFDUP	460-135701-3FDUP	Water	06/20/17
24				
25				
26 1	PBW1			
27 2	PBW2			
28 3	PBW3 (Hg)			

Notes:

LDC #: 39033A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39033A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 19	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 20 → 23	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 39033A4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/20/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Sample Identification										
	1	Action Level	2									
Al	87.3	873	292J+									
Ca	349	3490										
Na	798	7980	6620J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 39033A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	6	8		
Aluminum	131	169	25	
Barium	156	158	1	
Calcium	42900	42800	0	
Chromium	1.6	2.1	27	
Cobalt	1.4	1.5	7	
Copper	2.1	2.2	5	
Iron	407	446	9	
Magnesium	11900	12000	1	
Manganese	83.2	84.3	1	
Potassium	2300	2350	2	
Sodium	198000	200000	1	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033A4a.WPD

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	15	17		
Barium	146	145	1	
Calcium	42800	42300	1	
Copper	1.4	1.4U	0	
Iron	209	206	1	
Magnesium	10500	10400	1	
Manganese	74.0	72.2	2	

LDC#: 39033A4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [signature]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	15	17		
Potassium	2380	2270	5	
Sodium	159000	160000	1	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033A4a.WPD

LDC #: 39033A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{Found}{True} \times 100$$

Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1157 ICV	ICP/MS (Initial calibration)	As	39.247	40.0	98	98	Y
1344 ICV	CVAA (Initial calibration)	Hg	4.9331	5.00	99	99	
	ICP (Continuing calibration)						
1602 CCV	ICP/MS (Continuing calibration)	Mn	497.800	500	100	100	
1608 CCV	CVAA (Continuing calibration)	Hg	4.6476	5.00	93	93	
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

CALCLC.4SW

LDC #: 39033A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1209 ICSAB	ICP interference check	Ni	182.2 (µg/L)	200 (µg/L)	91	91	Y
1543 LCS	Laboratory control sample	V	50.45 (µg/L)	50.0 (µg/L)	101	101	↓
1548 20	Matrix spike	Ag	(SSR-SR) 25.97 (µg/L)	25.0 (µg/L)	104	104	↓
1552 / 1550 21	Duplicate	Al	292.5 (µg/L)	271.6 (µg/L)	7	7	↓
1552 / 1555 2	ICP serial dilution	Ca	51558 (µg/L)	53579 (µg/L)	3.9	3.9	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033A4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Cu were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(1.377\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 2.754\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cu	2.8	2.75 ~~2.8~~	mA Y
2	2	Al	292	292	
3	3	Ni	7.7	7.68	
4	4	Fe	462	462	
5	5	K	869	869	
6	6	Cr	1.6	1.61	
7	7	Co	1.3	1.33	
8	8	Cu	2.2	2.20	
9	9	Na	47200	47200	
10	10	V	7.1	7.05	
11	11	Ba	79.3	79.3	
12	12	Zn	1220	1220	
13	13	Mn	9.5	9.54	
14	14	Ca	48400	48400	
15	15	Cu	1.4	1.4	
16	16	Fe	178	178	
17	17	Na	160000	160000	
18	18	K	1100	1100	
19	19	As	11.3	11.3	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135701-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB30-AQ	460-135701-1	Water	06/20/17
CFMW-012a-GW	460-135701-3	Water	06/20/17
CFMW-008-GW	460-135701-4	Water	06/20/17
CFMW-018-GW	460-135701-5	Water	06/20/17
CFMW-037-GW	460-135701-6	Water	06/20/17
CFMW-032-GW	460-135701-7	Water	06/20/17
CFMW-042-GW	460-135701-8	Water	06/20/17
CFMW-DUP12-GW	460-135701-9	Water	06/20/17
CFMW-040-GW	460-135701-10	Water	06/20/17
CFMW-035-GW	460-135701-11	Water	06/20/17
CFMW-012a-GWMS	460-135701-3MS	Water	06/20/17
CFMW-012a-GWMSD	460-135701-3MSD	Water	06/20/17
CFMW-012a-GWDUP	460-135701-3DUP	Water	06/20/17
CFMW-008-GWMS	460-135701-4MS	Water	06/20/17
CFMW-008-GWMSD	460-135701-4MSD	Water	06/20/17
CFMW-018-GWMS	460-135701-5MS	Water	06/20/17
CFMW-018-GWMSD	460-135701-5MSD	Water	06/20/17
CFMW-032-GWMS	460-135701-7MS	Water	06/20/17
CFMW-032-GWMSD	460-135701-7MSD	Water	06/20/17
CFMW-042-GWMS	460-135701-8MS	Water	06/20/17
CFMW-042-GWMSD	460-135701-8MSD	Water	06/20/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB30-AQ was identified as a field blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB30-AQ	06/20/17	Chloride Nitrate/Nitrite as N	122 ug/L 109 ug/L	CFMW-012a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-012a-GW	Chloride Nitrate/Nitrite as N	385 ug/L 204 ug/L	385J+ ug/L 204J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-012a-GWMS/MSD (CFMW-012a-GW CFMW-008-GW CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW)	Sulfate	121 (90-110)	127 (90-110)	J+ (all detects)	A
CFMW-012a-GWMS/MSD (CFMW-012a-GW CFMW-008-GW CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW)	Orthophosphate as P Nitrate/Nitrite as N	85 (90-110) -	- 89 (90-110)	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A
CFMW-042-GWMS/MSD (CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW)	Dissolved total cyanide	-	73 (75-125)	J- (all detects)	A
CFMW-032-GWMS/MSD (CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-035-GW)	Free cyanide	-	55 (56-111)	J- (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
CFMW-012a-GWDUP (CFMW-012a-GW CFMW-008-GW CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW)	Total dissolved solids Total suspended solids	6 (≤5) 12 (≤5)	- -	J (all detects) J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFMW-032-GW and CFMW-DUP12-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-032-GW	CFMW-DUP12-GW			
Alkalinity	555000 ug/L	547000 ug/L	1 (≤30)	-	-
Ammonia as N	72.0U ug/L	84.8 ug/L	16 (≤30)	-	-
Chloride	1950 ug/L	1920 ug/L	2 (≤30)	-	-
Total cyanide	478 ug/L	470 ug/L	2 (≤30)	-	-
Dissolved total cyanide	494 ug/L	483 ug/L	2 (≤30)	-	-
Free cyanide	46.1 ug/L	129 ug/L	95 (≤30)	J (all detects)	A
Dissolved free cyanide	45.9 ug/L	135 ug/L	99 (≤30)	J (all detects)	A

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-032-GW	CFMW-DUP12-GW			
Fluoride	8570 ug/L	8460 ug/L	1 (≤30)	-	-
Dissolved fluoride	8400 ug/L	8420 ug/L	0 (≤30)	-	-
Hardness	156000 ug/L	152000 ug/L	3 (≤30)	-	-
Nitrate/Nitrite as N	3850 ug/L	2670 ug/L	36 (≤30)	J (all detects)	A
Sulfate	13600 ug/L	13400 ug/L	1 (≤30)	-	-
Total dissolved solids	660 mg/L	746 mg/L	12 (≤30)	-	-
Total suspended solids	15.7 mg/L	10.5 mg/L	40 (≤30)	J (all detects)	A

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, DUP RPD, and field duplicate RPD, data were qualified as estimated in ten samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135701-1

Sample	Analyte	Flag	A or P	Reason
CFMW-012a-GW CFMW-008-GW CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-012a-GW CFMW-008-GW CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW	Orthophosphate as P Nitrate/Nitrite as N	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW	Dissolved total cyanide	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-035-GW	Free cyanide	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-012a-GW CFMW-008-GW CFMW-018-GW CFMW-037-GW CFMW-032-GW CFMW-042-GW CFMW-DUP12-GW CFMW-040-GW CFMW-035-GW	Total dissolved solids Total suspended solids	J (all detects) J (all detects)	A	Duplicate sample analysis (RPD)
CFMW-032-GW CFMW-DUP12-GW	Free cyanide Dissolved free cyanide Nitrate/Nitrite as N Total suspended solids	J (all detects) J (all detects) J (all detects) J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135701-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135701-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-012a-GW	Chloride Nitrate/Nitrite as N	385J+ ug/L 204J+ ug/L	A

LDC #: 39033A6 **VALIDATION COMPLETENESS WORKSHEET** Date: 7-20-17
SDG #: 460-135701-1 Level IV Page: 1 of 2
Laboratory: Test America, Inc. Reviewer: MG
2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide ~~(EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)
MG Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	SW	DUP (SDG: 460-135619-1)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	SW	D=6+8
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB30-AQ	460-135701-1	Water	06/20/17
2	CFMW-012a-GW	460-135701-3	Water	06/20/17
3	CFMW-008-GW	460-135701-4	Water	06/20/17
4	CFMW-018-GW	460-135701-5	Water	06/20/17
5	CFMW-037-GW	460-135701-6	Water	06/20/17
6	CFMW-032-GW	460-135701-7	Water	06/20/17
7	CFMW-042-GW	460-135701-8	Water	06/20/17
8	CFMW-DUP12-GW	460-135701-9	Water	06/20/17
9	CFMW-040-GW	460-135701-10	Water	06/20/17
10	CFMW-035-GW	460-135701-11	Water	06/20/17
11	CFMW-012a-GWMS	460-135701-3MS	Water	06/20/17
12	CFMW-012a-GWMSD	460-135701-3MSD	Water	06/20/17
13	CFMW-012a-GWDUP	460-135701-3DUP	Water	06/20/17
14	CFMW-008-GWMS	460-135701-4MS	Water	06/20/17
15	CFMW-008-GWMSD	460-135701-4MSD	Water	06/20/17

LDC #: 39033A6

SDG #: 460-135701-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-20-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MH Free CN, Diss. Free CN (9016)

	Client ID	Lab ID	Matrix	Date
16	CFMW-018-GWMS	460-135701-5MS	Water	06/20/17
17	CFMW-018-GWMSD	460-135701-5MSD	Water	06/20/17
18	CFMW-032-GWMS	460-135701-7MS	Water	06/20/17
19	CFMW-032-GWMSD	460-135701-7MSD	Water	06/20/17
20	CFMW-042-GWMS	460-135701-8MS	Water	06/20/17
21	CFMW-042-GWMSD	460-135701-8MSD	Water	06/20/17
22				
23				
24				
25	PBW1			
26	PBW2			

Notes:

LDC #: 39033A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39033A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [signature]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: a

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2→10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS dis CN
3→10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis. Free CN
QC 11,12	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F dis CN
13	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard TSS
14,15, 18,19	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN
16,17	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
20,21	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis CN
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39033A6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: **6/20/17** Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
	1		2									
Cl	122	1220	385J+									
NO3/NO2-N	109	1090	204J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39033A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	11/12	water	SO_4	121 (90-110)	127 (90-110)		all 2-10	J+ dets/A (det in 2→10)
	↓	↓	PO_4-P	85 (↓)	↓		↓	J-/UJ/A (all N.D.)
			NO_3/NO_2-N		89 (↓)			↓ (det & ND)
2	20/21	↓	Dis. Total CN		73 (75-125)		4→10	J-/UJ/A (all dets)
								↓ ↓
3	18/19		Free CN		55 (56-111)		6→8, 10	(↓)

Comments:

LDC #: 39033A6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		13	water	TDS	6 (≤5)	2→10	J/UJ/A (all dets)
		↓	↓	TSS	12 (↓)	↓	↓ (↓)

Comments:

DUP.6

LDC#: 39033A6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: G

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	6	8		
Alkalinity	555000	547000	1	
Ammonia as N	72.0U	84.8	16	
Chloride	1950	1920	2	
Total Cyanide	478	470	2	
Dissolved Total Cyanide	494	483	2	
Free Cyanide	46.1	129	95	J/UJ/A (all dets)
Dissolved Free Cyanide	45.9	135	99	J/UJ/A (all dets)
Fluoride	8570	8460	1	
Dissolved Fluoride	8400	8420	0	
Hardness	156000	152000	3	
Nitrate/Nitrite as N	3850	2670	36	J/UJ/A (all dets)
Sulfate	13600	13400	1	
TDS (mg/L)	660	746	12	
TSS (mg/L)	15.7	10.5	40	J/UJ/A (all dets)

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033A6.WPD

LDC #: 39033A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of Cl was recalculated. Calibration date: 6-21-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Cl	Blank	-	-	$r^2 = 0.9994$	$r^2 = 0.9990$	Y
		Standard 1	0.12 (mg/L)	1862			
		Standard 2	0.30 ( )	4059			
		Standard 3	1.50 ( )	19622			
		Standard 4	3.00 ( )	40155			
		Standard 5	4.50 ( )	59890			
		Standard 6	6.00 ( )	82422			
		Standard 7	-	-			
Calibration verification	NO_3/NO_2-N	0948 CCV1	0.998 (mg/L)	1.00 (mg/L)	100	100	
Calibration verification	NH_3-N	1444 CCV1	2.011 (mg/L)	2.00 (mg/L)	101	101	
Calibration verification	Free CN	CCV1	51.81 (µg/L)	50.0 (µg/L)	104	104	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
1710 LCS	Laboratory control sample	PO_4-P	2379 (µg/L)	2500 (µg/L)	95	95	Y
1001 11	Matrix spike sample	NO_3/NO_2-N	(SSR-SR) 957.4 (µg/L)	1000 (µg/L)	96	96	↓
13	Duplicate sample	TDS	217.0 (mg/L)	230.0 (mg/L)	6	6	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39033A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: G

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for # 2, Alk reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$Alk = \frac{(4.979\ ml)(0.0207\ N)(50000)(1000\ \mu g/mg)}{25\ ml} = 206130.6\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	NO_3/NO_2-N	109	109	Y
2	2	Alk	206000	206000	
3	3	NH_3-N	519	519	
4	4	Diss. Total CN	74.9	75.0	
5	5	TDS	236 (mg/L)	236 (mg/L)	
6	6	Diss. Free CN	45.9	46.1 ~~47.0~~	MY
7	7	Diss. F	2590	2590	
8	8	TSS	10.5 (mg/L)	10.5 (mg/L)	
9	9	Hardness	224000	224000	
10	10	SO_4	15100	15100	

Note: method 9056A is N.D. for all samples

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 17, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135818-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	460-135818-2	Water	06/21/17
CFMW-049-GW	460-135818-4	Water	06/21/17
CFMW-050-GW	460-135818-5	Water	06/21/17
CFMW-047-GW	460-135818-6	Water	06/21/17
CFMW-031-GW	460-135818-7	Water	06/21/17
CFMW-DUP13-GW	460-135818-8	Water	06/21/17
CFMW-043-GW	460-135818-9	Water	06/21/17
CFMW-044-GW	460-135818-10	Water	06/21/17
CFMW-054-GW	460-135818-12	Water	06/21/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/28/17	Dichlorodifluoromethane Bromomethane Methyl acetate	22.1 43.1 20.3	All samples in SDG 460-135818-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LCS/D 460-446336 (All samples in SDG 460-135818-1)	Dichlorodifluoromethane	35 (≤30)	UJ (all non-detects)	P

X. Field Duplicates

Samples CFMW-031-GW and CFMW-DUP13-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD RPD, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-135818-1

Sample	Compound	Flag	A or P	Reason
TRIP BLANK CFMW-049-GW CFMW-050-GW CFMW-047-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW CFMW-054-GW	Dichlorodifluoromethane Bromomethane Methyl acetate	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
TRIP BLANK CFMW-049-GW CFMW-050-GW CFMW-047-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW CFMW-054-GW	Dichlorodifluoromethane	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

LDC #: 39033B1 **VALIDATION COMPLETENESS WORKSHEET** Date: 7/13/17
SDG #: 460-135818-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer: FI
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	< RL
VI.	Field blanks	ND	TB = 1 < RL
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/P
X.	Field duplicates	ND	D = 5, 6
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	TRIP BLANK	460-135818-2	Water	06/21/17
2	CFMW-049-GW	460-135818-4	Water	06/21/17
3	CFMW-050-GW	460-135818-5	Water	06/21/17
4	CFMW-047-GW	460-135818-6	Water	06/21/17
5	CFMW-031-GW D	460-135818-7	Water	06/21/17
6	CFMW-DUP13-GW D	460-135818-8	Water	06/21/17
7	CFMW-043-GW	460-135818-9	Water	06/21/17
8	CFMW-044-GW	460-135818-10	Water	06/21/17
9	CFMW-054-GW	460-135818-12	Water	06/21/17
10				
11	MB 460-446336			
12				
13				

LDC #: 39033B

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: G

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		< RL
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		< RL
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39033B1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39033B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/28/17	CCV	JJ	22.1		all	J-/UJ/A (ND)
-	0608		B	43.1		↓	↓
-			QQQQ	20.3		↓	↓

CONCAL.wpd

LDC #: 39033B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460	JJ	( )	( )	35 (30)	All	J/UJ/P ND
	446336		( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		

LDC #: 39033B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/27/2017	Z	1.4635	1.4635	1.5007	1.5007	3.5	3.5
	GCMS12		C	0.3881	0.3881	0.3539	0.3539	6.4	6.4
			CC	1.4627	1.4627	1.5003	1.5003	9.0	9.0
			JJJ	1.3075	1.3075	1.3811	1.3811	9.0	9.0

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0608	6/28/17	Z (1st internal standard)	1.5007	1.411	1.411	6.0	6.0
			C (2nd internal standard)	0.3539	0.3173	0.3173	10.4	10.4
			CC (3rd internal standard)	1.5003	1.465	1.465	2.3	2.3
			JJJ (4th internal standard)	1.3811	1.297	1.297	6.1	6.1
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033B1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 8

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	45.0	90	90	0
1,2-Dichloroethane-d4	↓	48.2	96	96	↓
Toluene-d8	↓	48.0	96	96	↓
Bromofluorobenzene	↓	52.0	104	104	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39033B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS/D 460 – 446336

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	16.7	17.3	83	83	86	86	4	4
Trichloroethene	↓	↓	18.4	18.7	92	92	94	94	2	2
Benzene	↓	↓	17.7	18.8	88	88	94	94	6	6
Toluene	↓	↓	17.6	19.7	88	88	99	99	12	12
Chlorobenzene	↓	↓	19.2	19.7	96	96	98	98	2	2

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 8, F:

Conc. = $\frac{\left[\left(\frac{1914}{349710}\right)(250)\right] - 0.4379}{0.1766}$

= 5.3 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135818-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-049-GW	460-135818-4	Water	06/21/17
CFMW-050-GW	460-135818-5	Water	06/21/17
CFMW-047-GW	460-135818-6	Water	06/21/17
CFMW-031-GW	460-135818-7	Water	06/21/17
CFMW-DUP13-GW	460-135818-8	Water	06/21/17
CFMW-043-GW	460-135818-9	Water	06/21/17
CFMW-044-GW	460-135818-10	Water	06/21/17
CFMW-054-GW	460-135818-12	Water	06/21/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/27/17	Hexachlorocyclopentadiene Benzo(b)fluoranthene	30.4 22.7	All samples in SDG 460-135818-1	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-445680 (All samples in SDG 460-135818-1)	Di-n-octylphthalate	132 (64-131)	-	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

LDC #: 39033B2a

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/13/17

SDG #: 460-135818-1

Page: 1 of 1

Laboratory: Test America, Inc.

Reviewer: EF

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	ND	D = 4, 5
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-049-GW	460-135818-4	Water	06/21/17
2	CFMW-050-GW	460-135818-5	Water	06/21/17
3	CFMW-047-GW	460-135818-6	Water	06/21/17
4	CFMW-031-GW D	460-135818-7	Water	06/21/17
5	CFMW-DUP13-GW D	460-135818-8	Water	06/21/17
6	CFMW-043-GW	460-135818-9	Water	06/21/17
7	CFMW-044-GW	460-135818-10	Water	06/21/17
8	CFMW-054-GW	460-135818-12	Water	06/21/17
9				
10				
11	MB 460-445680			
12				
13				

LDC #: 39033B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 39033B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: C

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o''-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.o-Toluidine

LDC #: 39033B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	6/27/17	CCV	X	30.4		all	J+ det /A ND
+	0934		GGG	22.7		↓	↓

CONCAL.wpd

LDC #: 39033B2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCSD 460-445680	FFF	132 (64-131)	( )	( )	all	J+ det / p ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 39033B2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS14	6/15/2017	A	1.7719	1.7719	1.6606	1.6606	7.1	7.1
			S	1.0300	1.0300	1.0145	1.0145	2.9	2.9
			DD	1.9765	1.9765	1.9297	1.9297	2.0	2.0
			UU	1.1229	1.1229	1.1089	1.1089	2.8	2.8
			DDD	1.1357	1.1357	1.1935	1.1935	3.3	3.3
			III	1.1363	1.1363	1.0470	1.0470	12.3	12.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0934	6/27/17	A (1st IS)	1.6606	1.775	1.775	6.9	6.9
			S (2nd IS)	1.0145	1.060	1.060	4.5	4.5
			DD (3rd IS)	1.9297	1.949	1.949	1.0	1.0
			UU (4th IS)	1.1089	1.148	1.148	3.5	3.5
			DDD (5th IS)	1.1935	1.123	1.123	5.9	5.9
			III (6th IS)	1.0470	1.146	1.146	9.5	9.5
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033B2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 7

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	10.5	105	105	0
2-Fluorobiphenyl		10.6	106	106	
Terphenyl-d14		10.8	108	108	
Phenol-d5		3.53	35	35	
2-Fluorophenol		5.27	53	53	
2,4,6-Tribromophenol		12.7	127	127	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39033B2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460 - 445680

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	27.0	26.9	34	34	34	34	0	0
N-Nitroso-di-n-propylamine	↓	↓	78.8	78.6	98	98	98	98	0	0
4-Chloro-3-methylphenol	80.0	↓	73.7	74.6	92	92	93	93	1	1
Acenaphthene	↓	↓	80.8	82.5	101	101	103	103	2	2
Pentachlorophenol	160	160	178	187	111	111	117	117	5	5
Pyrene	80.0	80.0	79.4	78.9	99	99	99	99	1	1

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033B2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #7, Δ:

Conc. = $\frac{21925\ (8.0)\ (2)}{218049\ (1.6606)\ (250)}$

= 3.9 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135818-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB31-AQ	460-135818-1	Water	06/21/17
CFMW-049a-GW	460-135818-3	Water	06/21/17
CFMW-049-GW	460-135818-4	Water	06/21/17
CFMW-050-GW	460-135818-5	Water	06/21/17
CFMW-047-GW	460-135818-6	Water	06/21/17
CFMW-031-GW	460-135818-7	Water	06/21/17
CFMW-DUP13-GW	460-135818-8	Water	06/21/17
CFMW-043-GW	460-135818-9	Water	06/21/17
CFMW-044-GW	460-135818-10	Water	06/21/17
CFMW-059-GW	460-135818-11	Water	06/21/17
CFMW-054-GW	460-135818-12	Water	06/21/17
CFMW-049a-GWF	460-135818-3F	Water	06/21/17
CFMW-049-GWF	460-135818-4F	Water	06/21/17
CFMW-050-GWF	460-135818-5F	Water	06/21/17
CFMW-047-GWF	460-135818-6F	Water	06/21/17
CFMW-031-GWF	460-135818-7F	Water	06/21/17
CFMW-DUP13-GWF	460-135818-8F	Water	06/21/17
CFMW-043-GWF	460-135818-9F	Water	06/21/17
CFMW-044-GWF	460-135818-10F	Water	06/21/17
CFMW-059-GWF	460-135818-11F	Water	06/21/17
CFMW-054-GWF	460-135818-12F	Water	06/21/17
CFMW-049a-GWMS	460-135818-3MS	Water	06/21/17
CFMW-049a-GWDUP	460-135818-3DUP	Water	06/21/17
CFMW-049a-GWFMS	460-135818-3FMS	Water	06/21/17
CFMW-049a-GWFDUP	460-135818-3FDUP	Water	06/21/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB31-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB31-AQ	06/21/17	Calcium Sodium	262 ug/L 518 ug/L	CFMW-049a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-049a-GWMS and CFMW-049a-GWFMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-031-GW and CFMW-DUP13-GW and samples CFMW-031-GWF and CFMW-DUP13-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-031-GW	CFMW-DUP13-GW			
Barium	150	147	2 (≤30)	-	-
Calcium	40500	39600	2 (≤30)	-	-
Iron	46.4	46.4	0 (≤30)	-	-
Magnesium	12100	11900	2 (≤30)	-	-
Potassium	712	697	2 (≤30)	-	-
Sodium	35000	34400	2 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-031-GWF	CFMW-DUP13-GWF			
Barium	151	150	1 (≤30)	-	-
Calcium	40000	39600	1 (≤30)	-	-
Magnesium	11100	10900	2 (≤30)	-	-
Potassium	691	678	2 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-031-GWF	CFMW-DUP13-GWF			
Sodium	30100	29700	1 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

The results for the dissolved metals sample analysis were greater than the total metals sample analysis as follows:

Analyte	Concentration (ug/L)	
	CFMW-044-GWF	CFMW-044-GW
Calcium	67300	45100

Analyte	Concentration (ug/L)	
	CFMW-059-GWF	CFMW-059-GW
Sodium	30600	21600

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

LDC #: 39033B4a
SDG #: 460-135818-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7-21-17
Page: 1 of 2
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB = 1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (#22: Ba, Ca, Mg, Na – 4x; #24: Ba, Ca, Mg, Na – 4x)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 2, 12
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D = 6 + 7, D = 16 + 17
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	SW	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

		Client ID	Lab ID	Matrix	Date
1	1	CFMW-EB31-AQ	460-135818-1	Water	06/21/17
2	2	CFMW-049a-GW	460-135818-3	Water	06/21/17
3	2	CFMW-049-GW	460-135818-4	Water	06/21/17
4	1	CFMW-050-GW	460-135818-5	Water	06/21/17
5	2	CFMW-047-GW	460-135818-6	Water	06/21/17
6	2	CFMW-031-GW	460-135818-7	Water	06/21/17
7	2	CFMW-DUP13-GW	460-135818-8	Water	06/21/17
8	2	CFMW-043-GW	460-135818-9	Water	06/21/17
9	2	CFMW-044-GW	460-135818-10	Water	06/21/17
10	2	CFMW-059-GW	460-135818-11	Water	06/21/17
11	2	CFMW-054-GW	460-135818-12	Water	06/21/17
12	3	CFMW-049a-GWF	460-135818-3F	Water	06/21/17
13	3	CFMW-049-GWF	460-135818-4F	Water	06/21/17
14	3	CFMW-050-GWF	460-135818-5F	Water	06/21/17
15	3	CFMW-047-GWF	460-135818-6F	Water	06/21/17

LDC #: 39033B4a

SDG #: 460-135818-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-21-17

Reviewer: MG

2nd Reviewer: G

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16 3	CFMW-031-GWF	460-135818-7F	Water	06/21/17
17 3	CFMW-DUP13-GWF	460-135818-8F	Water	06/21/17
18 3	CFMW-043-GWF	460-135818-9F	Water	06/21/17
19 3	CFMW-044-GWF	460-135818-10F	Water	06/21/17
20 3	CFMW-059-GWF	460-135818-11F	Water	06/21/17
21 3	CFMW-054-GWF	460-135818-12F	Water	06/21/17
22 2	CFMW-049a-GWMS	460-135818-3MS	Water	06/21/17
23 2	CFMW-049a-GWDUP	460-135818-3DUP	Water	06/21/17
24 3	CFMW-049a-GWFMS	460-135818-3FMS	Water	06/21/17
25 3	CFMW-049a-GWFDUP	460-135818-3FDUP	Water	06/21/17
26				
27				
28 1	PBW1			
29 2	PBW2			
30 3	PBW3			

Notes:

LDC #: 39033B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39033B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033B4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→21	W	(Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn) Mo, B, Si, CN^-, ____
QC 22→25	↓	(Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn) Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	(Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn) Hg (Ni, K, Se, Ag, Na, Tl, V, Zn) Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: (Mercury by CVAA if performed)

LDC #: 39033B4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer:

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/21/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2 (>10x)

Analyte	Blank ID	Sample Identification											
	1	Action Level	No Qual's.										
Ca	262	2620											
Na	518	5180											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 39033B4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	6	7		
Barium	150	147	2	
Calcium	40500	39600	2	
Iron	46.4	46.4	0	
Magnesium	12100	11900	2	
Potassium	712	697	2	
Sodium	35000	34400	2	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033B4a.WPD

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	16	17		
Barium	151	150	1	
Calcium	40000	39600	1	
Magnesium	11100	10900	2	
Potassium	691	678	2	
Sodium	30100	29700	1	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033B4a.WPD

LDC #: 39033B4a

VALIDATION FINDINGS WORKSHEET
Sample Result Verification

Reviewer: MG
2nd Reviewer: G

METHOD: Trace metals (EPA SW 846 6010/6020/7000)

— (µg / L) —

#	Sample ID	Analyte	Dissolved Result (units)	Total Result ~~RL~~ (units)	Finding	Qualifications
1	9/19	Ca	67300	45100	dissolved > total	text
					↓	↓
2	10/20	Na	30600	21600		

Comments:

SRV.SW4.wpd

LDC #: 39033B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
2128 ICV	ICP/MS (Initial calibration)	Cr	39.96	40.0	100	100	Y
1344 ICV	CVAA (Initial calibration)	Hg	4.9331	5.00	99	99	↓
	ICP (Continuing calibration)						↓
0041 CCV	ICP/MS (Continuing calibration)	Ni	47.26	50.0	95	95	↓
1712 CCV	CVAA (Continuing calibration)	Hg	4.3959	5.00	88	88	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
2644 ICSAB	ICP interference check	Co	187.1 (µg/L)	200 (µg/L)	94	94	Y
0054 LCS	Laboratory control sample	Se	9.38 (µg/L)	10.0 (µg/L)	94	94	↓
0057 24	Matrix spike	Pb	(SSR-SR) 9.02 (µg/L)	10.0 (µg/L)	90	90	↓
0104/0101 25	Duplicate	Ba	274.8 (µg/L)	274.5 (µg/L)	0.11	0.09	↓
0104/0113 12	ICP serial dilution	Na	11977 (µg/L)	12847 (µg/L)	7.3	7.3	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 39033B4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Mg were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(34.580\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 69.160\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Mg	69.2	69.2	Y
2	2	Cr	3.0	3.04	
3	3	Al	23.2	23.2	
4	4	Ca	49400	49400	
5	5	Cu	2.3	2.30	
6	6	Ba	150	150	
7	7	Fe	46.4	46.4	
8	8	Al	22.9	22.9	
9	9	Ni	8.8	8.77	
10	10	Pb	0.73	0.73	
11	11	Mn	9.2	9.23	
12	12	Ba	275	275	
13	13	Mg	14400	14400	
14	14	K	801	801	
15	15	Fe	45.6	45.6	
16	16	Ca	40000	40000	
17	17	Na	29700	29700	
18	18	Co	1.4	1.38	
19	19	Ba	147	147	
20	20	Fe	129	129	
21	21	Ca	57400	57400	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135818-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB31-AQ	460-135818-1	Water	06/21/17
CFMW-049a-GW	460-135818-3	Water	06/21/17
CFMW-049-GW	460-135818-4	Water	06/21/17
CFMW-050-GW	460-135818-5	Water	06/21/17
CFMW-047-GW	460-135818-6	Water	06/21/17
CFMW-031-GW	460-135818-7	Water	06/21/17
CFMW-DUP13-GW	460-135818-8	Water	06/21/17
CFMW-043-GW	460-135818-9	Water	06/21/17
CFMW-044-GW	460-135818-10	Water	06/21/17
CFMW-059-GW	460-135818-11	Water	06/21/17
CFMW-054-GW	460-135818-12	Water	06/21/17
CFMW-049a-GWMS	460-135818-3MS	Water	06/21/17
CFMW-049a-GWMSD	460-135818-3MSD	Water	06/21/17
CFMW-049a-GWDUP	460-135818-3DUP	Water	06/21/17
CFMW-054-GWMS	460-135818-12MS	Water	06/21/17
CFMW-EB31-AQMS	460-135818-1MS	Water	06/21/17
CFMW-EB31-AQMSD	460-135818-1MSD	Water	06/21/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB31-AQ was identified as a field blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB31-AQ	06/21/17	Chloride Nitrate/Nitrite as N	139 ug/L 151 ug/L	CFMW-049a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-049a-GW	Nitrate/Nitrite as N	619 ug/L	619J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-049a-GWMS/MSD (CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW)	Chloride	115 (90-110)	114 (90-110)	J+ (all detects)	A
CFMW-049a-GWMS/MSD (CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW)	Fluoride	89 (90-110)	86 (90-110)	J- (all detects)	A
CFMW-049a-GWMS/MSD (CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW)	Orthophosphate as P	0 (90-110)	0 (90-110)	R (all non-detects)	A
CFMW-049a-GWMS/MSD (CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-047-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW CFMW-059-GW CFMW-054-GW)	Nitrate/Nitrite as N	87 (90-110)	-	J- (all detects)	A
CFMW-045a-GWMS/MSD (CFMW-043-GW)	Sulfate	142 (90-110)	137 (90-110)	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Difference (Limits)	Flag	A or P
CFMW-049a-GWDUP (CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-047-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW CFMW-059-GW CFMW-054-GW)	Total dissolved solids	10 (≤5)	-	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFMW-031-GW and CFMW-DUP13-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-031-GW	CFMW-DUP13-GW			
Alkalinity	220000 ug/L	220000 ug/L	0 (≤30)	-	-
Chloride	1470 ug/L	1710 ug/L	15 (≤30)	-	-
Total cyanide	104 ug/L	103 ug/L	1 (≤30)	-	-
Dissolved total cyanide	101 ug/L	100 ug/L	1 (≤30)	-	-
Free cyanide	2.8 ug/L	3.5 ug/L	22 (≤30)	-	-
Dissolved free cyanide	2.4 ug/L	3.1 ug/L	25 (≤30)	-	-
Fluoride	2770 ug/L	2800 ug/L	1 (≤30)	-	-

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-031-GW	CFMW-DUP13-GW			
Dissolved fluoride	2900 ug/L	2900 ug/L	0 (≤30)	-	-
Hardness	152000 ug/L	158000 ug/L	4 (≤30)	-	-
Nitrate/Nitrite as N	953 ug/L	1020 ug/L	7 (≤30)	-	-
Sulfate	6530 ug/L	6570 ug/L	1 (≤30)	-	-
Total dissolved solids	219 mg/L	232 mg/L	6 (≤30)	-	-
Total suspended solids	1.3 mg/L	1.0U mg/L	26 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and DUP RPD, data were qualified as estimated in ten samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135818-1

Sample	Analyte	Flag	A or P	Reason
CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW	Fluoride	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW	Orthophosphate as P	R (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-047-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW CFMW-059-GW CFMW-054-GW	Nitrate/Nitrite as N	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-043-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-049a-GW CFMW-049-GW CFMW-050-GW CFMW-047-GW CFMW-031-GW CFMW-DUP13-GW CFMW-043-GW CFMW-044-GW CFMW-059-GW CFMW-054-GW	Total dissolved solids	J (all detects)	A	Duplicate sample analysis (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135818-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135818-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-049a-GW	Nitrate/Nitrite as N	619J+ ug/L	A

LDC #: 39033B6

SDG #: 460-135818-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-21-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

mB Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-135989-1, 460-135701-1)
VII.	Duplicate sample analysis	SW	DUP (↓ ↓)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	SW	D = 6+7
X.	Sample result verification	A	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB31-AQ	460-135818-1	Water	06/21/17
2	CFMW-049a-GW	460-135818-3	Water	06/21/17
3	CFMW-049-GW	460-135818-4	Water	06/21/17
4	CFMW-050-GW	460-135818-5	Water	06/21/17
5	CFMW-047-GW	460-135818-6	Water	06/21/17
6	CFMW-031-GW	460-135818-7	Water	06/21/17
7	CFMW-DUP13-GW	460-135818-8	Water	06/21/17
8	CFMW-043-GW	460-135818-9	Water	06/21/17
9	CFMW-044-GW	460-135818-10	Water	06/21/17
10	CFMW-059-GW	460-135818-11	Water	06/21/17
11	CFMW-054-GW	460-135818-12	Water	06/21/17
12	CFMW-049a-GWMS	460-135818-3MS	Water	06/21/17
13	CFMW-049a-GWMSD	460-135818-3MSD	Water	06/21/17
14	CFMW-049a-GWDUP	460-135818-3DUP	Water	06/21/17
15	CFMW-054-GWMS	460-135818-12MS	Water	06/21/17

LDC #: 39033B6

SDG #: 460-135818-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-21-17

Reviewer: MG

2nd Reviewer: [signature]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Motyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MG Free CN, Diss. Free CN (9016)

		Client ID	Lab ID	Matrix	Date
MG	16	~~CFMW-054-GWMSD~~	~~460-135818-12MSD~~	~~Water~~	~~06/21/17~~
	17	CFMW-EB31-AQMS	460-135818-1 MS	Water	6/21/17
	18	CFMW-EB31-AQ MSD	460-135818-1 MSD	Water	6/21/17
	19	PBW1			
	20	PBW2			
	21	PBW3			

Notes: PBW4

LDC #: 39033B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anayized for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39033B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033B6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2→11	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS dis CN
2→9, 11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis Free CN
QC 12, 13	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F dis CN
12, 13	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis Free CN
14	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS
15, 17, 18	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39033B6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/21/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
	1		2									
Cl	139	1390										
NO3/NO2-N	151	1510	619J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39033B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	12/13	water	Cl	115 (90-110)	114 (90-110)		2→4, 6→9	J+ dets/A (all dets)
	↓	↓	F	89 ( )	86 ( )		↓	J-/UJ/A (det ~~& ND)~~
			PO_4-P	0 ( )	0 ( )		↓	J-/R/A (all N.D.)
			NO_3/NO_2-N	87 ( )			~~a~~ 12-11	J-/UJ/A (all dets)
2	CFMW-045a-GW		Cl	122 ( )	123 ( )		none	No Qual.
	MS/MSD		F	111 ( )	121 ( )		↓	↓
			SO_4	142 ( )	137 ( )		8	J+ dets/A (det)
3	CFMW-012a-GW		SO_4	112 (↓)	117 (↓)		none	No Qual.
	MS/MSD	↓						

Comments:

LDC #: 39033B6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		14	water	TDS	10 ≤ 5	2 → 11	J/UJ/A (all dets)

Comments:

LDC#: 39033B6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	6	7		
Alkalinity	220000	220000	0	
Chloride	1470	1710	15	
Total Cyanide	104	103	1	
Dissolved Total Cyanide	101	100	1	
Free Cyanide	2.8	3.5	22	
Dissolved Free Cyanide	2.4	3.1	25	
Fluoride	2770	2800	1	
Dissolved Fluoride	2900	2900	0	
Hardness	152000	158000	4	
Nitrate/Nitrite as N	953	1020	7	
Sulfate	6530	6570	1	
TDS (mg/L)	219	232	6	
TSS (mg/L)	1.3	1.0U	26	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033B6.WPD

LDC #: 39033B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: Q

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of NH_3-N was recalculated. Calibration date: 6-28-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	NH_3-N	Blank	0.0 (mg/L)	519075	r = 0.9996	r = 0.9992	Y
		Standard 1	0.1 ( )	2410323			
		Standard 2	0.5 ( )	4880756			
		Standard 3	1.0 ( )	9336269			
		Standard 4	2.0 ( )	17804942			
		Standard 5	4.0 ( )	34041352			
		Standard 6	–	–			
		Standard 7	–	–			
Calibration verification	NO_3/NO_2-N	1431 ICV	0.985 (mg/L)	1.00 (mg/L)	98	98	
Calibration verification	Free CN	CCV1	47.93 (µg/L)	50.0 (µg/L)	96	96	
Calibration verification	Total CN	1535 ICV	0.194 (mg/L)	0.200 (mg/L)	97	97	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCSSRM	Laboratory control sample	Alk	169369 (µg/L)	165000 (µg/L)	102.6	102.6	Y
1120 12	Matrix spike sample	PO_4-P	(SSR-SR) 0 (µg/L)	2500 (µg/L)	0	0	↓
14	Duplicate sample	TSS	176.0 (mg/L)	176.4 (mg/L)	0.2	0.2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39033B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for # 1, Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = mx + b$

where
$m = 91637.82$
$b = -8763.36$
dil = 1x

Recalculation:
$3943 = 91637.82(x) - 8763.36$
$0.1387\ mg/L = x$
then $(0.1387\ mg/L)(1000\ \mu g/mg) = 138.7\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cl	139	139	Y
2	2	Total CN	58.6	58.6	↓
3	3	TDS	208 (mg/L)	208 (mg/L)	↓
4	4	Alk	228000	228000	↓
5	5	diss. F	2100	2100	↓
6	6	NO_3/NO_2-N	953	954	↓
7	7	Hardness	158000	158000	↓
8	8	Free CN	120	120	↓
9	9	NH_3-N	21900	21900	↓
10	10	NO_3/NO_2-N	4950	4960	↓
11	11	TSS	79.3 (mg/L)	79.3 (mg/L)	↓

Note: method 9056A is N.D. for all samples

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135884-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	460-135884-2	Water	06/22/17
CFMW-025b-GW	460-135884-8	Water	06/22/17
CFMW-026-GW	460-135884-9	Water	06/22/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/28/17	Dichlorodifluoromethane Chloromethane	26.6 35.4	All samples in SDG 460-135884-1	UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-135884-1

Sample	Compound	Flag	A or P	Reason
TRIP BLANK CFMW-025b-GW CFMW-026-GW	Dichlorodifluoromethane Chloromethane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

LDC #: 39033C1 **VALIDATION COMPLETENESS WORKSHEET** Date: 7/13/17
SDG #: 460-135884-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 1
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	TRIP BLANK	460-135884-2	Water	06/22/17
2	CFMW-025b-GW	460-135884-8	Water	06/22/17
3	CFMW-026-GW	460-135884-9	Water	06/22/17
4				
5				
6				
7				
8				

Notes:

	MB 460-444665					

LDC #: 39033C1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: G

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) > 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39033C1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39033C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/28/17	CCV	JJ	26.6		All	J-/UJ/A ND
-	19/17		A	35.4		↓	↓

CONCAL.wpd

LDC #: 39033C1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/27/2017	Z	1.4635	1.4635	1.5007	1.5007	3.5	3.5
	GCMS12		C	0.3881	0.3881	0.3539	0.3539	6.4	6.4
			CC	1.4627	1.4627	1.5003	1.5003	9.0	9.0
			JJJ	1.3075	1.3075	1.3811	1.3811	9.0	9.0

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033 C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 917	6/28/17	Z (1st internal standard)	1.5007	~~0.2963~~ 1.431	1.431	~~16.3~~ 4.6	4.6
			C (2nd internal standard)	0.3539	0.2963	0.2963	16.3	16.3
			CC (3rd internal standard)	1.5003	1.220	1.220	18.7	18.7
			JJJ (4th internal standard)	1.3811	1.257	1.257	9.0	9.0
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033c1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	49.5	99	99	0
1,2-Dichloroethane-d4	↓	46.7	93	93	↓
Toluene-d8	↓	48.7	97	97	↓
Bromofluorobenzene	↓	52.1	104	104	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39033 C1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: Q

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460 - 446465

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	17.0	NA	85	85				
Trichloroethene	↓	↓	17.1	↓	86	86				
Benzene	↓	↓	17.3	↓	86	86				
Toluene	↓	↓	17.9	↓	90	90				
Chlorobenzene	↓	↓	18.2	↓	91	91	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033C1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #2, [illegible]: V

Conc. = $\frac{(1336)(50.0)}{(342659)(1.5048)}$

= 0.13 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135884-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-025b-GW	460-135884-8	Water	06/22/17
CFMW-026-GW	460-135884-9	Water	06/22/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/25/17	Hexachlorocyclopentadiene	32.0	CFMW-025b-GW	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/29/17 (06:17)	2,2'-Oxybis(1-chloropropane) 2-Nitroaniline Acenaphthene 4-Nitrophenol 4-Nitroaniline	32.6 25.4 22.4 22.2 26.0	CFMW-026-GW	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
06/29/17 (06:17)	Indeno(1,2,3-cd)pyrene Dibenzo(a,h)anthracene Benzo(g,h,i)perylene	24.5 28.0 22.8	CFMW-026-GW	NA	-
06/28/17 (08:11)	2,6-Dinitrotoluene 3-Nitroaniline 4-Nitroaniline	23.6 33.7 27.4	CFMW-025b-GW	NA	-
06/28/17 (08:35)	Benzaldehyde	21.8	CFMW-025b-GW	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-135884-1

Sample	Compound	Flag	A or P	Reason
CFMW-025b-GW	Hexachlorocyclopentadiene	UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-026-GW	2,2'-Oxybis(1-chloropropane) 2-Nitroaniline Acenaphthene 4-Nitrophenol 4-Nitroaniline	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-025b-GW	Benzaldehyde	UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

LDC #: 39033C2a

SDG #: 460-135884-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/13/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A SW	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-025b-GW	460-135884-8	Water	06/22/17
2	CFMW-026-GW	460-135884-9	Water	06/22/17
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-446207						

LDC #: 39033C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	~~✓~~	✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 29033C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o''-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.o-Toluidine

LDC #: 39033 C2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
–	6/25/17 1719	ICV	X	32.0	1	J-/UJ/A ND

ICVsvoa.wpd

LDC #: 39033C2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/28/17	CCV	H	31.3		MB 460-446207	J-/UJ/A (all ND)
-	1737		J	29.2			
+			Q	24.6			J+ all / A
-			BB	24.8			J-/UJ/A
-			GG	27.6			
-			II	27.0			
-			OO	22.1			
-			FFF	25.8			
-	6/29/17	CCV	H	32.6		~~#2~~ #2	J-/UJ/A (ND)
-	0617		BB	25.4			
-			GG	22.4			
-			II	22.2			
-			OO	26.0			
+			JJJ	24.5			J+ all / A
+			KKK	28.0			
+			LLL	22.8			
+	6/28/17	CCV	EE	23.6		#1	J+ all / A ND
+	08:11		FF	33.7			
+			OO	27.4			
-	6/28/17 0835	CCV	LLLL	21.8		#1	J-/UJ/A ND

LDC #: 39033C2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	6/16/2017	A	1.6281	1.6281	1.6550	1.6550	2.1	2.1
			S	1.0198	1.0198	0.9965	0.9965	13.5	13.5
			DD	1.7846	1.7846	1.7490	1.7490	9.4	9.4
			UU	1.0105	1.0105	1.0306	1.0306	14.2	14.2
			DDD	1.1289	1.1289	1.1369	1.1369	4.2	4.2
			III	1.0451	1.0451	1.0127	1.0127	6.2	6.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033Cda

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS6	6/25/2017	A	1.8332	1.8332	1.8390	1.8390	3.5	3.5
			S	1.0092	1.0092	0.9151	0.9151	7.3	7.3
			DD	1.6831	1.6831	1.6210	1.6210	3.8	3.8
			UU	0.9349	0.9349	0.9013	0.9013	4.8	4.8
			DDD	0.9290	0.9290	0.9673	0.9673	6.2	6.2
			III	1.1785	1.1785	1.0842	1.0842	7.2	7.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033 c2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0617	6/29/17	A	(1st IS)	1.6550	1.637	1.637	1.1	1.1
			S	(2nd IS)	0.9965	1.116	1.116	12.0	12.0
			DD	(3rd IS)	1.7490	1.105	1.105	22.4	22.4
			UU	(4th IS)	1.0306	1.097	1.097	6.4	6.4
			DDD	(5th IS)	1.1369	1.076	1.076	5.3	5.3
			III	(6th IS)	1.0127	1.000	1.00	1.2	1.2
2	CCV 0811	6/28/17	A	(1st IS)	1.8390	1.873	1.873	1.9	1.9
			S	(2nd IS)	0.9151	0.9390	0.9390	2.6	2.6
			DD	(3rd IS)	1.6210	1.849	1.849	14.1	14.1
			UU	(4th IS)	0.9013	0.9344	0.9344	3.7	3.7
			DDD	(5th IS)	0.9673	0.9491	0.9491	1.9	1.9
			III	(6th IS)	1.0842	1.130	1.130	4.2	4.2
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033c2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	6.72	67	67	0
2-Fluorobiphenyl		7.05	70	70	
Terphenyl-d14		9.30	93	93	
Phenol-d5		2.36	24	24	
2-Fluorophenol		4.15	42	42	
2,4,6-Tribromophenol		11.0	110	110	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39033C2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = | LCSC - LCSDC | * 2/(LCSC + LCSDC) LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460-446207

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	24.8	NA	31	31				
N-Nitroso-di-n-propylamine	↓	↓	66.5	↓	83	83				
4-Chloro-3-methylphenol	↓	↓	63.7	↓	80	80				
Acenaphthene	↓	↓	73.1	↓	91	91				
Pentachlorophenol	160	↓	130	↓	81	81				
Pyrene	80.0	↓	71.9	↓	90	90	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033C 2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-446207 △

Conc. = $\frac{164414}{231184} \frac{(8.0)}{(1.8390)} \frac{(2)}{(250)} (1000)$

=

24.8 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135884-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB32-AQ	460-135884-1	Water	06/22/17
CFMW-056-GW	460-135884-5	Water	06/22/17
CFMW-056a-GW	460-135884-6	Water	06/22/17
CFMW-025a-GW	460-135884-7	Water	06/22/17
CFMW-025b-GW	460-135884-8	Water	06/22/17
CFMW-026-GW	460-135884-9	Water	06/22/17
CFMW-056b-GW	460-135884-10	Water	06/22/17
CFMW-056-GWF	460-135884-5F	Water	06/22/17
CFMW-056a-GWF	460-135884-6F	Water	06/22/17
CFMW-025a-GWF	460-135884-7F	Water	06/22/17
CFMW-025b-GWF	460-135884-8F	Water	06/22/17
CFMW-026-GWF	460-135884-9F	Water	06/22/17
CFMW-056b-GWF	460-135884-10F	Water	06/22/17
CFMW-026-GWMS	460-135884-9MS	Water	06/22/17
CFMW-026-GWDUP	460-135884-9DUP	Water	06/22/17
CFMW-056-GWFMS	460-135884-5FMS	Water	06/22/17
CFMW-056-GWFDUP	460-135884-5FDUP	Water	06/22/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB32-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB32-AQ	06/22/17	Calcium Sodium Zinc	368 ug/L 700 ug/L 22.7 ug/L	No associated samples in this SDG

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-056-GWFMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

LDC #: 39033C4a
SDG #: 460-135884-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7-21-17
Page: 1 of 2
Reviewer: MG
2nd Reviewer:

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (#16: Ba, Ca, Mg, Na-4x)
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 8
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

		Client ID	Lab ID	Matrix	Date
1	1	CFMW-EB32-AQ	460-135884-1	Water	06/22/17
2	1	CFMW-056-GW	460-135884-5	Water	06/22/17
3	1	CFMW-056a-GW	460-135884-6	Water	06/22/17
4	1	CFMW-025a-GW	460-135884-7	Water	06/22/17
5	1	CFMW-025b-GW	460-135884-8	Water	06/22/17
6	1	CFMW-026-GW	460-135884-9	Water	06/22/17
7	1	CFMW-056b-GW	460-135884-10	Water	06/22/17
8	2	CFMW-056-GWF	460-135884-5F	Water	06/22/17
9	2	CFMW-056a-GWF	460-135884-6F	Water	06/22/17
10	2	CFMW-025a-GWF	460-135884-7F	Water	06/22/17
11	2	CFMW-025b-GWF	460-135884-8F	Water	06/22/17
12	2	CFMW-026-GWF	460-135884-9F	Water	06/22/17
13	2	CFMW-056b-GWF	460-135884-10F	Water	06/22/17
14	1	CFMW-026-GWMS	460-135884-9MS	Water	06/22/17
15	1	CFMW-026-GWDUP	460-135884-9DUP	Water	06/22/17

LDC #: 39033C4a

SDG #: 460-135884-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-21-17

Reviewer: MG

2nd Reviewer: G

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16 2	CFMW-056-GWFMS	460-135884-5FMS	Water	06/22/17
17 2	CFMW-056-GWFDUP	460-135884-5FDUP	Water	06/22/17
18				
19				
20				
21 1	PBW1			
22 2	PBW2			

Notes:

LDC #: 39033C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39033C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033C4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→13	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
QC 14,15	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
↓ 16,17	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____

Comments: Mercury by CVAA if performed

LDC #: 39033C4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/22/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: none

Analyte	Blank ID	Sample Identification										
	1	Action Level	No Qual's.									
Ca	368	3680										
Na	700	7000										
Zn	22.7	227										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39033C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1232 ICV	ICP/MS (Initial calibration)	Se	40.490	40.0	101	101	Y
1417 ICV	CVAA (Initial calibration)	Hg	4.9222	5.00	98	98	↓
	ICP (Continuing calibration)						↓
1345 CCV	ICP/MS (Continuing calibration)	Cu	49.339	50.0	99	99	↓
1557 CCV	CVAA (Continuing calibration)	Hg	4.8371	5.00	97	97	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1244 ICSAB	ICP interference check	Zn	103.1 (µg/L)	100 (µg/L)	103	103	Y
1330 LCS	Laboratory control sample	Be	5.099 (µg/L)	5.00 (µg/L)	102	102	↓
1333 16	Matrix spike	Sb	(SSR-SR) 8.548 (µg/L)	10.0 (µg/L)	85	85	↓
1338/1335 17	Duplicate	Ba	135.2 (µg/L)	139.5 (µg/L)	3	3	↓
1338/1342 8	ICP serial dilution	Mg	17902 (µg/L)	18423 (µg/L)	2.9	2.9	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 39033C4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: C

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Cr were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(1.037\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 2.074\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cr	2.1	2.07	Y
2	2	As	0.74	0.74	
3	3	Pb	1.1	1.07	
4	4	V	5.2	5.17	
5	5	K	981	981	
6	6	Ba	272	272	
7	7	Na	9810	9810	
8	8	Mn	24.8	24.8	
9	9	Se	1.2	1.22	
10	10	Al	23.0	23.0	
11	11	Fe	1250	1250	
12	12	Ca	59000	59000	
13	13	Mg	17600	17600	

Note: method 7470A is ND for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135884-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB32-AQ	460-135884-1	Water	06/22/17
CFMW-056-GW	460-135884-5	Water	06/22/17
CFMW-056a-GW	460-135884-6	Water	06/22/17
CFMW-025a-GW	460-135884-7	Water	06/22/17
CFMW-025b-GW	460-135884-8	Water	06/22/17
CFMW-026-GW	460-135884-9	Water	06/22/17
CFMW-056b-GW	460-135884-10	Water	06/22/17
CFMW-EB32-AQMS	460-135884-1MS	Water	06/22/17
CFMW-EB32-AQMSD	460-135884-1MSD	Water	06/22/17
CFMW-056a-GWMS	460-135884-6MS	Water	06/22/17
CFMW-056a-GWMSD	460-135884-6MSD	Water	06/22/17
CFMW-025b-GWMS	460-135884-8MS	Water	06/22/17
CFMW-025b-GWMSD	460-135884-8MSD	Water	06/22/17
CFMW-056b-GWMS	460-135884-10MS	Water	06/22/17
CFMW-056b-GWMSD	460-135884-10MSD	Water	06/22/17
CFMW-056b-GWDUP	460-135884-10DUP	Water	06/22/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB32-AQ was identified as a field blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB32-AQ	06/22/17	Chloride Sulfate Alkalinity	186 ug/L 2540 ug/L 5690 ug/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-056b-GWMS/MSD (CFMW-056-GW CFMW-056a-GW CFMW-025a-GW CFMW-025b-GW CFMW-026-GW)	Chloride Sulfate	124 (90-110) 161 (90-110)	124 (90-110) 162 (90-110)	J+ (all detects) J+ (all detects)	A

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-056b-GWMS/MSD (CFMW-056-GW CFMW-056a-GW CFMW-025a-GW CFMW-025b-GW CFMW-026-GW)	Orthophosphate as P	73 (90-110)	72 (90-110)	UJ (all non-detects)	A
CFMW-049a-GWMS/MSD (CFMW-056-GW CFMW-056a-GW CFMW-025a-GW CFMW-025b-GW)	Nitrate/Nitrite as N	87 (90-110)	-	J- (all detects) UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135884-1

Sample	Analyte	Flag	A or P	Reason
CFMW-056-GW CFMW-056a-GW CFMW-025a-GW CFMW-025b-GW CFMW-026-GW CFMW-056b-GW	Chloride Sulfate	J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-056-GW CFMW-056a-GW CFMW-025a-GW CFMW-025b-GW CFMW-026-GW CFMW-056b-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-056-GW CFMW-056a-GW CFMW-025a-GW CFMW-025b-GW	Nitrate/Nitrite as N	J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135884-1

No Sample Data Qualified in this SDG

LDC #: 39033C6

SDG #: 460-135884-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-24-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MG Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-135818-1, 460-135989-1)
VII.	Duplicate sample analysis	A	DUP (↓)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB32-AQ	460-135884-1	Water	06/22/17
2	CFMW-056-GW	460-135884-5	Water	06/22/17
3	CFMW-056a-GW	460-135884-6	Water	06/22/17
4	CFMW-025a-GW	460-135884-7	Water	06/22/17
5	CFMW-025b-GW	460-135884-8	Water	06/22/17
6	CFMW-026-GW	460-135884-9	Water	06/22/17
7	CFMW-056b-GW	460-135884-10	Water	06/22/17
8	CFMW-EB32-AQMS	460-135884-1MS	Water	06/22/17
9	CFMW-EB32-AQMSD	460-135884-1MSD	Water	06/22/17
10	CFMW-056a-GWMS	460-135884-6MS	Water	06/22/17
11	CFMW-056a-GWMSD	460-135884-6MSD	Water	06/22/17
12	CFMW-025b-GWMS	460-135884-8MS	Water	06/22/17
13	CFMW-025b-GWMSD	460-135884-8MSD	Water	06/22/17
14	CFMW-056b-GWMS	460-135884-10MS	Water	06/22/17
15	CFMW-056b-GWMSD	460-135884-10MSD	Water	06/22/17

LDC #: 39033C6

SDG #: 460-135884-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-24-17

Reviewer: MG

2nd Reviewer: [signature]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

9014 Free CN, Diss. Free CN (9016)

	Client ID	Lab ID	Matrix	Date
16	CFMW-056b-GWDUP	460-135884-10DUP	Water	06/22/17
17				
18				
19				
20	PBW 1			
21	PBW 2			

Notes:

LDC #: 39033C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were < 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39033C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2→7	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS dis CN
3,6	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis. Free CN
QC 8,9, 12,13	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
10,11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN
14→16	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39033C6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/22/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: (EB) Associated Samples: none

Analyte	Blank ID	Action Limit	Sample Identification									
	1		No Qual's.									
Cl	186	1860										
SO4	2540	25400										
Alk	5690	56900										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39033C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications	
1	14/15	water	Cl	124 (90-110)	124 (90-110)		all 2-6	J+ dets/A	(all dets)
	↓	↓	SO4	161 ( )	162 ( )		↓	↓	(↓)
	↓	↓	PO4-P	73 ( )	72 (↓)		↓	J-/UJ/A	(all N.D.)
2	CFMW-049a-GW MS/MSD	↓	NO3/NO2-N	87 (↓)			2→5	J-/UJ/A	(det. & N.D.)

Comments:

LDC #: 39033C6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of Total CN was recalculated. Calibration date: 6-29-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Total CN	Blank	0.000 (mg/L)	0.0463	r=0.99990	r=0.99997	Y
		Standard 1	0.010 ( )	0.510			
		Standard 2	0.025 ( )	1.24			
		Standard 3	0.050 ( )	2.47			
		Standard 4	0.100 ( )	4.88			
		Standard 5	0.200 ( )	9.54			
		Standard 6	0.400 ( )	18.6			
		Standard 7	–	–			
Calibration verification	NO_3/NO_2-N	1449 CCV	0.971 (mg/L)	1.00 (mg/L)	97	97	
Calibration verification	NH_3-N	1535 CCV	1.96 (mg/L)	2.00 (mg/L)	98	98	
Calibration verification	Free CN	CCV1	49.79 (µg/L)	50.0 (µg/L)	100	100	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033C6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	NH_3-N	1069 (µg/L)	1000 (µg/L)	107	107	Y
8	Matrix spike sample	Total CN	(SSR-SR) 186 (µg/L)	200 (µg/L)	93	93	↓
16	Duplicate sample	Cl	3050 (µg/L)	2974 (µg/L)	3	2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033C6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: ✓

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1, SO_4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$Y = mx + b$
where
$m = 73070.95$
$b = -41943.75$
dil = 1x

$143735 = 73070.95(x) - 41943.75$
$2.541\ mg/L = X$
then $(2.541\ mg/L)(1000\ \mu g/mg) = 2541\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	SO_4	2540	2540	Y
2	2	NH_3-N	156	156	
3	3	TSS	73.3 (mg/L)	73.3 (mg/L)	
4	4	Hardness	240000	240000	
5	5	TDS	194 (mg/L)	194 (mg/L)	
6	6	NO_3/NO_2-N	167	167	
7	7	Alk	255000	255000	

Note: methods 9056A, 335.4 and 9016 are N.D. for all samples

RECALC.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135989-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	460-135989-2	Water	06/23/17
CFMW-044b-GW	460-135989-4	Water	06/23/17
CFMW-064-GW	460-135989-6	Water	06/23/17
CFMW-DUP14-GW	460-135989-7	Water	06/23/17
CFMW-061-GW	460-135989-8	Water	06/23/17
CFMW-012-GW	460-135989-9	Water	06/23/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/28/17	Dichlorodifluoromethane Chloromethane	26.6 35.4	TRIP BLANK CFMW-DUP14-GW CFMW-061-GW	UJ (all non-detects) UJ (all non-detects)	A

Date	Compound	%D	Associated Samples	Flag	A or P
06/29/17	Dichlorodifluoromethane	30.4	CFMW-044b-GW	UJ (all non-detects)	A
	Chloromethane	30.2	CFMW-064-GW	UJ (all non-detects)	
	Bromomethane	23.5	CFMW-012-GW	UJ (all non-detects)	
	Carbon disulfide	20.2		UJ (all non-detects)	
	1,2-Dichloroethane	21.1		UJ (all non-detects)	
	1,1,2,2-Tetrachloroethane	20.8		UJ (all non-detects)	
	1,2-Dibromo-3-chloropropane	24.2		UJ (all non-detects)	

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analysis Date	Compound	Concentration	Associated Samples
MB 460-446592	06/29/17	Acetone	7.40 ug/L	CFMW-044b-GW CFMW-064-GW CFMW-012-GW

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples CFMW-064-GW and CFMW-DUP14-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-135989-1

Sample	Compound	Flag	A or P	Reason
TRIP BLANK CFMW-DUP14-GW CFMW-061-GW	Dichlorodifluoromethane Chloromethane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-044b-GW CFMW-064-GW CFMW-012-GW	Dichlorodifluoromethane Chloromethane Bromomethane Carbon disulfide 1,2-Dichloroethane 1,1,2,2-Tetrachloroethane 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-135989-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-135989-1

No Sample Data Qualified in this SDG

LDC #: 39033D1 **VALIDATION COMPLETENESS WORKSHEET** Date: 7/13/17
SDG #: 460-135989-1 Level IV Page: 1 of 1
Laboratory: Test America, Inc. Reviewer: FJ
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	SW	
VI.	Field blanks	ND	TB = 1
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	ND	D = 3, 4
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	TRIP BLANK	460-135989-2	Water	06/23/17
2 2	CFMW-044b-GW	460-135989-4	Water	06/23/17
3 2	CFMW-064-GW D	460-135989-6	Water	06/23/17
4 1	CFMW-DUP14-GW D	460-135989-7	Water	06/23/17
5 1	CFMW-061-GW	460-135989-8	Water	06/23/17
6 2	CFMW-012-GW	460-135989-9	Water	06/23/17
7				
8				
9				

Notes:

1	MB 460-446465						
2	MB 460-446592						

LDC #: 39033D1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39033D1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39033B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/28/17	ccv	JJ	26.6		~~All~~ 1,4,5	J-/UJ/A ND
-	1917		A	35.4		↓ MB 460-446465 ↓	
-	6/29/17	ccv	JJ	30.4		2, 3, 6,	J-/UJ/A ND
-	0637		A	30.2		MB 460-446592	
-			B	23.5			
-			G	20.2			
-			L	21.1			
-			BB	20.8			
-			MM	24.2		↓	↓

CONCAL.wpd

LDC #: 39033D1

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a method blank associated with every sample in this SDG?
Y N N/A Was a method blank analyzed at least once every 12 hours for each matrix and concentration?
Y N N/A Was there contamination in the method blanks? If yes, please see the qualifications below.

Blank analysis date: 6/29/17
Conc. units: ug/L
Associated Samples: 2, 3, 6 ND

Compound	Blank ID	Sample Identification								
	MB 460-446592									
F	7.40									

Blank analysis date:
Conc. units:
Associated Samples:

Compound	Blank ID	Sample Identification								

All results were qualified using the criteria stated below except those circled.

Note: Common contaminants such as Methylene chloride, Acetone, 2-Butanone, Carbon disulfide and TICs that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC #: 39033C/D

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/27/2017	Z	1.4635	1.4635	1.5007	1.5007	3.5	3.5
	GCMS12		C	0.3881	0.3881	0.3539	0.3539	6.4	6.4
			CC	1.4627	1.4627	1.5003	1.5003	9.0	9.0
			JJJ	1.3075	1.3075	1.3811	1.3811	9.0	9.0

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033 D

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 917	6/28/17	Z (1st internal standard)	1.5067	~~0.2963~~ 1.431	1.431	~~16.3~~ 4.6	4.6
			C (2nd internal standard)	0.3539	0.2963	0.2963	16.3	16.3
			CC (3rd internal standard)	1.5003	1.220	1.220	18.7	18.7
			JJJ (4th internal standard)	1.3811	1.257	1.257	9.0	9.0
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033D1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	49.8	100	100	0
1,2-Dichloroethane-d4	↓	47.9	96	96	↓
Toluene-d8	↓	47.8	96	96	↓
Bromofluorobenzene	↓	50.8	102	102	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39033 D/

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460 - 446465

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	NA	17.0	NA	85	85				
Trichloroethene	↓	↓	17.1	↓	86	86				
Benzene	↓	↓	17.3	↓	86	86				
Toluene	↓	↓	17.9	↓	90	90				
Chlorobenzene	↓	↓	18.2	↓	91	91	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033D1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: O

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460 446465 CC

Conc. = $\frac{184970\ (50.0)}{343975\ (1.5003)}$

= 17.9 ng/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

LDC Report# 39033D2a

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135989-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-044b-GW	460-135989-4	Water	06/23/17
CFMW-064-GW	460-135989-6	Water	06/23/17
CFMW-DUP14-GW	460-135989-7	Water	06/23/17
CFMW-061-GW	460-135989-8	Water	06/23/17
CFMW-012-GW	460-135989-9	Water	06/23/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/25/17	Hexachlorocyclopentadiene	32.0	CFMW-064-GW CFMW-012-GW	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/29/17 (06:17)	2,2'-Oxybis(1-chloropropane) 2-Nitroaniline Acenaphthene 4-Nitrophenol 4-Nitroaniline	32.6 25.4 22.4 22.2 26.0	CFMW-044b-GW CFMW-DUP14-GW CFMW-061-GW	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
06/29/17 (06:17)	Indeno(1,2,3-cd)pyrene Dibenzo(a,h)anthracene Benzo(g,h,i)perylene	24.5 28.0 22.8	CFMW-044b-GW CFMW-DUP14-GW CFMW-061-GW	NA	-
06/28/17 (08:11)	2,6-Dinitrotoluene 3-Nitroaniline 4-Nitroaniline	23.6 33.7 27.4	CFMW-064-GW CFMW-012-GW	NA	-
06/28/17 (08:35)	Benzaldehyde	21.8	CFMW-064-GW CFMW-012-GW	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples CFMW-064-GW and CFMW-DUP14-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D, data were qualified as estimated in five samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-135989-1

Sample	Compound	Flag	A or P	Reason
CFMW-064-GW CFMW-012-GW	Hexachlorocyclopentadiene	UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-044b-GW CFMW-DUP14-GW CFMW-061-GW	2,2'-Oxybis(1-chloropropane) 2-Nitroaniline Acenaphthene 4-Nitrophenol 4-Nitroaniline	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-064-GW CFMW-012-GW	Benzaldehyde	UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-135989-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-135989-1

No Sample Data Qualified in this SDG

LDC #: 39033D2a

SDG #: 460-135989-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/14/17

Page: 1 of 1

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	ND	D = 2, 3
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-044b-GW	460-135989-4	Water	06/23/17
2	CFMW-064-GW D	460-135989-6	Water	06/23/17
3	CFMW-DUP14-GW D	460-135989-7	Water	06/23/17
4	CFMW-061-GW	460-135989-8	Water	06/23/17
5	CFMW-012-GW	460-135989-9	Water	06/23/17
6				
7				
8				
9				

Notes:

	MB 460-446207						

LDC #: 39033D2a

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT
2nd Reviewer: a

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?				✓
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 39033D2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o''-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.o-Toluidine

LDC #: 39033 D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤20 %D ?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Associated Samples	Qualifications
–	6/25/17 1719	ICV	X	32.0	2, 5	J-/UJ/A ND

ICVsvoa.wpd

LDC #: 39033&2a D

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/28/17	CCV	H	31.3		MB 460-446207	J-/UJ/A (all ND)
-	1737		J	29.2			
+			Q	24.6			J+ dit /A
-			BB	24.8			J-/UJ/A
-			GG	27.6			
-			II	27.0			
-			OO	22.1			
-			FFF	25.8			
-	6/29/17	CCV	H	32.6		~~#2~~ #~~1~~ 1,3,4	J-/UJ/A (ND)
-	0617		BB	25.4			
-			GG	22.4			
-			II	22.2			
-			OO	26.0			
+			JJJ	24.5			J+ dit /A
+			KKK	28.0			
+			LLL	22.8			
+	6/28/17	CCV	EE	23.6		#2, 5	J+ dit /A ND
+	08:11		FF	33.7			
+			OO	27.4			
-	6/28/17 0835	CCV	LLLL	21.8		#2, 5	J-/UJ/A ND

CONCAL.wpd

LDC #: 39033D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	6/16/2017	A	1.6281	1.6281	1.6550	1.6550	2.1	2.1
			S	1.0198	1.0198	0.9965	0.9965	13.5	13.5
			DD	1.7846	1.7846	1.7490	1.7490	9.4	9.4
			UU	1.0105	1.0105	1.0306	1.0306	14.2	14.2
			DDD	1.1289	1.1289	1.1369	1.1369	4.2	4.2
			III	1.0451	1.0451	1.0127	1.0127	6.2	6.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033 D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: Q

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS6	6/25/2017	A	1.8332	1.8332	1.8390	1.8390	3.5	3.5
			S	1.0092	1.0092	0.9151	0.9151	7.3	7.3
			DD	1.6831	1.6831	1.6210	1.6210	3.8	3.8
			UU	0.9349	0.9349	0.9013	0.9013	4.8	4.8
			DDD	0.9290	0.9290	0.9673	0.9673	6.2	6.2
			III	1.1785	1.1785	1.0842	1.0842	7.2	7.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033 ~~2~~ 2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0617	6/29/17	A	(1st IS)	1.6550	1.637	1.637	1.1	1.1
			S	(2nd IS)	0.9965	1.116	1.116	12.0	12.0
			DD	(3rd IS)	1.7490	1.105	1.105	22.4	22.4
			UU	(4th IS)	1.0306	1.097	1.097	6.4	6.4
			DDD	(5th IS)	1.1369	1.076	1.076	5.3	5.3
			III	(6th IS)	1.0127	1.000	1.00	1.2	1.2
2	CCV 0811	6/28/17	A	(1st IS)	1.8390	1.873	1.873	1.9	1.9
			S	(2nd IS)	0.9151	0.9390	0.9390	2.6	2.6
			DD	(3rd IS)	1.6210	1.849	1.849	14.1	14.1
			UU	(4th IS)	0.9013	0.9344	0.9344	3.7	3.7
			DDD	(5th IS)	0.9673	0.9491	0.9491	1.9	1.9
			III	(6th IS)	1.0842	1.130	1.130	4.2	4.2
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033D2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 5

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	6.92	69	69	0
2-Fluorobiphenyl		8.86	89	89	
Terphenyl-d14		8.91	89	89	
Phenol-d5		1.82	18	18	
2-Fluorophenol		3.21	32	32	
2,4,6-Tribromophenol		7.14	71	71	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39033829

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460-446207

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	24.8	NA	31	31				
N-Nitroso-di-n-propylamine			66.5		83	83				
4-Chloro-3-methylphenol			63.7		80	80				
Acenaphthene			73.1		91	91				
Pentachlorophenol	160		130		81	81				
Pyrene	80.0		71.9		90	90	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033D 2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

V_i = Volume of extract injected in microliters (ul)

V_t = Volume of the concentrated extract in microliters (ul)

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

2.0 = Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-446207 △

Conc. = $\frac{164414\ (8.0)\ (2)(1000)}{231184\ (1.8390)\ (250)}$

= 24.8 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135989-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB33-AQ	460-135989-1	Water	06/23/17
CFMW-044a-GW	460-135989-3	Water	06/23/17
CFMW-044b-GW	460-135989-4	Water	06/23/17
CFMW-045a-GW	460-135989-5	Water	06/23/17
CFMW-064-GW	460-135989-6	Water	06/23/17
CFMW-DUP14-GW	460-135989-7	Water	06/23/17
CFMW-061-GW	460-135989-8	Water	06/23/17
CFMW-012-GW	460-135989-9	Water	06/23/17
CFMW-044a-GWF	460-135989-3F	Water	06/23/17
CFMW-044b-GWF	460-135989-4F	Water	06/23/17
CFMW-045a-GWF	460-135989-5F	Water	06/23/17
CFMW-064-GWF	460-135989-6F	Water	06/23/17
CFMW-DUP14-GWF	460-135989-7F	Water	06/23/17
CFMW-061-GWF	460-135989-8F	Water	06/23/17
CFMW-012-GWF	460-135989-9F	Water	06/23/17
CFMW-DUP14-GWMS	460-135989-7MS	Water	06/23/17
CFMW-DUP14-GWDUP	460-135989-7DUP	Water	06/23/17
CFMW-044a-GWFMS	460-135989-3FMS	Water	06/23/17
CFMW-044a-GWFDUP	460-135989-3FDUP	Water	06/23/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB33-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB33-AQ	06/23/17	Calcium Sodium	442 ug/L 1510 ug/L	CFMW-044a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-DUP14-GWMS, no data were qualified for Barium, Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFMW-044a-GWFMS, no data were qualified for Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-064-GW and CFMW-DUP14-GW and samples CFMW-064-GWF and CFMW-DUP14-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-064-GW	CFMW-DUP14-GW			
Aluminum	18.2U	101	139 (≤30)	J (all detects) UJ (all non-detects)	A
Barium	345	344	0 (≤30)	-	-
Calcium	47800	47500	1 (≤30)	-	-
Iron	42.4U	140	107 (≤30)	J (all detects) UJ (all non-detects)	A
Magnesium	20000	19900	1 (≤30)	-	-
Manganese	2.5U	6.5	89 (≤30)	J (all detects) UJ (all non-detects)	A
Potassium	924	945	2 (≤30)	-	-
Sodium	11200	11100	1 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-064-GWF	CFMW-DUP14-GWF			
Barium	339	336	1 (≤30)	-	-
Calcium	48100	47700	1 (≤30)	-	-
Magnesium	17700	17500	1 (≤30)	-	-
Nickel	2.1	1.4U	40 (≤30)	J (all detects) UJ (all non-detects)	A
Potassium	905	908	0 (≤30)	-	-
Sodium	9880	9840	0 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to field duplicate RPD, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-135989-1

Sample	Analyte	Flag	A or P	Reason
CFMW-064-GW CFMW-DUP14-GW	Aluminum Iron Manganese	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)
CFMW-064-GWF CFMW-DUP14-GWF	Nickel	J (all detects) UJ (all non-detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-135989-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-135989-1

No Sample Data Qualified in this SDG

LDC #: 39033D4a

SDG #: 460-135989-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-24-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB=1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-135884-1) #16: Ba, Ca, Mg, Na-4x #18: Ca, Mg, Na-4x
VIII.	Duplicate sample analysis	A	DUP (↓)
IX.	Serial Dilution	A	SD: 6, 9
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D=5+6, D=12+13
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-EB33-AQ	460-135989-1	Water	06/23/17
2 1	CFMW-044a-GW	460-135989-3	Water	06/23/17
3 1	CFMW-044b-GW	460-135989-4	Water	06/23/17
4 1	CFMW-045a-GW	460-135989-5	Water	06/23/17
5 1	CFMW-064-GW	460-135989-6	Water	06/23/17
6 1	CFMW-DUP14-GW	460-135989-7	Water	06/23/17
7 1	CFMW-061-GW	460-135989-8	Water	06/23/17
8 1	CFMW-012-GW	460-135989-9	Water	06/23/17
9 2	CFMW-044a-GWF	460-135989-3F	Water	06/23/17
10 2	CFMW-044b-GWF	460-135989-4F	Water	06/23/17
11 2	CFMW-045a-GWF	460-135989-5F	Water	06/23/17
12 2	CFMW-064-GWF	460-135989-6F	Water	06/23/17
13 2	CFMW-DUP14-GWF	460-135989-7F	Water	06/23/17
14 2	CFMW-061-GWF	460-135989-8F	Water	06/23/17
15 2	CFMW-012-GWF	460-135989-9F	Water	06/23/17

LDC #: 39033D4a

SDG #: 460-135989-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-24-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16 1	CFMW-DUP14-GWMS	460-135989-7MS	Water	06/23/17
17 1	CFMW-DUP14-GWDUP	460-135989-7DUP	Water	06/23/17
18 2	CFMW-044a-GWFMS	460-135989-3FMS	Water	06/23/17
19 2	CFMW-044a-GWFDUP	460-135989-3FDUP	Water	06/23/17
20				
21				
22				
23 1	PBW1			
24 2	PBW2			

Notes:

LDC #: 39033D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39033D4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033D4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: ✓

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→15	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 16→19	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 39033D4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/23/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2 (>10x)

Analyte	Blank ID	Sample Identification											
	1	Action Level	No Qual's.										
Ca	442	4420											
Na	1510	15100											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 39033D4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: ✓

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	5	6		
Aluminum	18.2U	101	139	J/UJ/A (det & ND)
Barium	345	344	0	
Calcium	47800	47500	1	
Iron	42.4U	140	107	J/UJ/A (det & ND)
Magnesium	20000	19900	1	
Manganese	2.5U	6.5	89	J/UJ/A (det & ND)
Potassium	924	945	2	
Sodium	11200	11100	1	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033D4a.WPD

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	12	13		
Barium	339	336	1	
Calcium	48100	47700	1	
Magnesium	17700	17500	1	
Nickel	2.1	1.4U	40	J/UJ/A (det & ND)
Potassium	905	908	0	
Sodium	9880	9840	0	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033D4a.WPD

LDC #: 39033D4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1514 ICV	ICP/MS (Initial calibration)	Sb	40.791	40.0	102	102	Y
1417 ICV	CVAA (Initial calibration)	Hg	4.9222	5.00	98	98	↓
	ICP (Continuing calibration)						
1913 CCV	ICP/MS (Continuing calibration)	V	49.499	50.0	99	99	↓
1449 CCV	CVAA (Continuing calibration)	Hg	4.8526	5.00	97	97	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033D4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1526 ICSAB	ICP interference check	Ag	191.3 (µg/L)	200 (µg/L)	96	96	Y
1856 LCS	Laboratory control sample	As	47.30 (µg/L)	50.0 (µg/L)	95	95	↓
1901 16	Matrix spike	Co	(SSR-SR) 25.22 (µg/L)	25.0 (µg/L)	101	101	↓
1906 / 1903 17	Duplicate	Fe	140.5 (µg/L)	143.9 (µg/L)	2	2	↓
1906/ 1908 6	ICP serial dilution	Ba	344.0 (µg/L)	333.5 (µg/L)	3.1	3.0	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033D4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Na were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(752.531\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 1505.06\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Na	1510	1510	Y
2	2	Zn	12.9	12.9	
3	3	Pb	3.9	3.90	
4	4	Cr	3.2	3.15	
5	5	Mg	20000	20000	
6	6	Al	101	101	
7	7	Ca	51100	51100	
8	8	V	457	457	
9	9	Co	1.3	1.30	
10	10	Fe	1400	1400	
11	11	Mn	66.9	66.9	
12	12	Ni	2.1	2.12	
13	13	Ba	336	336	
14	14	K	690	690	
15	15	Cu	17.6	17.6	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-135989-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB33-AQ	460-135989-1	Water	06/23/17
CFMW-044a-GW	460-135989-3	Water	06/23/17
CFMW-044b-GW	460-135989-4	Water	06/23/17
CFMW-045a-GW	460-135989-5	Water	06/23/17
CFMW-064-GW	460-135989-6	Water	06/23/17
CFMW-DUP14-GW	460-135989-7	Water	06/23/17
CFMW-061-GW	460-135989-8	Water	06/23/17
CFMW-012-GW	460-135989-9	Water	06/23/17
CFMW-EB33-AQMS	460-135989-1MS	Water	06/23/17
CFMW-EB33-AQMSD	460-135989-1MSD	Water	06/23/17
CFMW-EB33-AQDUP	460-135989-1DUP	Water	06/23/17
CFMW-044a-GWMS	460-135989-3MS	Water	06/23/17
CFMW-044a-GWMSD	460-135989-3MSD	Water	06/23/17
CFMW-045a-GWMS	460-135989-5MS	Water	06/23/17
CFMW-045a-GWMSD	460-135989-5MSD	Water	06/23/17
CFMW-045a-GWDUP	460-135989-5DUP	Water	06/23/17
CFMW-061-GWMS	460-135989-8MS	Water	06/23/17
CFMW-061-GWMSD	460-135989-8MSD	Water	06/23/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB33-AQ was identified as a field blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB33-AQ	06/23/17	Chloride Nitrate/Nitrite as N	839 ug/L 109 ug/L	CFMW-044a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-044a-GW	Chloride Nitrate/Nitrite as N	3960 ug/L 810 ug/L	3960J+ ug/L 810J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-045a-GWMS/MSD (CFMW-044a-GW CFMW-044b-GW CFMW-045a-GW CFMW-064-GW CFMW-DUP14-GW CFMW-061-GW CFMW-012-GW)	Chloride	122 (90-110)	123 (90-110)	J+ (all detects)	A
CFMW-045a-GWMS/MSD (CFMW-044a-GW CFMW-044b-GW CFMW-045a-GW CFMW-064-GW CFMW-DUP14-GW CFMW-061-GW)	Fluoride	111 (90-110)	121 (90-110)	J+ (all detects)	A
CFMW-045a-GWMS/MSD (CFMW-044b-GW CFMW-045a-GW CFMW-064-GW CFMW-DUP14-GW CFMW-061-GW)	Sulfate	142 (90-110)	137 (90-110)	J+ (all detects)	A
CFMW-045a-GWMS/MSD (CFMW-044a-GW CFMW-044b-GW CFMW-045a-GW CFMW-064-GW CFMW-DUP14-GW CFMW-061-GW CFMW-012-GW)	Orthophosphate as P	56 (90-110)	61 (90-110)	UJ (all non-detects)	A
CFMW-014-GWMS/MSD (CFMW-044a-GW CFMW-012-GW)	Sulfate	122 (90-110)	124 (90-110)	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFMW-064-GW and CFMW-DUP14-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-064-GW	CFMW-DUP14-GW			
Alkalinity	238000 ug/L	230000 ug/L	3 (≤30)	-	-
Chloride	2060 ug/L	1880 ug/L	9 (≤30)	-	-
Total cyanide	60.1 ug/L	60.5 ug/L	1 (≤30)	-	-
Dissolved total cyanide	62.6 ug/L	61.5 ug/L	2 (≤30)	-	-
Fluoride	288 ug/L	302 ug/L	5 (≤30)	-	-
Dissolved fluoride	312 ug/L	307 ug/L	2 (≤30)	-	-
Hardness	216000 ug/L	210000 ug/L	3 (≤30)	-	-
Nitrate/Nitrite as N	590 ug/L	589 ug/L	0 (≤30)	-	-
Sulfate	5140 ug/L	5130 ug/L	0 (≤30)	-	-
Total dissolved solids	257 mg/L	250 mg/L	3 (≤30)	-	-
Total suspended solids	19.9 mg/L	14.5 mg/L	31 (≤30)	J (all detects)	A

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and field duplicate RPD, data were qualified as estimated in seven samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-135989-1

Sample	Analyte	Flag	A or P	Reason
CFMW-044a-GW CFMW-044b-GW CFMW-045a-GW CFMW-064-GW CFMW-DUP14-GW CFMW-061-GW CFMW-012-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-044a-GW CFMW-044b-GW CFMW-045a-GW CFMW-064-GW CFMW-DUP14-GW CFMW-061-GW	Fluoride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-044b-GW CFMW-045a-GW CFMW-064-GW CFMW-DUP14-GW CFMW-061-GW CFMW-044a-GW CFMW-012-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-044a-GW CFMW-044b-GW CFMW-045a-GW CFMW-064-GW CFMW-DUP14-GW CFMW-061-GW CFMW-012-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-064-GW CFMW-DUP14-GW	Total suspended solids	J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-135989-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-135989-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-044a-GW	Chloride Nitrate/Nitrite as N	3960J+ ug/L 810J+ ug/L	A

LDC #: 39033D6

SDG #: 460-135989-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-24-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)
MG Dissolved Free Cyanide, Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 1 (460-135884-1)
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-136178-1, 460-135818-1)
VII.	Duplicate sample analysis	A	DUP (↓ ↓)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	SW	D = 5+6
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB33-AQ	460-135989-1	Water	06/23/17
2	CFMW-044a-GW	460-135989-3	Water	06/23/17
3	CFMW-044b-GW	460-135989-4	Water	06/23/17
4	CFMW-045a-GW	460-135989-5	Water	06/23/17
5	CFMW-064-GW	460-135989-6	Water	06/23/17
6	CFMW-DUP14-GW	460-135989-7	Water	06/23/17
7	CFMW-061-GW	460-135989-8	Water	06/23/17
8	CFMW-012-GW	460-135989-9	Water	06/23/17
9	CFMW-EB33-AQMS	460-135989-1MS	Water	06/23/17
10	CFMW-EB33-AQMSD	460-135989-1MSD	Water	06/23/17
11	CFMW-EB33-AQDUP	460-135989-1DUP	Water	06/23/17
12	CFMW-044a-GWMS	460-135989-3MS	Water	06/23/17
13	CFMW-044a-GWMSD	460-135989-3MSD	Water	06/23/17
14	CFMW-045a-GWMS	460-135989-5MS	Water	06/23/17
15	CFMW-045a-GWMSD	460-135989-5MSD	Water	06/23/17

LDC #: 39033D6

SDG #: 460-135989-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-24-17

Reviewer: MG

2nd Reviewer: a

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MG Free CN, Dis. Free CN (9016)

	Client ID	Lab ID	Matrix	Date
16	CFMW-045a-GWDUP	460-135989-5DUP	Water	06/23/17
17	CFMW-061-GWMS	460-135989-8MS	Water	06/23/17
18	CFMW-061-GWMSD	460-135989-8MSD	Water	06/23/17
19				
20				
21				
22	PBW1			
23	PBW2			

Notes:

LDC #: 39033D6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39033D6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis CN
2→8	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS dis CN
2→8	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis Free CN
QC 9, 10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
11	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
12, 13	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
14, 15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
16	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
17, 18	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39033D6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/23/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
	1		2									
Cl	839	8390	3960J+									
NO3/NO2-N	109	1090	810J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39033D6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	14/15	Water	Cl	122 (90-110)	123 (90-110)		~~all~~ 2-8	J+ dets/A (all dets)
			F	111 ( )	121 ( )		2→7	(det in 2→7)
			SO4	142 ( )	137 ( )		~~1~~, 3→7	(det in 3→7)
			PO4-P	56 ( )	61 ( )		~~all~~ 2-8	J-/UJ/A (all N.D.)
2	CFMW-014-GW		Cl	130 ( )	121 ( )		none	No Qual.
	MS/MSD		SO4	122 ( )	124 ( )		2~~,1~~,8	J+ dets/A (all dets)

Comments:

LDC#: 39033D6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [signature]

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	5	6		
Alkalinity	238000	230000	3	
Chloride	2060	1880	9	
Total Cyanide	60.1	60.5	1	
Dissolved Total Cyanide	62.6	61.5	2	
Fluoride	288	302	5	
Dissolved Fluoride	312	307	2	
Hardness	216000	210000	3	
Nitrate/Nitrite as N	590	589	0	
Sulfate	5140	5130	0	
TDS (mg/L)	257	250	3	
TSS (mg/L)	19.9	14.5	31	J/UJ/A (all dets)

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39033D6.WPD

LDC #: 39033D6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of Free CN was recalculated. Calibration date: 6-29-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Abs. True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Free CN	Blank	0 (µg/L)	0.0	r^2=1.000	r^2= 1.000	Y
		Standard 1	2 ( )	0.006			
		Standard 2	5 ( )	0.013			
		Standard 3	10 ( )	0.030			
		Standard 4	25 ( )	0.058			
		Standard 5	50 ( )	0.116			
		Standard 6	150 ( )	0.337			
		Standard 7	–	–			
Calibration verification	NO_3/NO_2-N	1121 ICV	1.074 (mg/L)	1.00 (mg/L)	107	107	
Calibration verification	NH_3-N	1535 CCV	1.96 (mg/L)	2.00 (mg/L)	98	98	
Calibration verification	Total CN	1855 ICV	0.186 (mg/L)	0.200 (mg/L)	93	93	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCSSRM	Laboratory control sample	Alk	85602 (µg/L)	81200 (µg/L)	105.4	105.4	Y
14	Matrix spike sample	PO_4-P	(SSR-SR) 1411 (µg/L)	2500 (µg/L)	56	56	↓
16	Duplicate sample	TDS	336.0 (mg/L)	328.0 (mg/L)	2	2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39033D6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: O

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #1 Dissolved Total CN reported with a positive detect were recalculated and verified using the following equation:

Concentration =

$Y = mx + b$

where
$m = 0.0209$
$b = -0.00113$
$dil = 1x$

Recalculation:

$diss.\ CN = 0.0209\,(0.518) - 0.00113$
$= 0.00970\ mg/L$

then $(0.00970\ mg/L)(1000\ \mu g/mg) = 9.70\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	diss. total CN	9.7	9.7	Y
	↓	NO_3/NO_2-N	109	109	↓
2	2	diss. F	2350	2350	
3	3	NH_3-N	394	394	
4	4	TDS	336 (mg/L)	336 (mg/L)	
5	5	Alk	238000	238000	
6	6	TSS	14.5 (mg/L)	14.5 (mg/L)	
7	7	Hardness	204000	204000	
8	8	diss. Free CN	40.6	40.6	↓

Note: method 9056A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136063-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	460-136063-2	Water	06/26/17
CFMW-020-GW	460-136063-5	Water	06/26/17
CFMW-017-GW	460-136063-6	Water	06/26/17
CFMW-028-GW	460-136063-7	Water	06/26/17
CFMW-029-GW	460-136063-8	Water	06/26/17
CFMW-027-GW	460-136063-9	Water	06/26/17
CFMW-022-GW	460-136063-10	Water	06/26/17
CFMW-021-GW	460-136063-11	Water	06/26/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/01/17	Dichlorodifluoromethane Bromomethane	24.4 48.2	TRIP BLANK CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-021-GW	UJ (all non-detects) UJ (all non-detects)	A

Date	Compound	%D	Associated Samples	Flag	A or P
07/01/17	Chloroethane Methyl acetate 1,1,2,2-Tetrachloroethane	20.6 24.2 34.8	TRIP BLANK CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-021-GW	NA	-
07/02/17	Bromomethane Acetone Bromoform	32.7 24.0 31.0	CFMW-022-GW	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
07/02/17	Cyclohexane 1,1,2,2-Tetrachloroethane	21.4 20.5	CFMW-022-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D 460-447156 (TRIP BLANK CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-021-Gw)	1,1,2,2-Tetrachloroethane	128 (74-120)	-	NA	-
LCS/D 460-447156 (TRIP BLANK CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-021-Gw)	1,1,1-Trichloroethane Bromomethane	- -	74 (75-125) 62 (10-150)	UJ (all non-detects) UJ (all non-detects)	P
LCS/D 460-447207 (CFMW-022-GW)	1,1,2,2-Tetrachloroethane	126 (74-120)	126 (74-120)	NA	-

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
LCS/D 460-447156 (TRIP BLANK CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-021-Gw)	Bromomethane	34 (≤30)	UJ (all non-detects)	P

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD %R and RPD, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-136063-1

Sample	Compound	Flag	A or P	Reason
TRIP BLANK CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-021-GW	Dichlorodifluoromethane Bromomethane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-022-GW	Bromomethane Acetone Bromoform	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
TRIP BLANK CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-021-Gw	1,1,1-Trichloroethane Bromomethane	UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)
TRIP BLANK CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-021-Gw	Bromomethane	UJ (all non-detects)	P	Laboratory control samples (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-136063-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-136063-1

No Sample Data Qualified in this SDG

LDC #: 39033E1

SDG #: 460-136063-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/13/17

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 1
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1 1	TRIP BLANK	460-136063-2	Water	06/26/17
2 1	CFMW-020-GW	460-136063-5	Water	06/26/17
3 1	CFMW-017-GW	460-136063-6	Water	06/26/17
4 1	CFMW-028-GW	460-136063-7	Water	06/26/17
5 1	CFMW-029-GW	460-136063-8	Water	06/26/17
6 1	CFMW-027-GW	460-136063-9	Water	06/26/17
7 2	CFMW-022-GW	460-136063-10	Water	06/26/17
8 1	CFMW-021-GW	460-136063-11	Water	06/26/17
9				
10				
11 1	MB 460-447156			
12 2	MB 460-447207			
13				

LDC #: 39033E1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: R

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39033E 1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39033E 1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	7/01/17	JJ CCV	JJ	24.4		1→6, 8,	J-/UJ/A (all ND)
-	1042		B	48.2		MB 460-447156	↓
+			D	20.6			J+ all / A
+			QQQQ	24.2			
+			BB	34.8			
-	7/2/17	CCV	B	32.7		7,	J-/UJ/A (all ND)
-	0655		F	24.0		MB 460-447207	~~J+ all / A~~ J-/UJ/A
+			SSSS	21.4			J+ all / A
-			X	31.0			J-/UJ/A
+			BB	20.5			J+ all / A

CONCAL.wpd

LDC #: 39033E1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	lcs/D 460-447156	BB	128 (74-120)	( )	( )	1→6, 8,	J+ det /P ND
		N	( )	74 (75-125)	( )	MB 460-447156	J-/UJ/P
		B	( )	62 (10-150)	( )	↓	↓
		B	( )	( )	34 (30)	↓	J/UJ/P
			( )	( )	( )		
			( )	( )	( )		
	lcs ID 460-447207	BB	126 (74-120)	126 (74-120)	( )	7, MB 460-447207	J+ det /P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		

LDC #: 39033E1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/22/2017	Z	1.0172	1.0172	0.9568	0.9568	6.6	6.6
	GCMS8		C	0.3336	0.3336	0.3476	0.3476	8.7	8.7
			CC	1.4364	1.4364	1.5778	1.5778	13.5	13.5
			JJJ	1.2620	1.2620	1.3944	1.3944	11.8	11.8

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1042	7/1/17	Z (1st internal standard)	0.9568	0.9794	0.9794	2.4	2.4
			C (2nd internal standard)	0.3476	0.3952	0.3952	13.7	13.7
			CC (3rd internal standard)	1.5778	1.718	1.718	8.9	8.9
			JJJ (4th internal standard)	1.3944	1.442	1.442	3.4	3.4
2	CCV 0655	7/2/17	Z (1st internal standard)	0.9568	0.8376	0.8376	12.5	12.5
			C (2nd internal standard)	0.3476	0.3902	0.3902	12.2	12.2
			CC (3rd internal standard)	1.5778	1.557	1.557	1.3	1.3
			JJJ (4th internal standard)	1.3944	~~5.8~~ 1.313	1.313	5.8	5.8
3			(1st internal standard)		FT			
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 8

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	48.3	97	97	0
1,2-Dichloroethane-d4	↓	52.6	105	105	↓
Toluene-d8	↓	53.0	106	106	↓
Bromofluorobenzene	↓	39.4	79	79	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39033E1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS ID 460-447207

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	19.8	20.3	99	99	101	101	2	2
Trichloroethene	↓	↓	19.0	18.4	95	95	92	92	3	3
Benzene	↓	↓	19.8	20.7	99	99	103	103	5	5
Toluene	↓	↓	19.4	18.9	97	97	95	95	2	2
Chlorobenzene	↓	↓	19.5	19.3	97	97	96	96	1	1

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. LCS 460-447207 CC

Conc. = $\frac{(132680)(50)}{(216839)(1.5778)}$

= 19.4 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

LDC Report# 39033E2a

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 18, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136063-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-020-GW	460-136063-5	Water	06/26/17
CFMW-017-GW	460-136063-6	Water	06/26/17
CFMW-028-GW	460-136063-7	Water	06/26/17
CFMW-029-GW	460-136063-8	Water	06/26/17
CFMW-027-GW	460-136063-9	Water	06/26/17
CFMW-022-GW	460-136063-10	Water	06/26/17
CFMW-021-GW	460-136063-11	Water	06/26/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/25/17	Hexachlorocyclopentadiene	32.0	CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/29/17 (06:17)	2,2'-Oxybis(1-chloropropane) 2-Nitroaniline Acenaphthene 4-Nitrophenol 4-Nitroaniline	32.6 25.4 22.4 22.2 26.0	CFMW-021-GW	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A
06/29/17 (06:17)	Indeno(1,2,3-cd)pyrene Dibenzo(a,h)anthracene Benzo(g,h,i)perylene	24.5 28.0 22.8	CFMW-021-GW	NA	-
06/28/17 (08:11)	2,6-Dinitrotoluene 3-Nitroaniline 4-Nitroaniline	23.6 33.7 27.4	CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW	NA	-
06/28/17 (08:35)	Benzaldehyde	21.8	CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV and continuing calibration %D, data were qualified as estimated in seven samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-136063-1

Sample	Compound	Flag	A or P	Reason
CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW	Hexachlorocyclopentadiene	UJ (all non-detects)	A	Initial calibration verification (%D)
CFMW-021-GW	2,2'-Oxybis(1-chloropropane) 2-Nitroaniline Acenaphthene 4-Nitrophenol 4-Nitroaniline	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW	Benzaldehyde	UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-136063-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-136063-1

No Sample Data Qualified in this SDG

LDC #: 39033E2a

SDG #: 460-136063-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/14/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-020-GW	460-136063-5	Water	06/26/17
2	CFMW-017-GW	460-136063-6	Water	06/26/17
3	CFMW-028-GW	460-136063-7	Water	06/26/17
4	CFMW-029-GW	460-136063-8	Water	06/26/17
5	CFMW-027-GW	460-136063-9	Water	06/26/17
6	CFMW-022-GW	460-136063-10	Water	06/26/17
7	CFMW-021-GW	460-136063-11	Water	06/26/17
8				
9				

Notes:

	MB 460-446207						

LDC #: 39033E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 39033E2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FQ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o''-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.o-Toluidine

LDC #: 39633E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y (N) N/A Were all %D within the validation criteria of ≤20 %D ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
-	6/25/17 1719	ICV	X	32.0	1→6	J+/UJ/A ND

LDC #: 39033E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	6/28/17	CCV	H	31.3		MB 460-446207	J-/UJ/A (ND)
-	1737		J	29.2			
+			Q	24.6			J+ dit /A
-			BB	24.8			J-/UJ/A
-			GG	27.6			
-			II	27.0			
-			OO	22.1			
-			FFF	25.8			
-	6/29/17	CCV	H	32.6		~~#12~~ ~~#8~~ #7	J-/UJ/A (ND)
-	0617		BB	25.4			
-			GG	22.4			
-			II	22.2			
-			OO	26.0			
+			JJJ	24.5			J+ dit /A
+			KKK	28.0			
+			LLL	22.8			
+	6/28/17	CCV	EE	23.6		#1→6	J+ dit /A ND
+	08:11		FF	33.7			
+			OO	27.4			
-	6/28/17 0835	CCV	LLLL	21.8		#1→6	J-/UJ/A ND

CONCAL.wpd

LDC #: 39033E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS4	6/16/2017	A	1.6281	1.6281	1.6550	1.6550	2.1	2.1
			S	1.0198	1.0198	0.9965	0.9965	13.5	13.5
			DD	1.7846	1.7846	1.7490	1.7490	9.4	9.4
			UU	1.0105	1.0105	1.0306	1.0306	14.2	14.2
			DDD	1.1289	1.1289	1.1369	1.1369	4.2	4.2
			III	1.0451	1.0451	1.0127	1.0127	6.2	6.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS6	6/25/2017	A	1.8332	1.8332	1.8390	1.8390	3.5	3.5
			S	1.0092	1.0092	0.9151	0.9151	7.3	7.3
			DD	1.6831	1.6831	1.6210	1.6210	3.8	3.8
			UU	0.9349	0.9349	0.9013	0.9013	4.8	4.8
			DDD	0.9290	0.9290	0.9673	0.9673	6.2	6.2
			III	1.1785	1.1785	1.0842	1.0842	7.2	7.2

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033 E 2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)		Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0617	6/29/17	A	(1st IS)	1.6550	1.637	1.637	1.1	1.1
			S	(2nd IS)	0.9965	1.116	1.116	12.0	12.0
			DD	(3rd IS)	1.7490	1.105	1.105	22.4	22.4
			UU	(4th IS)	1.0306	1.097	1.097	6.4	6.4
			DDD	(5th IS)	1.1369	1.076	1.076	5.3	5.3
			III	(6th IS)	1.0127	1.000	1.00	1.2	1.2
2	CCV 0811	6/28/17	A	(1st IS)	1.8390	1.873	1.873	1.9	1.9
			S	(2nd IS)	0.9151	0.9390	0.9390	2.6	2.6
			DD	(3rd IS)	1.6210	1.849	1.849	14.1	14.1
			UU	(4th IS)	0.9013	0.9344	0.9344	3.7	3.7
			DDD	(5th IS)	0.9673	0.9491	0.9491	1.9	1.9
			III	(6th IS)	1.0842	1.130	1.130	4.2	4.2
3				(1st IS)					
				(2nd IS)					
				(3rd IS)					
				(4th IS)					
				(5th IS)					
				(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 7

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10	6.62	66	66	0
2-Fluorobiphenyl		7.78	78	78	
Terphenyl-d14		8.71	87	87	
Phenol-d5		2.10	21	21	
2-Fluorophenol		3.81	38	38	
2,4,6-Tribromophenol		10.6	106	106	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39033E2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS 460-446207

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
[redacted]	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	24.8	NA	31	31				
N-Nitroso-di-n-propylamine	↓	↓	66.5	↓	83	83				
4-Chloro-3-methylphenol	↓	↓	63.7	↓	80	80				
Acenaphthene	↓	↓	73.1	↓	91	91				
Pentachlorophenol	160	↓	130	↓	81	81				
Pyrene	80.0	↓	71.9	↓	90	90	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS 460-446207 △

$$\text{Conc.} = \frac{164414\ (8.0)\ (2)(1000)}{231184\ (1.8390)\ (250)}$$

=

24.8 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136063-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB34-AQ	460-136063-1	Water	06/26/17
CFMW-019a-GW	460-136063-3	Water	06/26/17
CFMW-016a-GW	460-136063-4	Water	06/26/17
CFMW-020-GW	460-136063-5	Water	06/26/17
CFMW-017-GW	460-136063-6	Water	06/26/17
CFMW-028-GW	460-136063-7	Water	06/26/17
CFMW-029-GW	460-136063-8	Water	06/26/17
CFMW-027-GW	460-136063-9	Water	06/26/17
CFMW-022-GW	460-136063-10	Water	06/26/17
CFMW-021-GW	460-136063-11	Water	06/26/17
CFMW-019a-GWF	460-136063-3F	Water	06/26/17
CFMW-016a-GWF	460-136063-4F	Water	06/26/17
CFMW-020-GWF	460-136063-5F	Water	06/26/17
CFMW-017-GWF	460-136063-6F	Water	06/26/17
CFMW-028-GWF	460-136063-7F	Water	06/26/17
CFMW-029-GWF	460-136063-8F	Water	06/26/17
CFMW-027-GWF	460-136063-9F	Water	06/26/17
CFMW-022-GWF	460-136063-10F	Water	06/26/17
CFMW-021-GWF	460-136063-11F	Water	06/26/17
CFMW-019a-GWMS	460-136063-3MS	Water	06/26/17
CFMW-019a-GWDUP	460-136063-3DUP	Water	06/26/17
CFMW-016a-GWMS	460-136063-4MS	Water	06/26/17
CFMW-016a-GWDUP	460-136063-4DUP	Water	06/26/17
CFMW-019a-GWFMS	460-136063-3FMS	Water	06/26/17
CFMW-019a-GWFDUP	460-136063-3FDUP	Water	06/26/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB34-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB34-AQ	06/26/17	Calcium Sodium	474 ug/L 680 ug/L	CFMW-019a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-016a-GWMS, no data were qualified for Calcium and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFMW-019a-GWFMS, no data were qualified for Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-136063-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-136063-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-136063-1

No Sample Data Qualified in this SDG

LDC #: 39033E4a
SDG #: 460-136063-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7-24-17
Page: 1 of 2
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB = 1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS #22: Ca, Na - 4x #24: Ca, Mg, Na - 4x
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 3, 11
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with F were analyzed as dissolved.

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-EB34-AQ	460-136063-1	Water	06/26/17
2 1	CFMW-019a-GW	460-136063-3	Water	06/26/17
3 1	CFMW-016a-GW	460-136063-4	Water	06/26/17
4 1	CFMW-020-GW	460-136063-5	Water	06/26/17
5 1	CFMW-017-GW	460-136063-6	Water	06/26/17
6 2	CFMW-028-GW	460-136063-7	Water	06/26/17
7 2	CFMW-029-GW	460-136063-8	Water	06/26/17
8 1	CFMW-027-GW	460-136063-9	Water	06/26/17
9 1	CFMW-022-GW	460-136063-10	Water	06/26/17
10 1	CFMW-021-GW	460-136063-11	Water	06/26/17
11 3	CFMW-019a-GWF	460-136063-3F	Water	06/26/17
12 3	CFMW-016a-GWF	460-136063-4F	Water	06/26/17
13 3	CFMW-020-GWF	460-136063-5F	Water	06/26/17
14 3	CFMW-017-GWF	460-136063-6F	Water	06/26/17
15 3	CFMW-028-GWF	460-136063-7F	Water	06/26/17

LDC #: 39033E4a

SDG #: 460-136063-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-24-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

		Client ID	Lab ID	Matrix	Date
16	3	CFMW-029-GWF	460-136063-8F	Water	06/26/17
17	3	CFMW-027-GWF	460-136063-9F	Water	06/26/17
18	3	CFMW-022-GWF	460-136063-10F	Water	06/26/17
19	3	CFMW-021-GWF	460-136063-11F	Water	06/26/17
20	1	CFMW-019a-GWMS	460-136063-3MS	Water	06/26/17
21	1	CFMW-019a-GWDUP	460-136063-3DUP	Water	06/26/17
22	1	CFMW-016a-GWMS	460-136063-4MS	Water	06/26/17
MG 23	1	CFMW-016a-GW~~MSD~~ DUP	460-136063-4~~MSD~~ DUP	Water	06/26/17
24	3	CFMW-019a-GWFMS	460-136063-3FMS	Water	06/26/17
25	3	CFMW-019a-GWFDUP	460-136063-3FDUP	Water	06/26/17
26					
27					
28	1	PBW1			
29	2	PBW2			
30	3	PBW3			

Notes:

LDC #: 39033E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39033E4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033E4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→19	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 20, 21	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
↓ 22→25	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 39033E4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/26/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2 (>10x)

Analyte	Blank ID	Sample Identification											
	1	Action Level	No Qual's.										
Ca	474	4740											
Na	680	6800											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39033E4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
2120 ICV	ICP/MS (Initial calibration)	Tl	7.99	8.00	100	100	Y
1425 ICV	CVAA (Initial calibration)	Hg	5.0226	5.00	100	100	↓
	ICP (Continuing calibration)						↓
0233 CCV	ICP/MS (Continuing calibration)	Fe	4682.04	5000	94	94	↓
1519 CCV	CVAA (Continuing calibration)	Hg	4.8857	5.00	98	98	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
2137 ICSAB	ICP interference check	Ni	181.9 (µg/L)	200 (µg/L)	91	91	Y
0203 LCS	Laboratory control sample	Se	46.62 (µg/L)	50.0 (µg/L)	93	93	↓
0209 22	Matrix spike	Pb	(SSR-SR) 23.82 (µg/L)	25.0 (µg/L)	95	95	↓
0216/0213 23	Duplicate	Sb	4.40 (µg/L)	4.24 (µg/L)	4	4	↓
0216/0219 3	ICP serial dilution	Ca	62792 (µg/L)	64020 (µg/L)	2.0	2.0	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Zn were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(3.74\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 7.48\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Zn	7.5	7.48	Y
2	2	Sb	1.0	1.02	
3	3	K	1080	1080	
4	4	Mn	12.9	12.9	
5	5	Ba	87.9	87.9	
6	6	Al	38.6	38.6	
7	7	Ca	34500	34500	
8	8	Ni	1.7	1.68	
9	9	Mg	11700	11700	
10	10	Co	1.7	1.66	
11	11	As	1.3	1.32	
12	12	Pb	1.3	1.26	
13	13	Na	3680	3680	
14	14	V	5.6	5.62	
15	15	Mg	15400	15400	
16	16	Fe	48.8	48.8	
17	17	Co	1.3	1.26	
18	18	Na	5310	5310	
19	19	K	881	881	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 25, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136063-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB34-AQ	460-136063-1	Water	06/26/17
CFMW-019a-GW	460-136063-3	Water	06/26/17
CFMW-016a-GW	460-136063-4	Water	06/26/17
CFMW-020-GW	460-136063-5	Water	06/26/17
CFMW-017-GW	460-136063-6	Water	06/26/17
CFMW-028-GW	460-136063-7	Water	06/26/17
CFMW-029-GW	460-136063-8	Water	06/26/17
CFMW-027-GW	460-136063-9	Water	06/26/17
CFMW-022-GW	460-136063-10	Water	06/26/17
CFMW-021-GW	460-136063-11	Water	06/26/17
CFMW-EB34-AQMS	460-136063-1MS	Water	06/26/17
CFMW-EB34-AQMSD	460-136063-1MSD	Water	06/26/17
CFMW-019a-GWMS	460-136063-3MS	Water	06/26/17
CFMW-019a-GWMSD	460-136063-3MSD	Water	06/26/17
CFMW-019a-GWDUP	460-136063-3DUP	Water	06/26/17
CFMW-016a-GWMS	460-136063-4MS	Water	06/26/17
CFMW-016a-GWMSD	460-136063-4MSD	Water	06/26/17
CFMW-021-GWMS	460-136063-11MS	Water	06/26/17
CFMW-021-GWMSD	460-136063-11MSD	Water	06/26/17
CFMW-021-GWDUP	460-136063-11DUP	Water	06/26/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Cyanide by EPA Method 335.4
Dissolved Organic Carbon by EPA SW 846 Method 9060A
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB34-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB34-AQ	06/26/17	Chloride	172 ug/L	CFMW-019a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-019a-GW	Chloride	917 ug/L	917J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-021-GWMS/MSD (CFMW-019a-GW CFMW-016a-GW CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW CFMW-021-GW)	Chloride	119 (90-110)	121 (90-110)	J+ (all detects)	A
CFMW-021-GWMS/MSD (CFMW-019a-GW CFMW-016a-GW CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-022-GW CFMW-021-GW)	Fluoride Sulfate	121 (90-110) 143 (90-110)	119 (90-110) 143 (90-110)	J+ (all detects) J+ (all detects)	A
CFMW-021-GWMS/MSD (CFMW-019a-GW CFMW-016a-GW CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW CFMW-021-GW)	Orthophosphate as P	82 (90-110)	83 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in nine samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-136063-1

Sample	Analyte	Flag	A or P	Reason
CFMW-019a-GW CFMW-016a-GW CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW CFMW-021-GW	Chloride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-019a-GW CFMW-016a-GW CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-022-GW CFMW-021-GW	Fluoride Sulfate	J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-019a-GW CFMW-016a-GW CFMW-020-GW CFMW-017-GW CFMW-028-GW CFMW-029-GW CFMW-027-GW CFMW-022-GW CFMW-021-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-136063-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-136063-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-019a-GW	Chloride	917J+ ug/L	A

LDC #: 39033E6

SDG #: 460-136063-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-25-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer:

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide ~~(EPA Metyhod 335.4)~~, Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MG Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-135989-1, 460-136263-1
VII.	Duplicate sample analysis MG	~~SW~~ A	DUP
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB34-AQ	460-136063-1	Water	06/26/17
2	CFMW-019a-GW	460-136063-3	Water	06/26/17
3	CFMW-016a-GW	460-136063-4	Water	06/26/17
4	CFMW-020-GW	460-136063-5	Water	06/26/17
5	CFMW-017-GW	460-136063-6	Water	06/26/17
6	CFMW-028-GW	460-136063-7	Water	06/26/17
7	CFMW-029-GW	460-136063-8	Water	06/26/17
8	CFMW-027-GW	460-136063-9	Water	06/26/17
9	CFMW-022-GW	460-136063-10	Water	06/26/17
10	CFMW-021-GW	460-136063-11	Water	06/26/17
11	CFMW-EB34-AQMS	460-136063-1MS	Water	06/26/17
12	CFMW-EB34-AQMSD	460-136063-1MSD	Water	06/26/17
13	CFMW-019a-GWMS	460-136063-3MS	Water	06/26/17
14	CFMW-019a-GWMSD	460-136063-3MSD	Water	06/26/17
15	CFMW-019a-GWDUP	460-136063-3DUP	Water	06/26/17

LDC #: 39033E6

SDG #: 460-136063-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-25-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Metyhod 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

OMY Free CN, Diss. Free CN (9016)

	Client ID	Lab ID	Matrix	Date
16	CFMW-016a-GWMS	460-136063-4MS	Water	06/26/17
17	CFMW-016a-GWMSD	460-136063-4MSD	Water	06/26/17
18	CFMW-021-GWMS	460-136063-11MS	Water	06/26/17
19	CFMW-021-GWMSD	460-136063-11MSD	Water	06/26/17
20	CFMW-021-GWDUP	460-136063-11DUP	Water	06/26/17
21				
22				
23				
24	PBW1			
25	PBW2			

Notes:

LDC #: 39033E6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39033E6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	~~✓~~	✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39033E6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: O

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2→10	↓	pH TDS Cl F NO_3/NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS dis CN
3→10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis. Free CN
QC 11,12	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
13,14	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis CN
15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
16,17	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis Free CN
18→20	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39033E6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/26/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
	1		2									
Cl	172	1720	917J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39033E6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	18/19	water	Cl	119 (90-110)	121 (90-110)		~~all~~ 2-10	J+ dets/A (all dets)
	↓	↓	F	121 ( )	119 ( )		2→7, 9, 10	↓ (det in 2→7,9,10)
			SO4	143 ( )	143 ( )		↓	↓ (↓)
			diss. Cl	112 ( )			none	No Qual.
	↓	↓	PO4-P	82 (↓)	83 (↓)		~~all~~ 2-10	J-/UJ/A (all N.D.)

Comments:

MSD.6

LDC #: 39033E6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of F was recalculated. Calibration date: 6-21-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	F	Blank	-	-	$r^2 = 0.9989$	$r^2 = 0.9990$	Y
		Standard 1	0.08 (mg/L)	1119			
		Standard 2	0.20 ( )	3646			
		Standard 3	1.00 ( )	19325			
		Standard 4	2.00 ( )	44135			
		Standard 5	3.00 ( )	63397			
		Standard 6	4.00 ( )	87383			
		Standard 7	-	-			
Calibration verification	NH_3-N	1504 CCV1	1.98 (mg/L)	2.00 (mg/L)	99	99	
Calibration verification	NO_3/NO_2-N	1139 CCV1	1.067 (mg/L)	1.00 (mg/L)	107	107	
Calibration verification	Total CN	0746 ICV	0.199 (mg/L)	0.200 (mg/L)	100	100	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39033E6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	SO_4	7185 (µg/L)	7500 (µg/L)	96	96	Y
16	Matrix spike sample	Free CN	(SSR-SR) 40.72 (µg/L)	50.0 (µg/L)	81	81	↓
15	Duplicate sample	Alk	181057 (µg/L)	182162 (µg/L)	0.6	0.6	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39033E6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer:

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #6, Free CN reported with a positive detect were recalculated and verified using the following equation:

Concentration =

$Y = mx + b$
where
$m = 458.4$
$b = -0.918$
$V_i = 3.0$ ml
$V_f = 1.3$ ml

Recalculation:

$$\frac{[458.4(0.056) - 0.918] \times (1.3\ ml)}{3.0\ ml} = 10.726\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cl	172	172	Y
2	2	Alk	181000	181000	
3	3	NH3-N	109	108	
4	4	TDS	220 (mg/L)	220 (mg/L)	
5	5	diss. Total CN	93.6	93.4	
6	6	Free CN	10.7	10.7	
7	7	Hardness	136000	136000	
8	8	NO3/NO2-N	3560	3560	
9	9	diss. F	607	607	
10	10	TSS	1.0 (mg/L)	1.0 (mg/L)	

Note: method 9056A is N.D. for all samples

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Roux Associates, INC
209 Shafter Street
Islandia, New York 11749
Attn: Mr. Michael Ritorto

August 1, 2017

SUBJECT: Columbia Falls Aluminum Company, Columbia Falls, Montana, Data Validation

Dear Mr. Ritorto

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on July 12, 2017. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #39068:

SDG #	Fraction
460-136178-1, 460-136263-1 460-136351-1	Volatiles, Semivolatiles, Metals, Wet Chemistry

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana, November 2015
- USEPA, National Functional Guidelines for Superfund Organic Methods Data Review, August 2014
- USEPA, National Functional Guidelines for Inorganic Superfund Data Review, August 2014
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Chemist

EDD

LDC #39068 (Roux Associates, Inc.- Islandia, NY / Columbia Falls Aluminum Company, Columbia Falls, Montana)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6020A /7470A)		D.Metals (6020A /7470A)		Alk. (2320B)		NH_3-N (350.1)		Cl,F SO_4 (300.0)		Diss. F (300.0)		Total CN- (335.4)		Free CN- (9016)		D.Total CN- (335.4)		D.Free CN- (9016)		Hard. (2340C)		NO_3/ NO_2-N (353.2)		O-PO_4 (9056A)		TDS (2540C)		TSS (2540D)	
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	460-136178-1	07/12/17	08/02/17	8	0	7	0	10	0	9	0	10	0	10	0	10	0	9	0	10	0	9	0	9	0	9	0	10	0	10	0	10	0	9	0	9	0
B	460-136263-1	07/12/17	08/02/17	6	0	5	0	10	0	9	0	10	0	10	0	10	0	9	0	10	0	5	0	9	0	5	0	10	0	10	0	10	0	9	0	9	0
C	460-136351-1	07/12/17	08/02/17	3	0	2	0	4	0	3	0	4	0	4	0	4	0	3	0	4	0	2	0	3	0	2	0	4	0	4	0	4	0	4	0	4	0
Total	J/CR			17	0	14	0	24	0	21	0	24	0	24	0	24	0	21	0	24	0	16	0	21	0	16	0	24	0	24	0	24	0	22	0	22	362

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 26, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136178-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
Trip Blank	460-136178-2	Water	06/27/17
CFMW-023-GW	460-136178-3	Water	06/27/17
CFMW-038-GW	460-136178-6	Water	06/27/17
CFMW-003-GW	460-136178-7	Water	06/27/17
CFMW-010-GW	460-136178-8	Water	06/27/17
CFMW-002-GW	460-136178-9	Water	06/27/17
CFMW-015-GW	460-136178-10	Water	06/27/17
CFMW-014-GW	460-136178-11	Water	06/27/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/20/17	Dichlorodifluoromethane Vinyl chloride Chloromethane Chloroethane Trichlorofluoromethane	30.8 31.6 28.4 32.3 41.5	All samples in SDG 460-136178-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/04/17 (08:11)	Chloroethane Trichlorofluoromethane	39.0 25.4	Trip Blank CFMW-023-GW CFMW-038-GW CFMW-003-GW CFMW-010-GW CFMW-002-GW CFMW-015-GW	NA	-
07/04/17 (20:11)	Chloromethane Chloroethane Methyl cyclohexane Tetrachloroethene	21.9 53.8 23.1 21.4	CFMW-014-GW	NA	-

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D460-447531 (Trip Blank CFMW-023-GW CFMW-038-GW CFMW-003-GW CFMW-010-GW CFMW-002-GW CFMW-015-GW)	Chloroethane	161 (52-150)	-	NA	-
LCS/D460-447547 (CFMW-014-GW)	Chloroethane	152 (52-150)	158 (52-150)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

LDC #: 39068A1
SDG #: 460-136178-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7/24/17
Page: 1 of 1
Reviewer:
2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 1
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	Trip Blank	460-136178-2	Water	06/27/17
2	CFMW-023-GW	460-136178-3	Water	06/27/17
3	CFMW-038-GW	460-136178-6	Water	06/27/17
4	CFMW-003-GW	460-136178-7	Water	06/27/17
5	CFMW-010-GW	460-136178-8	Water	06/27/17
6	CFMW-002-GW	460-136178-9	Water	06/27/17
7	CFMW-015-GW	460-136178-10	Water	06/27/17
8	CFMW-014-GW	460-136178-11	Water	06/27/17
9				
10				

Notes:

1	MB 460-447531						
2	MB 460-447547						

LDC #: 39068A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39068A 1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39068A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples F7	Qualifications
+	6/20/17	ICV-5	JJ	30.8	~~1-27, MB 460-447531~~	J+ all /A all ND
+	0544		C	31.6	All	
+			A	28.4		
+			D	32.3		
+			KK	41.5		

LDC #: 39068A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
+	7/4/17	E73292-CCV	D	39.0		1→7, MB 460-447531	J+ dit/A ND
+	0811		KK	25.4		↓	↓
+	7/4/17	E73320-CCV	A	21.9		8, MB 460-447547	J+ dit/A ND
+	2011		D	53.8		↓	↓
+			TTTT	23.1			
+			AA	21.4			

CONCAL.wpd

LDC #: 39068A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/D 460-	D	161 (52-150)	( )	( )	1→7,	J+ dit /P ND
	447531		( )	( )	( )	MB 460-447531	
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
	LCS/D 460-	D	152 (52-150)	158 (52-150)	( )	8, MB 460-447547	J+ dit /P ND
	447547		( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 39068 A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/19/2017	F	0.2017	0.2017	0.2117	0.2117	8.9	8.9
	GCMS5		C	0.2348	0.2348	0.2930	0.2930	11.4	11.4
			CC	1.4151	1.4151	1.4775	1.4775	10.4	10.4
			JJJ	1.2599	1.2599	1.2772	1.2772	6.4	6.4

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	E73292 CCV 0811	7/4/17	F (1st internal standard)	0.2117	0.2168	0.2168	2.4	2.4
			C (2nd internal standard)	0.2930	0.3173	0.3173	8.3	8.3
			CC (3rd internal standard)	1.4775	1.610	1.610	8.9	8.9
			JJJ (4th internal standard)	1.2772	1.384	1.384	8.3	8.3
2	E73320 CCV 2011	7/4/17	F (1st internal standard)		0.2159	0.2159	2.0	2.0
			C (2nd internal standard)		0.3517	0.3517	20	20
			CC (3rd internal standard)		1.657	1.657	12.2	12.2
			JJJ (4th internal standard)		1.457	1.457	14.1	14.1
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	48.7	97	97	0
1,2-Dichloroethane-d4	↓	46.7	93	93	↓
Toluene-d8	↓	47.4	95	95	↓
Bromofluorobenzene	↓	52.1	104	104	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39068A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs ID 460-447531

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	22.1	20.3	110	110	102	102	8	8
Trichloroethene	↓	↓	22.8	22.0	114	114	110	110	4	4
Benzene	↓	↓	22.6	22.2	113	113	111	111	2	2
Toluene	↓	↓	22.2	21.6	111	111	108	108	3	3
Chlorobenzene	↓	↓	22.7	21.9	114	114	109	109	4	4

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 4 , AA

Conc. = $\frac{(1447)\ (50)}{(533780)\ (0.3079}$

= 0.44 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

LDC Report# 39068A2a

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 27, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136178-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-023-GW	460-136178-3	Water	06/27/17
CFMW-038-GW	460-136178-6	Water	06/27/17
CFMW-003-GW	460-136178-7	Water	06/27/17
CFMW-010-GW	460-136178-8	Water	06/27/17
CFMW-002-GW	460-136178-9	Water	06/27/17
CFMW-015-GW	460-136178-10	Water	06/27/17
CFMW-014-GW	460-136178-11	Water	06/27/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/30/17	Hexachlorocyclopentadiene	21.4	All samples in SDG 460-136178-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D460-446890	Hexachlorocyclopentadiene	104 (18-99)	108 (18-99)	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

LDC #: 39068A2a
SDG #: 460-136178-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7/24/17
Page: 1 of 1
Reviewer: P
2nd Reviewer: G

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r^2 ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS 10
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-023-GW	460-136178-3	Water	06/27/17
2	CFMW-038-GW	460-136178-6	Water	06/27/17
3	CFMW-003-GW	460-136178-7	Water	06/27/17
4	CFMW-010-GW	460-136178-8	Water	06/27/17
5	CFMW-002-GW	460-136178-9	Water	06/27/17
6	CFMW-015-GW	460-136178-10	Water	06/27/17
7	CFMW-014-GW	460-136178-11	Water	06/27/17
8				
9				

Notes:

	MB 460-446890						

LDC #: 39068A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: O

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.			✓	
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 39068 A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FQ
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o''-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.o-Toluidine

LDC #: 39068 A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	6/30/17	CCV	X	21.4		All	J+ dil /A ND
	2238						

CONCAL.wpd

LDC #: 39068A2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: ✓ GC ___ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a laboratory control samples (LCS) and laboratory control sample duplicate (LCSD) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent differences (RPD) within the QC limits?

Level IV/D Only

Y N N/A Was an LCS analyzed every 20 samples for each matrix or whenever a sample extraction was performed?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	*		( )	( )	( )		
	LCS/D 460-446890	X	104 (18-99)	108 (18-99)	( )	all	J+ all /P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 39068A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS14	6/15/2017	A	1.7719	1.7719	1.6606	1.6606	7.1	7.1
			S	1.0300	1.0300	1.0145	1.0145	2.9	2.9
			DD	1.9765	1.9765	1.9297	1.9297	2.0	2.0
			UU	1.1229	1.1229	1.1089	1.1089	2.8	2.8
			DDD	1.1357	1.1357	1.1935	1.1935	3.3	3.3
			III	1.1363	1.1363	1.0470	1.0470	12.3	12.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 2238	6/30/17	A (1st IS)	1.6606	1.751	1.751	5.4	5.4
			S (2nd IS)	1.0145	1.040	1.040	2.5	2.5
			DD (3rd IS)	1.9297	1.975	1.975	2.4	2.4
			UU (4th IS)	1.1089	1.130	1.130	1.9	1.9
			DDD (5th IS)	1.1935	1.133	1.133	5.1	5.1
			III (6th IS)	1.0470	1.156	1.156	10.4	10.4
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 7

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.40	94	94	0
2-Fluorobiphenyl		9.53	95	95	
Terphenyl-d14		10.1	101	101	
Phenol-d5		2.97	30	30	
2-Fluorophenol		4.61	46	46	
2,4,6-Tribromophenol		11.2	112	112	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39068A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460-446890

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	26.6 ~~68.8~~	23.6	~~86~~ 33	33	29	29	12	12
N-Nitroso-di-n-propylamine	↓	↓	80.0	80.5	100	100	101	101	1	1
4-Chloro-3-methylphenol			68.8	67.5	86	86	84	84	2	2
Acenaphthene			76.0	77.1	95	95	96	96	1	1
Pentachlorophenol	160	160	163	177	102	102	111	111	8	8
Pyrene	80	80	75.3	75.4	94	94	94	94	0	0

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068A 2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: G

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS/D 460-446890 A

Conc. = $\frac{128229\ (8)\ (2)\ (1000)}{185987\ (1.6606)\ (250)}$

=

26.6 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 27, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136178-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB35-AQ	460-136178-1	Water	06/27/17
CFMW-023-GW	460-136178-3	Water	06/27/17
CFMW-028a-GW	460-136178-4	Water	06/27/17
CFMW-032a-GW	460-136178-5	Water	06/27/17
CFMW-038-GW	460-136178-6	Water	06/27/17
CFMW-003-GW	460-136178-7	Water	06/27/17
CFMW-010-GW	460-136178-8	Water	06/27/17
CFMW-002-GW	460-136178-9	Water	06/27/17
CFMW-015-GW	460-136178-10	Water	06/27/17
CFMW-014-GW	460-136178-11	Water	06/27/17
CFMW-023-GWF	460-136178-3F	Water	06/27/17
CFMW-028a-GWF	460-136178-4F	Water	06/27/17
CFMW-032a-GWF	460-136178-5F	Water	06/27/17
CFMW-038-GWF	460-136178-6F	Water	06/27/17
CFMW-003-GWF	460-136178-7F	Water	06/27/17
CFMW-010-GWF	460-136178-8F	Water	06/27/17
CFMW-002-GWF	460-136178-9F	Water	06/27/17
CFMW-015-GWF	460-136178-10F	Water	06/27/17
CFMW-014-GWF	460-136178-11F	Water	06/27/17
CFMW-023-GWFMS	460-136178-3FMS	Water	06/27/17
CFMW-023-GWFDUP	460-136178-3FDUP	Water	06/27/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB35-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB35-AQ	06/27/17	Calcium Sodium	324 ug/L 718 ug/L	CFMW-023-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-023-GW	Sodium	3560 ug/L	3560J+ ug/L

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-023-GWFMS, no data were qualified for Barium, Calcium, and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-136178-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-023-GW	Sodium	3560J+ ug/L	A

LDC #: 39068A4a

SDG #: 460-136178-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-25-17

Reviewer: MG

2nd Reviewer: C

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB = 1 Mg
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-136263-1) #20: Ba, Ca, Mg - 4x
VIII.	Duplicate sample analysis	A	DUP (↓)
IX.	Serial Dilution	A	SD: 11
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with "F" were analyzed as dissolved

	Client ID	Lab ID	Matrix	Date
1 1	CFMW-EB35-AQ	460-136178-1	Water	06/27/17
2 1	CFMW-023-GW	460-136178-3	Water	06/27/17
3 1	CFMW-028a-GW	460-136178-4	Water	06/27/17
4 1	CFMW-032a-GW	460-136178-5	Water	06/27/17
5 1	CFMW-038-GW	460-136178-6	Water	06/27/17
6 1	CFMW-003-GW	460-136178-7	Water	06/27/17
7 1	CFMW-010-GW	460-136178-8	Water	06/27/17
8 1	CFMW-002-GW	460-136178-9	Water	06/27/17
9 1	CFMW-015-GW	460-136178-10	Water	06/27/17
10 1	CFMW-014-GW	460-136178-11	Water	06/27/17
11 2	CFMW-023-GWF	460-136178-3F	Water	06/27/17
12 2	CFMW-028a-GWF	460-136178-4F	Water	06/27/17
13 2	CFMW-032a-GWF	460-136178-5F	Water	06/27/17
14 2	CFMW-038-GWF	460-136178-6F	Water	06/27/17
15 2	CFMW-003-GWF	460-136178-7F	Water	06/27/17

LDC #: 39068A4a

SDG #: 460-136178-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-25-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16 2	CFMW-010-GWF	460-136178-8F	Water	06/27/17
17 2	CFMW-002-GWF	460-136178-9F	Water	06/27/17
18 2	CFMW-015-GWF	460-136178-10F	Water	06/27/17
19 2	CFMW-014-GWF	460-136178-11F	Water	06/27/17
20 2	CFMW-023-GWFMS	460-136178-3FMS	Water	06/27/17
21 2	CFMW-023-GWFDUP	460-136178-3FDUP	Water	06/27/17
22				
23				
24				
25 1	PBW1			
26 2	PBW2			

Notes:

LDC #: 39068A4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: a

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39068A4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: G

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 19	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 20, 21	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 39068A4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/27/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Sample Identification										
	1	Action Level	2									
Ca	324	3240										
Na	718	7180	3560J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39068A4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: Q

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
0317 ICV	ICP/MS (Initial calibration)	Pb	41.57	40.0	104	104	Y
1415 ICV	CVAA (Initial calibration)	Hg	4.7764	5.00	96	96	↓
	ICP (Continuing calibration)						
0713 CCV	ICP/MS (Continuing calibration)	Mn	491.62	500	98	98	↓
1729 CCV	CVAA (Continuing calibration)	Hg	4.5411	5.00	91	91	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068A4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
0334 ICSAB	ICP interference check	Cr	196.9 (µg/L)	200 (µg/L)	98	98	Y
0643 LCS	Laboratory control sample	Cu	9.60 (µg/L)	10.0 (µg/L)	96	96	↓
0647 20	Matrix spike	As	(SSR-SR) 19.88 (µg/L)	20.0 (µg/L)	99	99	↓
0653 / 0650 21	Duplicate	Ba	170.4 (µg/L)	169.4 (µg/L)	0.6	0.6	↓
0653 / 0700 11	ICP serial dilution	Mg	14182 (µg/L)	14401 (µg/L)	1.5	1.5	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068A4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(161.770\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 323.54\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Ca	324	324	Y
2	2	Zn	10.2	10.2	
3	3	Pb	1.3	1.28	
4	4	Cr	7.4	7.43	
5	5	Al	27.1	27.1	
6	6	Ni	3.3	3.26	
7	7	As	2.9	2.87	
8	8	Fe	617	617	
9	9	Sb	0.82	0.82	
10	10	Na	79100	79100	
11	11	K	475	475	
12	12	V	2.7	2.72	
13	13	Cu	3.1	3.08	
14	14	Ba	231	231	
15	15	Se	9.1	9.14	
16	16	Co	2.2	2.22	
17	17	Mg	9180	9180	
18	18	Mn	4.3	4.26	
19	19	As	2.1	2.08	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 27, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136178-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB35-AQ	460-136178-1	Water	06/27/17
CFMW-023-GW	460-136178-3	Water	06/27/17
CFMW-028a-GW	460-136178-4	Water	06/27/17
CFMW-032a-GW	460-136178-5	Water	06/27/17
CFMW-038-GW	460-136178-6	Water	06/27/17
CFMW-003-GW	460-136178-7	Water	06/27/17
CFMW-010-GW	460-136178-8	Water	06/27/17
CFMW-002-GW	460-136178-9	Water	06/27/17
CFMW-015-GW	460-136178-10	Water	06/27/17
CFMW-014-GW	460-136178-11	Water	06/27/17
CFMW-023-GWMS	460-136178-3MS	Water	06/27/17
CFMW-023-GWMSD	460-136178-3MSD	Water	06/27/17
CFMW-032a-GWMS	460-136178-5MS	Water	06/27/17
CFMW-032a-GWMSD	460-136178-5MSD	Water	06/27/17
CFMW-028a-GWMS	460-136178-4MS	Water	06/27/17
CFMW-028a-GWMSD	460-136178-4MSD	Water	06/27/17
CFMW-028a-GWDUP	460-136178-4DUP	Water	06/27/17
CFMW-014-GWMS	460-136178-11MS	Water	06/27/17
CFMW-014-GWMSD	460-136178-11MSD	Water	06/27/17
CFMW-014-GWDUP	460-136178-11DUP	Water	06/27/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB35-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB35-AQ	06/27/17	Chloride	162 ug/L	CFMW-023-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-023-GW	Chloride	372 ug/L	372J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-014-GWMS/MSD (CFMW-023-GW CFMW-032a-GW CFMW-038-GW CFMW-010-GW CFMW-002-GW CFMW-015-GW CFMW-014-GW)	Chloride Sulfate	130 (90-110) 122 (90-110)	121 (90-110) 124 (90-110)	J+ (all detects)	A
CFMW-014-GWMS/MSD (CFMW-023-GW CFMW-028a-GW CFMW-032a-GW CFMW-038-GW CFMW-003-GW CFMW-010-GW CFMW-002-GW CFMW-015-GW CFMW-014-GW)	Orthophosphate as P	61 (90-110)	66 (90-110)	J- (all detects) UJ (all non-detects)	A
CFMW-011a-GWMS/MSD (CFMW-023-GW CFMW-028a-GW CFMW-032a-GW CFMW-038-GW CFMW-010-GW CFMW-002-GW CFMW-015-GW CFMW-014-GW)	Dissolved fluoride	115 (90-110)	115 (90-110)	J+ (all detects)	A
CFMW-011a-GWMS/MSD (CFMW-003-GW)	Dissolved fluoride	115 (90-110)	115 (90-110)	NA	-
CFMW-028a-GWMS/MSD (CFMW-028a-GW CFMW-003-GW)	Sulfate	85 (90-110)	78 (90-110)	J- (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in nine samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-136178-1

Sample	Analyte	Flag	A or P	Reason
CFMW-023-GW CFMW-032a-GW CFMW-038-GW CFMW-010-GW CFMW-002-GW CFMW-015-GW CFMW-014-GW	Chloride Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-023-GW CFMW-028a-GW CFMW-032a-GW CFMW-038-GW CFMW-003-GW CFMW-010-GW CFMW-002-GW CFMW-015-GW CFMW-014-GW	Orthophosphate as P	J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-023-GW CFMW-028a-GW CFMW-032a-GW CFMW-038-GW CFMW-010-GW CFMW-002-GW CFMW-015-GW CFMW-014-GW	Dissolved fluoride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-028a-GW CFMW-003-GW	Sulfate	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-136178-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-136178-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-023-GW	Chloride	372J+ ug/L	A

LDC #: 39068A6

SDG #: 460-136178-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-25-17

Page: 1 of 2

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Method 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MG Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB = 1
VI.	Matrix Spike/Matrix Spike Duplicates MG	~~A~~ SW	MS/MSD (SDG: 460-136351-1, 460-136263-1, 460-136063-1)
VII.	Duplicate sample analysis	A	DUP (↓ ↓)
VIII.	Laboratory control samples	A	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB35-AQ	460-136178-1	Water	06/27/17
2	CFMW-023-GW	460-136178-3	Water	06/27/17
3	CFMW-028a-GW	460-136178-4	Water	06/27/17
4	CFMW-032a-GW	460-136178-5	Water	06/27/17
5	CFMW-038-GW	460-136178-6	Water	06/27/17
6	CFMW-003-GW	460-136178-7	Water	06/27/17
7	CFMW-010-GW	460-136178-8	Water	06/27/17
8	CFMW-002-GW	460-136178-9	Water	06/27/17
9	CFMW-015-GW	460-136178-10	Water	06/27/17
10	CFMW-014-GW	460-136178-11	Water	06/27/17
11	CFMW-023-GWMS	460-136178-3MS	Water	06/27/17
12	CFMW-023-GWMSD	460-136178-3MSD	Water	06/27/17
13	CFMW-032a-GWMS	460-136178-5MS	Water	06/27/17
14	CFMW-032a-GWMSD	460-136178-5MSD	Water	06/27/17
15	CFMW-028a-GWMS	460-136178-4MS	Water	06/27/17

LDC #: 39068A6

SDG #: 460-136178-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-25-17

Reviewer: MG

2nd Reviewer: G

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Method 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

9014 Dis. Free CN, Free CN (9016)

	Client ID	Lab ID	Matrix	Date
16	CFMW-028a-GWMSD	460-136178-4MSD	Water	06/27/17
17	CFMW-028a-GWDUP	460-136178-4DUP	Water	06/27/17
18	CFMW-014-GWMS	460-136178-11MS	Water	06/27/17
19	CFMW-014-GWMSD	460-136178-11MSD	Water	06/27/17
20	CFMW-014-GWDUP	460-136178-11DUP	Water	06/27/17
21				
22				
23	PBW1			
24	PBW2			
25	PBW3			

Notes:

LDC #: 39068A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: G

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39068A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39068A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: a

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2→10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS dis CN
2→10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis. Free CN
QC 11,12	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+} ClO_4
13 14	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis CN
15,16	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
17	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
18→20	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39068A6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/27/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
	1		2									
Cl	162	1620	372J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39068A6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	18/19	Water	Cl	130 (90-110)	121 (90-110)		~~1~~,2,4,5,7→10	J+ dets/A (all dets)
	↓	↓	SO4	122 (↓)	124 (↓)		↓	↓ (det in 2,4,5,7→10)
			PO4-P	61 (↓)	66 (↓)		~~2~~-10	J-/UJ/A (det & ND)
2	CFMW-011a-GW MS/MSD	↓	dis. F	115 (↓)	115 (↓)		2→10	J+ dets/A (det in 2→5, 7→10)
3	15/16	↓	SO4	85 (↓)	78 (↓)		3,6	J-/UJ/A (all dets)

Comments:

LDC #: 39068A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of CN was recalculated. Calibration date: 7-7-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Total CN	Blank	0.000 (mg/L)	0.215	r=0.99985	r=0.99990	Y
		Standard 1	0.010 ( )	0.583			
		Standard 2	0.025 ( )	1.32			
		Standard 3	0.050 ( )	2.61			
		Standard 4	0.100 ( )	5.23			
		Standard 5	0.200 ( )	9.88			
		Standard 6	0.400 ( )	19.3			
		Standard 7	-	-			
Calibration verification	NO_3/NO_3-N	1639 CCV1	1.052 (mg/L)	1.00 (mg/L)	105	105	
Calibration verification	NH_3-N	1705 CCV1	2.00 (mg/L)	2.00 (mg/L)	100	100	
Calibration verification	Free CN	CCV2	48.59 (µg/L)	50.0 (µg/L)	97	not reported	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39086A6 (68)

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCSSRM	Laboratory control sample	Hardness	380000 (µg/L)	351000 (µg/L)	108.3	108.3	Y
11	Matrix spike sample	NH_3-N	(SSR-SR) 1058 (µg/L)	1000 (µg/L)	106	106	↓
17	Duplicate sample	Alk	55320 (µg/L)	54779 (µg/L)	1	1	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39068A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: G

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for # 9, PO4-P reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$y = mx + b$
where
$m = 90094.5$
$b = -7428.2$
1:1 = 1x

$21895 = 90094.5(x) - 7428.2$

0.325 mg/L

then (0.325 mg/L)(1000 µg/mg) = 325 µg/L

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	NH3-N	94.1	94.1	Y
2	2	NO3/NO2-N	119	119	
3	3	TSS	106 (mg/L)	106 (mg/L)	
4	4	Cl	1400	1400	
5	5	Alk	289000	289000	
6	6	TDS	2000 (mg/L)	2000 (mg/L)	
7	7	Free CN	117	117	
8	8	Total CN	985	983	
9	9	PO4-P	325	325	
10	10	Hardness	108000	108000	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 26, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136263-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	460-136263-2	Water	06/28/17
CFMW-011-GW	460-136263-7	Water	06/28/17
CFMW-045-GW	460-136263-8	Water	06/28/17
CFMW-008a-GW	460-136263-9	Water	06/28/17
CFMW-053-GW	460-136263-10	Water	06/28/17
CFMW-DUP15-GW	460-136263-11	Water	06/28/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
06/29/17	1,2,4-Trichlorobenzene	30.9	All samples in SDG 460-136263-1	NA	-

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/05/17	Dichlorodifluoromethane Cyclohexane Methyl cyclohexane	23.0 32.7 47.1	All samples in SDG 460-136263-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples CFMW-011-GW and CFMW-DUP15-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D, data were qualified as estimated in six samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-136263-1

Sample	Compound	Flag	A or P	Reason
TRIP BLANK CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW	Dichlorodifluoromethane Cyclohexane Methyl cyclohexane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-136263-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-136263-1

No Sample Data Qualified in this SDG

LDC #: 39068B1
SDG #: 460-136263-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7/24/17
Page: 1 of 1
Reviewer:
2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 1
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	ND	D = 2, 6
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	TRIP BLANK	460-136263-2	Water	06/28/17
2	CFMW-011-GW D	460-136263-7	Water	06/28/17
3	CFMW-045-GW	460-136263-8	Water	06/28/17
4	CFMW-008a-GW	460-136263-9	Water	06/28/17
5	CFMW-053-GW	460-136263-10	Water	06/28/17
6	CFMW-DUP15-GW D	460-136263-11	Water	06/28/17
7				
8				
9				
10				

Notes:

	MB 460-447589						

LDC #: 39068B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: G

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39068 B1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39068 B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y N N/A Were all %D within the validation criteria of ≤20 %D?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
	6/29/17 0357	ICV-2	KKK	30.9	All	J+ all /A ND

ICVvoa.wpd

LDC #: 390688 1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: Q

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	7/5/17	CCV	JJ	23.0		all	J-/UJ/A ND
-	0823		SSSS	32.7		↓	↓
-			TTTT	47.1		↓	↓

LDC #: 39068B1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/29/2017	F	0.7842	0.7842	0.7966	0.7966	5.9	5.9
	GCMS2		C	0.4722	0.4722	0.5118	0.5118	11.5	11.5
			CC	1.5795	1.5795	1.7338	1.7338	8.5	8.5
			JJJ	1.2866	1.2866	1.4029	1.4029	7.9	7.9

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0823	7/5/17	F (1st internal standard)	0.7966	0.8639	0.8639	8.4	8.4
			C (2nd internal standard)	0.5118	0.4465	0.4465	12.8	12.8
			CC (3rd internal standard)	1.7338	1.536	1.536	11.4	11.4
			JJJ (4th internal standard)	1.4029	1.339	1.339	4.5	4.5
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	55.8	112	112	0
1,2-Dichloroethane-d4	↓	49.7	99	99	↓
Toluene-d8	↓	41.5	83	83	↓
Bromofluorobenzene	↓	47.0	94	94	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39068B1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs/D 460-447589

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	20.1	20.1	100	100	101	101	0	0
Trichloroethene	↓	↓	19.2	18.8	96	96	94	94	2	2
Benzene	↓	↓	18.4	18.2	92	92	91	91	1	1
Toluene	↓	↓	18.3	18.5	91	91	92	92	1	1
Chlorobenzene	↓	↓	20.6	20.9	103	103	105	105	1	1

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. 4, F:

Conc. = $\frac{(13690)(250.0)}{(335155)(0.7966)}$

=

13 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

LDC Report# 39068B2a

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 27, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136263-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-011-GW	460-136263-7	Water	06/28/17
CFMW-045-GW	460-136263-8	Water	06/28/17
CFMW-008a-GW	460-136263-9	Water	06/28/17
CFMW-053-GW	460-136263-10	Water	06/28/17
CFMW-DUP15-GW	460-136263-11	Water	06/28/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/05/17	Hexachlorocyclopentadiene	28.0	All samples in SDG 460-136263-1	NA	-
	2,4-Dinitrophenol	23.3			
	4-Nitrophenol	20.6			
	Pentachlorophenol	21.3			
	Di-n-octylphthalate	21.0			
	Benzo(b)fluoranthene	24.5			
	Indeno(1,2,3-cd)pyrene	21.7			
	Dibenzo(a,h)anthracene	23.5			
	2,3,4,6-Tetrachlorophenol	20.6			

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples CFMW-011-GW and CFMW-DUP15-GW were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-136263-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-136263-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-136263-1

No Sample Data Qualified in this SDG

LDC #: 39068B2a

SDG #: 460-136263-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7/24/17

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	ND	D = 1.5
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-011-GW	460-136263-7	Water	06/28/17
2	CFMW-045-GW	460-136263-8	Water	06/28/17
3	CFMW-008a-GW	460-136263-9	Water	06/28/17
4	CFMW-053-GW	460-136263-10	Water	06/28/17
5	CFMW-DUP15-GW D	460-136263-11	Water	06/28/17
6				
7				
8				
9				

Notes:

	MB 460-447213						

LDC #: 39068B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 39068B2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: a

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o''-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.o-Toluidine

LDC #: 39068 B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
+	7/5/17	CCV	X	28.0		All	J+ all/Δ NP
+	1035		HH	23.3			
+			II	20.6			
+			TT	21.3			
+			FFF	21.0			
+			GGG	24.5			
+			JJJ	21.7			
+			KKK	23.5			
+			UUUU	20.6			

CONCAL.wpd

LDC #: 39068B2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS14	6/15/2017	A	1.7719	1.7719	1.6606	1.6606	7.1	7.1
			S	1.0300	1.0300	1.0145	1.0145	2.9	2.9
			DD	1.9765	1.9765	1.9297	1.9297	2.0	2.0
			UU	1.1229	1.1229	1.1089	1.1089	2.8	2.8
			DDD	1.1357	1.1357	1.1935	1.1935	3.3	3.3
			III	1.1363	1.1363	1.0470	1.0470	12.3	12.3

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1035	7/5/17	Δ (1st IS)	1.6606	1.846	1.846	11.1	11.1
			S (2nd IS)	1.0145	1.032	1.032	1.7	1.7
			DD (3rd IS)	1.9297	1.236	1.236	2.1	2.1
			HH (4th IS)	1.1089	1.132	1.132	2.1	2.1
			PPP (5th IS)	1.1935	1.115	1.115	6.5	6.5
			III (6th IS)	1.0470	1.196	1.196	14.3	14.3
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: ✓

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	9.35	93	93	0
2-Fluorobiphenyl		9.08	91	91	
Terphenyl-d14		8.35	84	84	
Phenol-d5		3.28	~~32~~ 33	33	
2-Fluorophenol		4.67	47	47	
2,4,6-Tribromophenol		12.8	128	128	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39068B2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: les 460-447213

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	NA	29.5	NA	37	37				
N-Nitroso-di-n-propylamine	↓	↓	82.4	↓	103	103				
4-Chloro-3-methylphenol	↓	↓	74.8	↓	93	93				
Acenaphthene	↓	↓	74.9	↓	94	94				
Pentachlorophenol	160	↓	181	↓	113	112				
Pyrene	80	↓	65.9	↓	82	82	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #3, EEE

$$\text{Conc.} = \frac{(9642)(8.0)(2)(1000)}{(643256)(0.7755)(250)}$$

= 1.2 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: August 1, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136263-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB36-AQ	460-136263-1	Water	06/28/17
CFMW-057-GW	460-136263-3	Water	06/28/17
CFMW-057a-GW	460-136263-4	Water	06/28/17
CFMW-059a-GW	460-136263-5	Water	06/28/17
CFMW-053a-GW	460-136263-6	Water	06/28/17
CFMW-011-GW	460-136263-7	Water	06/28/17
CFMW-045-GW	460-136263-8	Water	06/28/17
CFMW-008a-GW	460-136263-9	Water	06/28/17
CFMW-053-GW	460-136263-10	Water	06/28/17
CFMW-DUP15-GW	460-136263-11	Water	06/28/17
CFMW-057-GWF	460-136263-3F	Water	06/28/17
CFMW-057a-GWF	460-136263-4F	Water	06/28/17
CFMW-059a-GWF	460-136263-5F	Water	06/28/17
CFMW-053a-GWF	460-136263-6F	Water	06/28/17
CFMW-011-GWF	460-136263-7F	Water	06/28/17
CFMW-045-GWF	460-136263-8F	Water	06/28/17
CFMW-008a-GWF	460-136263-9F	Water	06/28/17
CFMW-053-GWF	460-136263-10F	Water	06/28/17
CFMW-DUP15-GWF	460-136263-11F	Water	06/28/17
CFMW-057-GWMS	460-136263-3MS	Water	06/28/17
CFMW-057-GWDUP	460-136263-3DUP	Water	06/28/17
CFMW-057-GWFMS	460-136263-3FMS	Water	06/28/17
CFMW-057-GWFDUP	460-136263-3FDUP	Water	06/28/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB35-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB36-AQ	06/28/17	Aluminum Calcium Sodium	70.9 ug/L 1030 ug/L 1290 ug/L	CFMW-057-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-057-GW	Aluminum Sodium	123 ug/L 5880 ug/L	123J+ ug/L 5880J+ ug/L

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-057-GWMS, no data were qualified for Barium, Calcium, and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFMW-057-GWFMS, no data were qualified for Barium, Calcium, and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

Samples CFMW-011-GW and CFMW-DUP15-GW and samples CFMW-011-GWF and CFMW-DUP15-GWF were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-011-GW	CFMW-DUP15-GW			
Barium	199	197	1 (≤30)	-	-
Calcium	46500	46300	0 (≤30)	-	-
Iron	62.0	62.9	1 (≤30)	-	-
Magnesium	14100	14100	0 (≤30)	-	-
Potassium	733	737	1 (≤30)	-	-
Sodium	18100	18200	1 (≤30)	-	-

Analyte	Concentration (ug/L)		RPD (Limits)	Flag	A or P
	CFMW-011-GWF	CFMW-DUP15-GWF			
Barium	181	186	3 (≤30)	-	-
Calcium	44000	43600	1 (≤30)	-	-
Iron	45.9	47.3	3 (≤30)	-	-
Magnesium	11900	11900	0 (≤30)	-	-
Potassium	663	663	0 (≤30)	-	-
Sodium	15300	15000	2 (≤30)	-	-

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-136263-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-136263-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-136263-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-057-GW	Aluminum Sodium	123J+ ug/L 5880J+ ug/L	A

LDC #: 39068B4a
SDG #: 460-136263-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7-26-17
Page: 1 of 2
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB = 1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS (SDG: 460-136351-1) #20: Ca, Fe, Mg - 4x #22: Ba, Ca, Mg, Na - 4x
VIII.	Duplicate sample analysis	A	DUP (↓) #21: As ok by diff.
IX.	Serial Dilution	A	SD: 2, 11, SDG: 460-136351-1
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	SW	D = 6+10, D = 15+19
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with "F" were analyzed as dissolved

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB36-AQ	460-136263-1	Water	06/28/17
2	CFMW-057-GW	460-136263-3	Water	06/28/17
3	CFMW-057a-GW	460-136263-4	Water	06/28/17
4	CFMW-059a-GW	460-136263-5	Water	06/28/17
5	CFMW-053a-GW	460-136263-6	Water	06/28/17
6	CFMW-011-GW	460-136263-7	Water	06/28/17
7	CFMW-045-GW	460-136263-8	Water	06/28/17
8	CFMW-008a-GW	460-136263-9	Water	06/28/17
9	CFMW-053-GW	460-136263-10	Water	06/28/17
10	CFMW-DUP15-GW	460-136263-11	Water	06/28/17
11	CFMW-057-GWF	460-136263-3F	Water	06/28/17
12	CFMW-057a-GW F	460-136263-4F	Water	06/28/17
13	CFMW-059a-GW F	460-136263-5F	Water	06/28/17
14	CFMW-053a-GWF	460-136263-6F	Water	06/28/17
15	CFMW-011-GWF	460-136263-7F	Water	06/28/17

LDC #: 39068B4a

SDG #: 460-136263-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-26-17

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

	Client ID	Lab ID	Matrix	Date
16	CFMW-045-GWF	460-136263-8F	Water	06/28/17
17	CFMW-008a-GWF	460-136263-9F	Water	06/28/17
18	CFMW-053-GWF	460-136263-10F	Water	06/28/17
19	CFMW-DUP15-GWF	460-136263-11F	Water	06/28/17
20	CFMW-057-GWMS	460-136263-3MS	Water	06/28/17
21	CFMW-057-GWDUP	460-136263-3DUP	Water	06/28/17
22	CFMW-057-GWFMS	460-136263-3FMS	Water	06/28/17
23	CFMW-057-GWFDUP	460-136263-3FDUP	Water	06/28/17
24	PBW1			
25	PBW2			
26	PBW3			

Notes:

LDC #: 39068B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were ≤ 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 39068B4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39068B4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: G

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→19	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
QC 20→23	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ____

Comments: Mercury by CVAA if performed

LDC #: 39068B4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/28/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Sample Identification										
	1	Action Level	2									
Al	70.9	709	123J+									
Ca	1030	10300										
Na	1290	12900	5880J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC#: 39068B4a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Metals (EPA Method 6020A/7470A)

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	6	10		
Barium	199	197	1	
Calcium	46500	46300	0	
Iron	62.0	62.9	1	
Magnesium	14100	14100	0	
Potassium	733	737	1	
Sodium	18100	18200	1	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39068B4a.WPD

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent Only)
	15	19		
Barium	181	186	3	
Calcium	44000	43600	1	
Iron	45.9	47.3	3	
Magnesium	11900	11900	0	
Potassium	663	663	0	
Sodium	15300	15000	2	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39068B4a.WPD

LDC #: 39068B4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1421 ICV	ICP/MS (Initial calibration)	Al	396.256	400	99	99	Y
1415 ICV	CVAA (Initial calibration)	Hg	4.7764	5.00	96	96	↓
	ICP (Continuing calibration)						
1838 CCV	ICP/MS (Continuing calibration)	Cr	50.880	50.0	102	102	↓
1653 CCV	CVAA (Continuing calibration)	Hg	4.9270	5.00	99	99	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1433 ICSAB	ICP interference check	Ni	191.0 (µg/L)	200 (µg/L)	96	95	Y
1819 LCS	Laboratory control sample	Co	26.14 (µg/L)	25.0 (µg/L)	105	105	↓
1824 20	Matrix spike	Sb	(SSR-SR) 26.36 (µg/L)	25.0 (µg/L)	105	105	↓
1828/1826 21	Duplicate	Zn	769.8 (µg/L)	792.4 (µg/L)	3	3	↓
1828/1831 2	ICP serial dilution	Ca	39541 (µg/L)	40406 (µg/L)	2.2	2.2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Al were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(35.432\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 70.864\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Al	70.9	70.9	Y
2	2	Zn	770	770	
3	3	Cr	20.4	20.4	
4	4	Pb	0.65	0.65	
5	5	Sb	10	9.97	
6	6	K	733	733	
7	7	Co	1.3	1.29	
8	8	Cu	6.8	6.85	
9	9	Ca	57600	57600	
10	10	Ba	197	197	
11	11	Fe	2580	2580	
12	12	V	3.9	3.88	
13	13	As	3.7	3.72	
14	14	Cu	8.0	8.02	
15	15	Ba	181	181	
16	16	Na	44300	44300	
17	17	Pb	1.8	1.76	
18	18	Mg	15500	15500	
19	19	Ca	43600	43600	

Note: method 7470A is N.D. for all samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 28, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136263-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB36-AQ	460-136263-1	Water	06/28/17
CFMW-057-GW	460-136263-3	Water	06/28/17
CFMW-057a-GW	460-136263-4	Water	06/28/17
CFMW-059a-GW	460-136263-5	Water	06/28/17
CFMW-053a-GW	460-136263-6	Water	06/28/17
CFMW-011-GW	460-136263-7	Water	06/28/17
CFMW-045-GW	460-136263-8	Water	06/28/17
CFMW-008a-GW	460-136263-9	Water	06/28/17
CFMW-053-GW	460-136263-10	Water	06/28/17
CFMW-DUP15-GW	460-136263-11	Water	06/28/17
CFMW-057-GWMS	460-136263-3MS	Water	06/28/17
CFMW-057-GWMSD	460-136263-3MSD	Water	06/28/17
CFMW-057-GWDUP	460-136263-3DUP	Water	06/28/17
CFMW-011-GWMS	460-136263-7MS	Water	06/28/17
CFMW-011-GWMSD	460-136263-7MSD	Water	06/28/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB36-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB36-AQ	06/28/17	Chloride Sulfate Nitrate/Nitrite as N Alkalinity	202 ug/L 705 ug/L 285 ug/L 8680 ug/L	CFMW-057-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-057-GW	Chloride Sulfate	314 ug/L 4150 ug/L	314J+ ug/L 4150J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-057-GWMS/MSD (CFMW-057-GW CFMW-057a-GW CFMW-059a-GW CFMW-053a-GW CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW)	Fluoride Orthophosphate as P	87 (90-110) 53 (90-110)	88 (90-110) 56 (90-110)	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A
CFMW-057-GWMS/MSD (CFMW-057a-GW CFMW-059a-GW CFMW-053a-GW CFMW-008a-GW)	Ammonia as N	112 (90-110)	114 (90-110)	J+ (all detects)	A
CFMW-057-GWMS/MSD (CFMW-057-GW CFMW-011-GW CFMW-045-GW)	Ammonia as N	112 (90-110)	114 (90-110)	NA	-
CFMW-011a-GWMS/MSD (CFMW-057a-GW CFMW-059a-GW CFMW-053a-GW CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW)	Dissolved fluoride	115 (90-110)	115 (90-110)	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-057-GWDUP (CFMW-057-GW CFMW-057a-GW CFMW-059a-GW CFMW-053a-GW CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW)	Total dissolved solids Total suspended solids	8 (≤5) 8 (≤5)	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
DCLK (CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW)	Free cyanide	49 (50-150)	-	J- (all detects) UJ (all non-detects)	P
	Dissolved free cyanide	49 (50-150)	-	J- (all detects) UJ (all non-detects)	

Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples CFMW-011-GW and CFMW-DUP15-GW were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-011-GW	CFMW-DUP15-GW			
Alkalinity	213000 ug/L	208000 ug/L	2 (≤30)	-	-
Chloride	1750 ug/L	1780 ug/L	2 (≤30)	-	-
Total cyanide	125 ug/L	123 ug/L	2 (≤30)	-	-
Dissolved total cyanide	125 ug/L	126 ug/L	1 (≤30)	-	-
Free cyanide	6.6 ug/L	9.8 ug/L	39 (≤30)	J (all detects)	A
Dissolved free cyanide	3.3 ug/L	3.1 ug/L	6 (≤30)	-	-
Fluoride	297 ug/L	289 ug/L	3 (≤30)	-	-
Dissolved fluoride	298 ug/L	296 ug/L	1 (≤30)	-	-
Hardness	416000 ug/L	180000 ug/L	79 (≤30)	J (all detects)	A
Nitrate/Nitrite as N	1530 ug/L	1600 ug/L	4 (≤30)	-	-

Analyte	Concentration		RPD (Limits)	Flag	A or P
	CFMW-011-GW	CFMW-DUP15-GW			
Sulfate	4590 ug/L	4410 ug/L	4 (≤30)	-	-
Total dissolved solids	214 mg/L	228 mg/L	6 (≤30)	-	-
Total suspended solids	1.1 mg/L	1.0U mg/L	10 (≤30)	-	-

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, DUP RPD, LCS/LCSD %R, and field duplicate RPD, data were qualified as estimated in nine samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-136263-1

Sample	Analyte	Flag	A or P	Reason
CFMW-057-GW CFMW-057a-GW CFMW-059a-GW CFMW-053a-GW CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW	Fluoride Orthophosphate as P	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-057a-GW CFMW-059a-GW CFMW-053a-GW CFMW-008a-GW	Ammonia as N	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-057a-GW CFMW-059a-GW CFMW-053a-GW CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW	Dissolved fluoride	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-057-GW CFMW-057a-GW CFMW-059a-GW CFMW-053a-GW CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW	Total dissolved solids Total suspended solids	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Duplicate sample analysis (RPD)
CFMW-011-GW CFMW-045-GW CFMW-008a-GW CFMW-053-GW CFMW-DUP15-GW	Free cyanide Dissolved free cyanide	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	P	Laboratory control samples (%R)
CFMW-011-GW CFMW-DUP15-GW	Free cyanide Hardness	J (all detects) J (all detects)	A	Field duplicates (RPD)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-136263-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-136263-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-057-GW	Chloride Sulfate	314J+ ug/L 4150J+ ug/L	A

LDC #: 39068B6

SDG #: 460-136263-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-26-17

Reviewer: MG

2nd Reviewer: ~~o~~

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Method 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MB Free Cyanide, Dissolved Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-136351-1)
VII.	Duplicate sample analysis	SW	DUP (↓)
VIII.	Laboratory control samples	SW	LCS/LCSD/SRM
IX.	Field duplicates	SW	D=6+10
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB36-AQ	460-136263-1	Water	06/28/17
2	CFMW-057-GW	460-136263-3	Water	06/28/17
3	CFMW-057a-GW	460-136263-4	Water	06/28/17
4	CFMW-059a-GW	460-136263-5	Water	06/28/17
5	CFMW-053a-GW	460-136263-6	Water	06/28/17
6	CFMW-011-GW	460-136263-7	Water	06/28/17
7	CFMW-045-GW	460-136263-8	Water	06/28/17
8	CFMW-008a-GW	460-136263-9	Water	06/28/17
9	CFMW-053-GW	460-136263-10	Water	06/28/17
10	CFMW-DUP15-GW	460-136263-11	Water	06/28/17
11	CFMW-057-GWMS	460-136263-3MS	Water	06/28/17
12	CFMW-057-GWMSD	460-136263-3MSD	Water	06/28/17
13	CFMW-057-GWDUP	460-136263-3DUP	Water	06/28/17
14	CFMW-011-GWMS	460-136263-7MS	Water	06/28/17
15	CFMW-011-GWMSD	460-136263-7MSD	Water	06/28/17

LDC #: 39068B6

SDG #: 460-136263-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-26-17

Page: 2 of 2

Reviewer: MG

2nd Reviewer: ✓

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Method 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MG Free CN, Dis. Free CN (9016)

	Client ID	Lab ID	Matrix	Date
16				
17				
18				
19	PBW1			
20	PBW2			

Notes:

LDC #: 39068B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39068B6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target analytes were detected in the field duplicates.	✓			
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 3906886

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2 → 10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS dis CN
6 → 10	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis Free CN
QC 11, 12	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F dis CN
13	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS
14, 15	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39068B6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/28/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
	1		2									
Cl	202	2020	314J+									
SO4	705	7050	4150J+									
NO3/NO2-N	285	2850										
Alk	8680	86800										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39068B6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

(Y) N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

(Y) N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	11/12	water	F	87 (90-110)	88 (90-110)		~~all~~ 2-10	J-/UJ/A (det & ND)
	↓	↓	PO_4-P	53 ( )	56 ( )		↓	↓ (all N.D.)
			NH_3-N	112 ( )	114 ( )		2→8	J+ dets/A (det in 3→5, 8)
2	CFMW-011a-GW MS/MSD	↓	diss. F	115 (↓)	115 (↓)		3→10	J+ dets/A (all dets)

Comments:

LDC #: 39068B6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		13	water	TDS	8 (≤5)	2 → 10	J/UJ/A (all dets)
		↓	↓	TSS	8 (↓)	↓	↓ (det in 2 → 9)

Comments:

LDC #: 39068B6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: MG
2nd Reviewer: C

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	DLCK	Water	Free CN	49 (50-150)			6 → 10	J-/UJ/P (det & ND)
		↓					↓	↓ (↓)
1	DLCK	↓	Diss. Free CN	49 (50-150)			↓	↓ (↓)

Comments: low level LCS

LCSD.wpd

LDC#: 39068B6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer: G

Inorganics, Method See Cover

Analyte	Concentration (ug/L)		RPD (≤30)	Qualification (Parent only)
	6	10		
Alkalinity	213000	208000	2	
Chloride	1750	1780	2	
Total Cyanide	125	123	2	
Dissolved Total Cyanide	125	126	1	
Free Cyanide	6.6	9.8	39	J/UJ/A (all dets)
Dissolved Free Cyanide	3.3	3.1	6	
Fluoride	297	289	3	
Dissolved Fluoride	298	296	1	
Hardness	416000	180000	79	J/UJ/A (all dets)
Nitrate/Nitrite as N	1530	1600	4	
Sulfate	4590	4410	4	
TDS (mg/L)	214	228	6	
TSS (mg/L)	1.1	1.0U	10	

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2017\39068B6.WPD

LDC #: 39068B6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: G

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of PO_4-P was recalculated. Calibration date: 6-8-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	PO_4-P	Blank	-	-	r^2 = ~~0.9999~~ 0.9997 mg	r^2 = 1.0000	Y
		Standard 1	0.2 (mg/L)	14043			
		Standard 2	0.5 ( )	33648			
		Standard 3	2.5 ( )	224044			
		Standard 4	5.0 ( )	438272			
		Standard 5	7.5 ( )	660674			
		Standard 6	10.0 ( )	900178			
		Standard 7	-	-			
Calibration verification	NH_3-N	1155 ICV	2.044 (mg/L)	2.00 (mg/L)	102	102	
Calibration verification	NO_3/NO_2-N	1126 ICV	1.052 (mg/L)	1.00 (mg/L)	105	105	
Calibration verification	Total CN	1745 CCV1	0.203 (mg/L)	0.200 (mg/L)	102	102	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068B6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	Free CN	43.14 (µg/L)	50.0 (µg/L)	86	86	Y
11	Matrix spike sample	PO_4-P	(SSR-SR) 1328 (µg/L)	2500 (µg/L)	53	53	↓
13	Duplicate sample	Hardness	216000 (µg/L)	212000 (µg/L)	2	2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.6

LDC #: 39068B6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: C

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for #5, Hardness reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

$$\text{Hardness} = \frac{(6.9\ \text{ml})(0.020\ \text{N})(50\,000)(1000\ \mu g/mg)}{10\ \text{ml}} = 690\,000\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cl	202	202	Y
2	2	SO4	4150	4150	
3	3	NH3-N	205	205	
4	4	TSS	69.7 (mg/L)	69.7 (mg/L)	
5	5	Hardness	690000	690000	
6	6	Free CN	6.6	6.56	
7	7	Total CN	450	451	
8	8	NO3/NO2-N	168	168	
9	9	TDS	325 (mg/L)	325 (mg/L)	
10	10	Alk	208000	208000	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 27, 2017

Parameters: Volatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-13635-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	460-136351-2	Water	06/29/17
CFMW-016-GW	460-136351-4	Water	06/29/17
CFMW-019-GW	460-136351-5	Water	06/29/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/07/17	cis-1,3-Dichloropropene trans-1,3-Dichloropropene Bromoform 1,2-Dibromo-3-chloropropane	20.7 23.4 22.5 24.6	All samples in SDG 460-13635-1	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/D460-448094 (All samples in SDG 460-136351-1)	trans-1,3-Dichloropropene	-	75 (76-120)	UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria.

XIII. Target Compound Identifications

All target compound identifications met validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to continuing calibration %D and LCS/LCSD %R, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Data Qualification Summary - SDG 460-13635-1

Sample	Compound	Flag	A or P	Reason
TRIP BLANK CFMW-016-GW CFMW-019-GW	cis-1,3-Dichloropropene trans-1,3-Dichloropropene Bromoform 1,2-Dibromo-3-chloropropane	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
TRIP BLANK CFMW-016-GW CFMW-019-GW	trans-1,3-Dichloropropene	UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Laboratory Blank Data Qualification Summary - SDG 460-13635-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Volatiles - Field Blank Data Qualification Summary - SDG 460-13635-1

No Sample Data Qualified in this SDG

LDC #: 39068C1
SDG #: 460-136351-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7/24/17
Page: 1 of 1
Reviewer:
2nd Reviewer:

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / Δ	
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration/ICV	Δ / Δ	% RSD ≤ 15/30, r² ICV ≤ 20
IV.	Continuing calibration	SW	CCV ≤ 20
V.	Laboratory Blanks	Δ	
VI.	Field blanks	ND	TB = 1
VII.	Surrogate spikes	Δ	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	SW	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	Δ	
XII.	Compound quantitation RL/LOQ/LODs	Δ	
XIII.	Target compound identification	Δ	
XIV.	System performance	Δ	
XV.	Overall assessment of data	Δ	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	TRIP BLANK	460-136351-2	Water	06/29/17
2	CFMW-016-GW	460-136351-4	Water	06/29/17
3	CFMW-019-GW	460-136351-5	Water	06/29/17
4				
5				
6				
7				
8				

Notes:

	MB 460-448094						

LDC #: 39068c1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: O

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30%/15% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	

LDC #: 39066C1

VALIDATION FINDINGS CHECKLIST

Reviewer: PT
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 39068C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
-	7/7/17	CCV	R	20.7		All	J- /UJ/A NP
-	1024		W	23.4		↓	↓
-			X	22.5			
-			MM	24.6			

CONCAL.wpd

LDC #: 39068 C1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS/P 460-448094	W	( )	75 (76-120)	( )	All	J-/UJ/P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 39068C1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GCMS 8260 B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20/100 std)	Recalculated (RRF 20/100 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	7/1/2017	F	0.1734	0.1734	0.2015	0.2015	14.9	14.9
	GCMS12		C	0.3414	0.3414	0.3733	0.3733	10.4	10.4
			CC	1.7664	1.7664	1.7317	1.7317	8.0	8.0
			JJJ	1.3242	1.3242	1.3647	1.3647	6.6	6.6

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 1024	7/7/17	F (1st internal standard)	0.2015	0.1779	0.1779	11.7	11.7
			C (2nd internal standard)	0.3733	0.3326	0.3326	10.9	10.9
			CC (3rd internal standard)	1.7317	1.511	1.511	12.8	12.8
			JJ (4th internal standard)	1.3647	1.218	1.218	10.8	10.8
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068C1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: C

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	55.1	110	110	0
1,2-Dichloroethane-d4	↓	48.4	97	97	↓
Toluene-d8	↓	47.6	95	95	↓
Bromofluorobenzene	↓	49.9	100	100	↓

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 39068C1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: LCS 460-448094

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	20.0	20.0	20.0	19.0	100	100	95	95	5	5
Trichloroethene	↓	↓	20.4	19.8	102	102	99	99	3	3
Benzene	↓	↓	17.1	16.3	86	86	81	81	5	5
Toluene	↓	↓	17.3	16.6	87	87	83	83	4	4
Chlorobenzene	↓	↓	18.6	17.7	93	93	88	88	5	5

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068C1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #3, AA

Conc. = $\frac{977\ (50.0)}{3062973\ (0.2939)}$

=

0.54 ug/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

LDC Report# 39068C2a

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 27, 2017

Parameters: Semivolatiles

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136351-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-016-GW	460-136351-4	Water	06/29/17
CFMW-019-GW	460-136351-5	Water	06/29/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Superfund Organic Methods Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
07/06/17	Hexachlorocyclopentadiene	48.3	All samples in SDG 460-136351-1	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations were within validation criteria.

XIII. Target Compound Identifications

All target compound identifications were within validation criteria.

XIV. System Performance

The system performance was acceptable.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to ICV %D, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Data Qualification Summary - SDG 460-136351-1

Sample	Compound	Flag	A or P	Reason
CFMW-016-GW CFMW-019-GW	Hexachlorocyclopentadiene	UJ (all non-detects)	A	Initial calibration verification (%D)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 460-136351-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Semivolatiles - Field Blank Data Qualification Summary - SDG 460-136351-1

No Sample Data Qualified in this SDG

LDC #: 39068C2a
SDG #: 460-136351-1
Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET
Level IV

Date: 7/24/17
Page: 1 of 1
Reviewer:
2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 20, r² ICV ≤ 30
IV.	Continuing calibration	A	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS/LD
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	
XIII.	Target compound identification	A	
XIV.	System performance	A	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-016-GW	460-136351-4	Water	06/29/17
2	CFMW-019-GW	460-136351-5	Water	06/29/17
3				
4				
5				
6				
7				
8				

Notes:

	MB 460-447842						

LDC #: 39068C 2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: O

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 30% or percent recoveries (%R) 70-130%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis?			✓	
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	

LDC #: 39068C2a

VALIDATION FINDINGS CHECKLIST

Reviewer: FM
2nd Reviewer: G

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.			✓	
Was a MS/MSD analyzed every 20 samples of each matrix?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	AA. 2-Chloronaphthalene	AAA. Butylbenzylphthalate	AAAA. Dibenzothiophene	A1. N-Nitrosodiethylamine
B. Bis (2-chloroethyl) ether	BB. 2-Nitroaniline	BBB. 3,3'-Dichlorobenzidine	BBBB. Benzo(a)fluoranthene	B1. N-Nitrosodi-n-butylamine
C. 2-Chlorophenol	CC. Dimethylphthalate	CCC. Benzo(a)anthracene	CCCC. Benzo(b)fluorene	C1. N-Nitrosomethylethylamine
D. 1,3-Dichlorobenzene	DD. Acenaphthylene	DDD. Chrysene	DDDD. cis/trans-Decalin	D1. N-Nitrosomorpholine
E. 1,4-Dichlorobenzene	EE. 2,6-Dinitrotoluene	EEE. Bis(2-ethylhexyl)phthalate	EEEE. Biphenyl	E1. N-Nitrosopyrrolidine
F. 1,2-Dichlorobenzene	FF. 3-Nitroaniline	FFF. Di-n-octylphthalate	FFFF. Retene	F1. Phenacetin
G. 2-Methylphenol	GG. Acenaphthene	GGG. Benzo(b)fluoranthene	GGGG. C30-Hopane	G1. 2-Acetylaminofluorene
H. 2,2'-Oxybis(1-chloropropane)	HH. 2,4-Dinitrophenol	HHH. Benzo(k)fluoranthene	HHHH. 1-Methylphenanthrene	H1. Pronamide
I. 4-Methylphenol	II. 4-Nitrophenol	III. Benzo(a)pyrene	IIII. 1,4-Dioxane	I1. Methyl methanesulfonate
J. N-Nitroso-di-n-propylamine	JJ. Dibenzofuran	JJJ. Indeno(1,2,3-cd)pyrene	JJJJ. Acetophenone	J1. Ethyl methanesulfonate
K. Hexachloroethane	KK. 2,4-Dinitrotoluene	KKK. Dibenz(a,h)anthracene	KKKK. Atrazine	K1. o,o',o''-Triethylphosphorothioate
L. Nitrobenzene	LL. Diethylphthalate	LLL. Benzo(g,h,i)perylene	LLLL. Benzaldehyde	L1. n-Phenylene diamine
M. Isophorone	MM. 4-Chlorophenyl-phenyl ether	MMM. Bis(2-Chloroisopropyl)ether	MMMM. Caprolactam	M1. 1,4-Naphthoquinone
N. 2-Nitrophenol	NN. Fluorene	NNN. Aniline	NNNN. 2,6-Dichlorophenol	N1. N-Nitro-o-toluidine
O. 2,4-Dimethylphenol	OO. 4-Nitroaniline	OOO. N-Nitrosodimethylamine	OOOO. 1,2-Diphenylhydrazine	O1. 1,3,5-Trinitrobenzene
P. Bis(2-chloroethoxy)methane	PP. 4,6-Dinitro-2-methylphenol	PPP. Benzoic Acid	PPPP. 3-Methylphenol	P1. Pentachlorobenzene
Q. 2,4-Dichlorophenol	QQ. N-Nitrosodiphenylamine	QQQ. Benzyl alcohol	QQQQ. 3&4-Methylphenol	Q1. 4-Aminobiphenyl
R. 1,2,4-Trichlorobenzene	RR. 4-Bromophenyl-phenylether	RRR. Pyridine	RRRR. 4-Dimethyldibenzothiophene (4MDT)	R1. 2-Naphthylamine
S. Naphthalene	SS. Hexachlorobenzene	SSS. Benzidine	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	S1. Triphenylene
T. 4-Chloroaniline	TT. Pentachlorophenol	TTT. 1-Methylnaphthalene	TTTT. 1-Methyldibenzothiophene (1MDT)	T1. Octachlorostyrene
U. Hexachlorobutadiene	UU. Phenanthrene	UUU.Benzo(b)thiophene	UUUU.. 2,3,4,6-Tetrachlorophenol	U1. Famphur
V. 4-Chloro-3-methylphenol	VV. Anthracene	VVV.Benzonaphthothiophene	VVVV. 1,2,4,5-Tetrachlorobenzene	V1. 1,4-phenylenediamine
W. 2-Methylnaphthalene	WW. Carbazole	WWW.Benzo(e)pyrene	WWWW.. 2-Picoline	W1. Methapyrilene
X. Hexachlorocyclopentadiene	XX. Di-n-butylphthalate	XXX. 2,6-Dimethylnaphthalene	XXXX. 3-Methylcholanthrene	X1.Pentachloroethane
Y. 2,4,6-Trichlorophenol	YY. Fluoranthene	YYY. 2,3,5-Trimethylnaphthalene	YYYY. a,a-Dimethylphenethylamine	Y1.3,3'-Dimethylbenzidine
Z. 2,4,5-Trichlorophenol	ZZ. Pyrene	ZZZ. Perylene	ZZZZ. Hexachloropropene	Z1.o-Toluidine

LDC #: 39068C2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤30 %D ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Associated Samples	Qualifications
-	7/6/17 1715	ICV-14	X	48.3	All	J-/UJ/A NB

ICVsvoa.wpd

LDC #: 39068 C2q

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GCMS 8270D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF10 std)	Recalculated (RRF10 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL GCMS14	7/6/2017	A	1.7724	1.7724	1.7173	1.7173	2.5	2.5
			S	1.0333	1.0333	1.0137	1.0137	1.2	1.2
			DD	2.0140	2.0140	1.9354	1.9354	3.9	3.9
			UU	1.1505	1.1505	1.1174	1.1174	1.9	1.9
			DDD	1.1115	1.1115	1.1968	1.1968	4.0	4.0
			III	1.1797	1.1797	1.0126	1.0126	17.7	17.7

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068 C2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: a

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0938	7/7/17	Δ (1st IS)	1.7173	1.739	1.739	1.3	1.3
			S (2nd IS)	1.0137	1.032	1.032	1.8	1.8
			DD (3rd IS)	1.9354	2.003	2.003	3.5	3.5
			UU (4th IS)	1.1174	1.134	1.134	1.5	1.5
			DDD (5th IS)	1.1968	1.112	1.112	7.1	7.1
			III (6th IS)	1.0126	1.134	1.134	12.0	12.0
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068C2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	10.4	104	104	0
2-Fluorobiphenyl		10.1	101	101	
Terphenyl-d14		10.3	103	103	
Phenol-d5		3.44	34	34	
2-Fluorophenol		5.17	52	52	
2,4,6-Tribromophenol		10.5	105	105	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 39068 C2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: LCS ID 460-447842

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	80.0	80.0	29.8 ~~66.4~~	28.6	37	37	36	36	4	4
N-Nitroso-di-n-propylamine	↓	↓	75.2	74.2	94	94	93	93	1	1
4-Chloro-3-methylphenol	↓	↓	66.4	68.7	83	83	86	86	3	3
Acenaphthene	↓	↓	75.5	75.2	94	94	94	94	0	0
Pentachlorophenol	160	160	162 (161.6)	162	101	101	102	102	0	0
Pyrene	80.0	80.0	76.8	73.3	96	96	92	92	5	5

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068C2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. LCS460-44784.2 A

Conc. = $\frac{257138}{321263} \frac{(8)}{(1.7173)} \frac{(2)}{(250)} (1000)$

=

29.8 ng/L

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 28, 2017

Parameters: Metals

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136351-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB37-AQ	460-136351-1	Water	06/29/17
CFMW-011a-GW	460-136351-3	Water	06/29/17
CFMW-016-GW	460-136351-4	Water	06/29/17
CFMW-019-GW	460-136351-5	Water	06/29/17
CFMW-011a-GWF	460-136351-3F	Water	06/29/17
CFMW-016-GWF	460-136351-4F	Water	06/29/17
CFMW-019-GWF	460-136351-5F	Water	06/29/17
CFMW-011a-GWMS	460-136351-3MS	Water	06/29/17
CFMW-011a-GWDUP	460-136351-3DUP	Water	06/29/17
CFMW-011a-GWFMS	460-136351-3FMS	Water	06/29/17
CFMW-011a-GWFDUP	460-136351-3FDUP	Water	06/29/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW 846 Method 6020A
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Stage 4 evaluation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. ICPMS Tune

The mass calibration was within 0.1 AMU and the percent relative standard deviation (%RSD) was less than or equal to 5%.

III. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

IV. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample CFMW-EB37-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB37-AQ	06/29/17	Aluminum Calcium Sodium	42.3 ug/L 303 ug/L 705 ug/L	CFMW-011a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-011a-GW	Aluminum	2030 ug/L	2030J+ ug/L

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. For CFMW-011a-GWMS, no data were qualified for Calcium and Magnesium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

For CFMW-011a-GWFMS, no data were qualified for Calcium, Magnesium, and Sodium percent recoveries outside the QC limits since the parent sample results were greater than 4X the spike concentration.

VIII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

IX. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

X. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

XI. Field Duplicates

No field duplicates were identified in this SDG.

XII. Internal Standards (ICP-MS)

All internal standard percent recoveries (%R) were within QC limits.

XIII. Sample Result Verification

All sample result verifications were acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Data Qualification Summary - SDG 460-136351-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Laboratory Blank Data Qualification Summary - SDG 460-136351-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Metals - Field Blank Data Qualification Summary - SDG 460-136351-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-011a-GW	Aluminum	2030J+ ug/L	A

LDC #: 39068C4a

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-26-17

SDG #: 460-136351-1

Page: 1 of 1

Laboratory: Test America, Inc.

Reviewer: MG

2nd Reviewer: ✓

METHOD: Metals (EPA SW 846 Method 6020A/7470A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	ICP/MS Tune	A	
III.	Instrument Calibration	A	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Laboratory Blanks	A	
VI.	Field Blanks	SW	EB = 1
VII.	Matrix Spike/Matrix Spike Duplicates	A	MS #8: Ca, Mg - 4x #10: Ca, Mg, Na - 4x
VIII.	Duplicate sample analysis	A	DUP
IX.	Serial Dilution	A	SD: 2, 5
X.	Laboratory control samples	A	LCS
XI.	Field Duplicates	N	
XII.	Internal Standard (ICP-MS)	A	
XIII.	Sample Result Verification	A	
XIV.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

Samples appended with "F" were analyzed as dissolved

		Client ID	Lab ID	Matrix	Date
1	1	CFMW-EB37-AQ	460-136351-1	Water	06/29/17
2	1	CFMW-011a-GW	460-136351-3	Water	06/29/17
3	1	CFMW-016-GW	460-136351-4	Water	06/29/17
4	1	CFMW-019-GW	460-136351-5	Water	06/29/17
5	2	CFMW-011a-GWF	460-136351-3F	Water	06/29/17
6	2	CFMW-016-GWF	460-136351-4F	Water	06/29/17
7	2	CFMW-019-GWF	460-136351-5F	Water	06/29/17
8	1	CFMW-011a-GWMS	460-136351-3MS	Water	06/29/17
9	1	CFMW-011a-GWDUP	460-136351-3DUP	Water	06/29/17
10	2	CFMW-011a-GWFMS	460-136351-3FMS	Water	06/29/17
11	2	CFMW-011a-GWFDUP	460-136351-3FDUP	Water	06/29/17
12	1	PBW1			
13	2	PBW2			

Notes:

LDC #: 39068C4a

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?	✓			
Were %RSD of isotopes in the tuning solution ≤5%?	✓			
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	✓			
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?	✓			
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39068C4a

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: a

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1 → 7	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 8 → 11	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 39068C4a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: C

METHOD: Trace Metals (EPA SW846 6020A/7470A)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target analytes detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/29/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Sample Identification										
	1	Action Level	2									
Al	42.3	4230	2030J+									
Ca	303	3030										
Na	705	7050										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39068C4a

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: a

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Initial calibration)						
1249 ICV	ICP/MS (Initial calibration)	Zn	38.381	40.0	96	96	Y
1402 ICV	CVAA (Initial calibration)	Hg	5.0149	5.00	100	100	↓
	ICP (Continuing calibration)						↓
1454 CCV	ICP/MS (Continuing calibration)	Ag	50.219	50.0	100	100	↓
1434 CCV	CVAA (Continuing calibration)	Hg	5.2030	5.00	104	104	↓
	GFAA (Initial calibration)						
	GFAA (Continuing calibation)						

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068 C4a

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: G

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
1301 ICSAB	ICP interference check	V	202.9 (µg/L)	200 (µg/L)	101	101	Y
1435 LCS	Laboratory control sample	Tl	20.15 (µg/L)	20.0 (µg/L)	101	101	↓
1440 8	Matrix spike	Cd	(SSR-SR) 26.13 (µg/L)	25.0 (µg/L)	105	105	↓
1445/1535 9	Duplicate	Mn	167.5 (µg/L)	168.4 (µg/L)	0.5	0.6	↓
1445/1447 2	ICP serial dilution	Al	2030 (µg/L)	2045 (µg/L)	0.74	0.73	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 39068C4a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: ✓

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #1, Ca were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(151.530\ \mu g/L)(0.050\ L)(2)}{0.050\ L} = 303.06\ \mu g/L$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Ca	303	303	Y
2	2	Cu	4.0	4.00	
3	3	Al	67.0	67.0	
4	4	Zn	24.9	24.9	
5	5	As	1.3	1.32	
6	6	K	534	534	
7	7	Se	1.2	1.21	

Note: method 7470A is N.D. for all samples

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Columbia Falls Aluminum Company, Columbia Falls, Montana

LDC Report Date: July 28, 2017

Parameters: Wet Chemistry

Validation Level: Stage 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): 460-136351-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
CFMW-EB37-AQ	460-136351-1	Water	06/29/17
CFMW-011a-GW	460-136351-3	Water	06/29/17
CFMW-016-GW	460-136351-4	Water	06/29/17
CFMW-019-GW	460-136351-5	Water	06/29/17
CFMW-011a-GWMS	460-136351-3MS	Water	06/29/17
CFMW-011a-GWMSD	460-136351-3MSD	Water	06/29/17
CFMW-011a-GWDUP	460-136351-3DUP	Water	06/29/17

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Phase I Site Characterization Sampling and Analysis Plan, Columbia Falls Aluminum Company Facility, 2000 Aluminum Drive, Columbia Falls, Flathead County, Montana (November 2015) and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Data Review (August 2014). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Ammonia as Nitrogen by Environmental Protection Agency (EPA) Method 350.1
Chloride, Fluoride, Dissolved Fluoride, and Sulfate by EPA Method 300.0
Total Cyanide and Dissolved Total Cyanide by EPA Method 335.4
Free Cyanide and Dissolved Free Cyanide by EPA SW 846 Method 9016
Hardness by Standard Method 2340C
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Orthophosphate as Phosphorous by EPA SW 846 Method 9056A
Total Dissolved Solids by Standard Method 2540C
Total Suspended Solids by Standard Method 2540D

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

Sample CFMW-EB37-AQ was identified as an equipment blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
CFMW-EB37-AQ	06/29/17	Chloride Nitrate/Nitrite as N	167 ug/L 103 ug/L	CFMW-011a-GW

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
CFMW-011a-GW	Chloride Nitrate/Nitrite as N	808 ug/L 208 ug/L	808J+ ug/L 208J+ ug/L

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
CFMW-011a-GWMS/MSD (CFMW-011a-GW CFMW-016-GW CFMW-019-GW)	Chloride Dissolved fluoride	123 (90-110) 115 (90-110)	119 (90-110) 115 (90-110)	J+ (all detects) J+ (all detects)	A
CFMW-011a-GWMS/MSD (CFMW-011a-GW CFMW-016-GW)	Sulfate	129 (90-110)	130 (90-110)	J+ (all detects)	A
CFMW-011a-GWMS/MSD (CFMW-011a-GW CFMW-016-GW CFMW-019-GW)	Orthophosphate as P	65 (90-110)	68 (90-110)	UJ (all non-detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
CFMW-011a-GWDUP (CFMW-011a-GW CFMW-016-GW CFMW-019-GW)	Total dissolved solids	7 (≤5)	J (all detects)	A

VIII. Laboratory Control Samples/Standard Reference Material

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
DCLK (CFMW-016-GW CFMW-019-GW)	Free cyanide Dissolved free cyanide	49 (50-150) 49 (50-150)	- -	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	P

Relative percent differences (RPD) were within QC limits.

Standard reference material (SRM) samples were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, DUP RPD, and LCS/LCSD %R, data were qualified as estimated in three samples.

Due to equipment blank contamination, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Data Qualification Summary - SDG 460-136351-1

Sample	Analyte	Flag	A or P	Reason
CFMW-011a-GW CFMW-016-GW CFMW-019-GW	Chloride Dissolved fluoride	J+ (all detects) J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-011a-GW CFMW-016-GW	Sulfate	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-011a-GW CFMW-016-GW CFMW-019-GW	Orthophosphate as P	UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
CFMW-011a-GW CFMW-016-GW CFMW-019-GW	Total dissolved solids	J (all detects)	A	Duplicate sample analysis (RPD)
CFMW-016-GW CFMW-019-GW	Free cyanide Dissolved free cyanide	J- (all detects) UJ (all non-detects) J- (all detects) UJ (all non-detects)	P	Laboratory control samples (%R)

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 460-136351-1

No Sample Data Qualified in this SDG

Columbia Falls Aluminum Company, Columbia Falls, Montana
Wet Chemistry - Field Blank Data Qualification Summary - SDG 460-136351-1

Sample	Analyte	Modified Final Concentration	A or P
CFMW-011a-GW	Chloride Nitrate/Nitrite as N	808J+ ug/L 208J+ ug/L	A

LDC #: 39068C6

SDG #: 460-136351-1

Laboratory: Test America, Inc.

VALIDATION COMPLETENESS WORKSHEET

Level IV

Date: 7-27-17

Page: 1 of 1

Reviewer: MG

2nd Reviewer: [illegible]

METHOD: (Analyte) Alkalinity (SM2320B), Ammonia-N (EPA Method 350.1), Chloride, Fluoride, Dissolved Fluoride, Sulfate (EPA Method 300.0), Total Cyanide (EPA Method 335.4), Dissolved Total Cyanide (EPA Method 335.4), Free Cyanide, Dissolved Free Cyanide (~~EPA Method 335.4~~), Hardness (SM2340C), Nitrite/Nitrite-N (EPA Method 353.2), Orthophosphate-P (EPA SW846 Method 9056A), TDS (SM2540C), TSS (SM2540D)

MG Free Cyanide Dissolved Free Cyanide (EPA SW846 Method 9016)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	SW	EB=1
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD (SDG: 460-136263-1)
VII.	Duplicate sample analysis	SW	DUP
VIII.	Laboratory control samples	SW	LCS/LCSD/SRM
IX.	Field duplicates	N	
X.	Sample result verification	A	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	CFMW-EB37-AQ	460-136351-1	Water	06/29/17
2	CFMW-011a-GW	460-136351-3	Water	06/29/17
3	CFMW-016-GW	460-136351-4	Water	06/29/17
4	CFMW-019-GW	460-136351-5	Water	06/29/17
5	CFMW-011a-GWMS	460-136351-3MS	Water	06/29/17
6	CFMW-011a-GWMSD	460-136351-3MSD	Water	06/29/17
7	CFMW-011a-GWDUP	460-136351-3DUP	Water	06/29/17
8				
9				
10				
11				
12	PBW1			
13	PBW2			

Notes:

LDC #: 3906BC6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: ✓

Method: Inorganics (EPA Method see cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)	✓			
Were balance checks performed as required? (Level IV only)	✓			
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.		✓		
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?		✓		
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 39068C6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.	✓			
Target analytes were detected in the field blanks.	✓			

LDC #: 39068C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: G

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1	W	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard
2→4	↓	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS dis CN
3, 4		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Free CN dis Free CN
∅C 5, 6		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 dis F dis CN
↓ 7		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4 Hard dis F TSS
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4
		pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+} ClO_4

Comments:

LDC #: 39068C6

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, EPA Method See Cover
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/29/17 Soil factor applied NA
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples: 2

Analyte	Blank ID	Action Limit	Sample Identification									
	1		2									
Cl	167	1670	808J+									
NO3/NO2-N	103	1030	208J+									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with analyte concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 39068C6

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: Q

METHOD: Inorganics, EPA Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications	
1	5/6	water	Cl	123 (90-110)	119 (90-110)		all 2-4	J+ dets/A	(all dets)
	↓	↓	SO4	129 (↓)	130 (↓)		2→3	↓	(det in 2,3)
			diss. F	115 (↓)	115 (↓)		2→4		(all dets)
			PO4-P	65 (↓)	68 (↓)		all 2-4	J-/UJ/A	(all N.D.)

Comments:

LDC #: 39068C6

VALIDATION FINDINGS WORKSHEET
Duplicate Analysis

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a duplicate sample analyzed for each matrix in this SDG?

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water and ≤ 35% for soil samples (≤ 10% for Method 300.0)? If no, see qualification below. A control limit of ±CRDL (±2X CRDL for soil) was used for samples that were ≤5X the CRDL, including when only one of the duplicate sample values were ≤5X the CRDL. If field blanks were used for laboratory duplicates, see overall assessment.

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Duplicate ID	Matrix	Analyte	RPD (Limits)	Associated Samples	Qualifications
1		7	Water	TDS	7 (≤ 5)	2 → 4	J/UJ/A (all dets)

Comments:

LDC #: 39068C6

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a laboratory control sample (LCS) analyzed for each matrix in this SDG?

Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	LCS/LCSD ID	Matrix	Analyte	LCS %R (limits)	LCSD %R (limits)	RPD (limits)	Associated Samples	Qualifications
1	DLCK	Water	Free CN	49 (50-150)			3, 4	J-/UJ/P (det & ND)
2	DLCK	↓	Diss. Free CN	49 (↓)			↓	↓ (↓)

Comments: low level LCS

LCSD.wpd

LDC #: 39068C6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: a

METHOD: Inorganics, Method See cover

The correlation coefficient (r) for the calibration of Free CN was recalculated. Calibration date: 7-6-17

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Abs True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	Free CN	Blank	0 (µg/L)	0.000	r = 0.9996	r = 0.9996	Y
		Standard 1	2 ( )	0.005			
		Standard 2	5 ( )	0.014			
		Standard 3	10 ( )	0.025			
		Standard 4	25 ( )	0.051			
		Standard 5	50 ( )	0.107			
		Standard 6	150 ( )	0.298			
		Standard 7	-	-			
Calibration verification	PO_4-P	1603 CCV	2.50 (mg/L)	2.50 (mg/L)	0.0 %D	0.0 %D	
Calibration verification	NH_3-N	1408 ICV	1.980 (mg/L)	2.00 (mg/L)	99	99	
Calibration verification	NO_3/NO_2-N	1143 CCV1	1.050 (mg/L)	1.00 (mg/L)	105	105	

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068C6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	F	980.6 (µg/L)	1000 (µg/L)	98	98	Y
5	Matrix spike sample	Total CN	(SSR-SR) 190.7 (µg/L)	200 (µg/L)	95	96	↓
7	Duplicate sample	TDS	237.0 (mg/L)	220.0 (mg/L)	7	7	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 39068C6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer: C

METHOD: Inorganics, Method see cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for # 1, Cl reported with a positive detect were recalculated and verified using the following equation:

Concentration = $y = mx + b$

where
$m = 91637.8$
$b = -8763.4$
dil = 1x

Recalculation:
$6538 = 91637.8(x) - 8763.4$
$0.1670\ mg/L = x$

then $(0.1670\ mg/L)(1000\ \mu g/mg) = 167.0\ \mu g/L$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
1	1	Cl	167	167	Y
	↓	NO_3/NO_2-N	103	103	↓
2	2	Hardness	176000	176000	
	↓	TSS	60.1 (mg/L)	60.1 (mg/L)	
3	3	NH_3-N	139	139	
	↓	Alk	183000	183000	
4	4	Free CN	67.8	67.8	
	↓	Diss. Total CN	1250	1250	
		TDS	658 (mg/L)	658 (mg/L)	↓

Note: method 9056A is N.D. for all samples

APPENDIX T

Method Detection Limit Comparison Table

1. Method Detection Limit Comparison Table in Groundwater
2. Method Detection Limit Comparison Table in Surface Water – Human Health Screening Levels
3. Method Detection Limit Comparison Table in Surface Water – Ecological Screening Levels

Appendix T1. Method Detection Limit Comparison Table in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	DEQ 7 HH	Drinking MCL	Tapwater RSL	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 HH	Median MDL> DEQ 7 HH	Mean MDL> EPA MCL	Median MDL> EPA MCL	Count	Detections	Non-Detects
GENCHEM	STL00171	Alkalinity	N																		242	242	0
GENCHEM	7664-41-7	Ammonia	N	72	72	72.00000	72.000														241	85	156
GENCHEM	16887-00-6	Chloride	N	30	31	30.50000	30.500														242	240	2
GENCHEM	16984-48-8	Fluoride	N	15	60	37.50000	37.500	4000	4000	80	80	4000	No	No	No	No	No	No	No	No	242	236	6
GENCHEM	16984-48-8	Fluoride	DI	60	60	60.00000	60.000	4000	4000	80	80	4000	No	No	No	No	No	No	No	No	63	62	1
GENCHEM	STL00009	Hardness as calcium carbonate	N																		242	242	0
GENCHEM	STL00217	Nitrate Nitrite as N	N	100	2000	129.68750	100.000	10000	10000		10000	10000	No	No	No	No	No	No	No	No	241	177	64
GENCHEM	STL00599	Orthophosphate as P	N	42	84	46.58824	48.000														223	2	221
GENCHEM	14808-79-8	Sulfate	N	127	127	127.00000	127.000														242	241	1
GENCHEM	18496-25-8	Sulfide	N																		0	0	0
GENCHEM	STL00242	Total Dissolved Solids	N																		242	242	0
GENCHEM	STL00161	Total Suspended Solids	N	1	1	1.00000	1.0000														242	11	231
METALS	7429-90-5	Aluminum	N	18.2	18.2	18.20000	18.200			2000	2000	2000	No	No	No	No					63	46	17
METALS	7429-90-5	Aluminum	DI	9.1	18.2	18.10471	18.200			2000	2000	2000	No	No	No	No					242	51	191
METALS	7440-36-0	Antimony	N	0.62	0.62	0.62000	0.620	6	6	0.78	0.78	6	No	No	No	No	No	No	No	No	63	9	54
METALS	7440-36-0	Antimony	DI	0.31	0.62	0.61733	0.620	6	6	0.78	0.78	6	No	No	No	No	No	No	No	No	242	10	232
METALS	7440-38-2	Arsenic	N	0.64	0.64	0.64000	0.640	10	10	0.052	0.052	10	Yes	Yes	Yes	Yes	No	No	No	No	63	23	40
METALS	7440-38-2	Arsenic	DI	0.32	0.64	0.63636	0.640	10	10	0.052	0.052	10	Yes	Yes	Yes	Yes	No	No	No	No	242	66	176
METALS	7440-39-3	Barium	N					1000	2000	380	380	2000					No	No	No	No	63	63	0
METALS	7440-39-3	Barium	DI					1000	2000	380	380	2000					No	No	No	No	242	242	0
METALS	7440-41-7	Beryllium	N	0.24	0.24	0.24000	0.240	4	4	2.5	2.5	4	No	No	No	No	No	No	No	No	63	2	61
METALS	7440-41-7	Beryllium	DI	0.12	0.24	0.23901	0.240	4	4	2.5	2.5	4	No	No	No	No	No	No	No	No	242	0	242
METALS	7440-43-9	Cadmium	N	0.71	0.71	0.71000	0.710	5	5	0.92	0.92	5	No	No	No	No	No	No	No	No	63	0	63
METALS	7440-43-9	Cadmium	DI	0.36	0.71	0.70711	0.710	5	5	0.92	0.92	5	No	No	No	No	No	No	No	No	242	0	242
METALS	7440-70-2	Calcium	N																		63	63	0
METALS	7440-70-2	Calcium	DI																		242	242	0
METALS	7440-47-3	Chromium	N	1.3	1.3	1.30000	1.300	100	100	0.035	0.035	100	Yes	Yes	Yes	Yes	No	No	No	No	63	15	48
METALS	7440-47-3	Chromium	DI	0.66	1.3	1.29396	1.300	100	100	0.035	0.035	100	Yes	Yes	Yes	Yes	No	No	No	No	242	30	212
METALS	7440-48-4	Cobalt	N	1.3	1.3	1.30000	1.300			0.6	0.6	0.6	Yes	Yes	Yes	Yes					63	17	46
METALS	7440-48-4	Cobalt	DI	0.65	1.3	1.29667	1.300			0.6	0.6	0.6	Yes	Yes	Yes	Yes					242	47	195
METALS	7440-50-8	Copper	N	1.4	1.4	1.40000	1.400	1300	1300	80	80	1300	No	No	No	No	No	No	No	No	63	32	31
METALS	7440-50-8	Copper	DI	1.4	1.4	1.40000	1.400	1300	1300	80	80	1300	No	No	No	No	No	No	No	No	242	91	151
METALS	STL00131	Cyanide, Free	N	1.5	1.5	1.50000	1.500	200	200	0.15	0.15	200	Yes	Yes	Yes	Yes	No	No	No	No	95	55	40
METALS	STL00131	Cyanide, Free	DI	1.5	1.5	1.50000	1.500	200	200	0.15	0.15	200	Yes	Yes	Yes	Yes	No	No	No	No	51	31	20
METALS	57-12-5	Cyanide, Total	N	2	2	2.00000	2.000	200	200	0.15	0.15	200	Yes	Yes	Yes	Yes	No	No	No	No	242	166	76
METALS	57-12-5	Cyanide, Total	DI	2	2	2.00000	2.000	200	200	0.15	0.15	200	Yes	Yes	Yes	Yes	No	No	No	No	63	39	24
METALS	7439-89-6	Iron	N	42.4	42.4	42.40000	42.400			1400	1400	1400	No	No	No	No					63	57	6
METALS	7439-89-6	Iron	DI	42.4	42.4	42.40000	42.400			1400	1400	1400	No	No	No	No					242	132	110
METALS	7439-92-1	Lead	N	0.38	0.38	0.38000	0.380	15	15	15	15	15	No	No	No	No	No	No	No	No	63	18	45
METALS	7439-92-1	Lead	DI	0.19	0.38	0.37830	0.380	15	15	15	15	15	No	No	No	No	No	No	No	No	242	18	224
METALS	7439-95-4	Magnesium	N	63.6	63.6	63.60000	63.600														63	62	1
METALS	7439-95-4	Magnesium	DI	63.6	63.6	63.60000	63.600														242	226	16
METALS	7439-96-5	Manganese	N	2.5	2.5	2.50000	2.500			43	43	43	No	No	No	No					63	38	25
METALS	7439-96-5	Manganese	DI	1.2	2.5	2.48934	2.500			43	43	43	No	No	No	No					242	120	122
METALS	7439-97-6	Mercury	N	0.17	0.17	0.17000	0.170	2	2	0.063	0.063	2	Yes	Yes	Yes	Yes	No	No	No	No	63	0	63
METALS	7439-97-6	Mercury	DI	0.17	0.17	0.17000	0.170	2	2	0.063	0.063	2	Yes	Yes	Yes	Yes	No	No	No	No	242	0	242
METALS	7440-02-0	Nickel	N	1.4	1.4	1.40000	1.400	100		39	39	100	No	No	No	No	No	No			63	14	49
METALS	7440-02-0	Nickel	DI	0.68	1.4	1.39345	1.400	100		39	39	100	No	No	No	No	No	No			242	22	220
METALS	7440-09-7	Potassium	N																		63	63	0
METALS	7440-09-7	Potassium	DI																		242	242	0
METALS	7782-49-2	Selenium	N	0.73	0.73	0.73000	0.730	50	50	10	10	50	No	No	No	No	No	No	No	No	63	6	57
METALS	7782-49-2	Selenium	DI	0.37	0.73	0.72657	0.730	50	50	10	10	50	No	No	No	No	No	No	No	No	242	32	210
METALS	7440-22-4	Silver	N	1.3	1.3	1.30000	1.300	100		9.4	9.4	100	No	No	No	No	No	No			63	0	63
METALS	7440-22-4	Silver	DI	0.64	1.3	1.29455	1.300	100		9.4	9.4	100	No	No	No	No	No	No			242	0	242
METALS	7440-23-5	Sodium	N																		202	202	0
METALS	7440-23-5	Sodium	DI	69	69	69.00000	69.000														242	241	1
METALS	7440-28-0	Thallium	N	0.26	0.26	0.26000	0.260	2	2	0.02	0.02	2	Yes	Yes	Yes	Yes	No	No	No	No	63	0	63
METALS	7440-28-0	Thallium	DI	0.13	0.26	0.25893	0.260	2	2	0.02	0.02	2	Yes	Yes	Yes	Yes	No	No	No	No	242	0	242
METALS	7440-62-2	Vanadium	N	1.9	1.9	1.90000	1.900			8.6	8.6	8.6	No	No	No	No					63	13	50
METALS	7440-62-2	Vanadium	DI	0.95	1.9	1.89108	1.900			8.6	8.6	8.6	No	No	No	No					242	29	213
METALS	7440-66-6	Zinc	N	7	7	7.00000	7.000	2000		600	600	2000	No	No	No	No	No	No			63	20	43

Appendix T1. Method Detection Limit Comparison Table in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	DEQ 7 HH	Drinking MCL	Tapwater RSL	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 HH	Median MDL> DEQ 7 HH	Mean MDL> EPA MCL	Median MDL> EPA MCL	Count	Detections	Non-Detects
METALS	7440-66-6	Zinc	DI	3.5	7	6.96861	7.000	2000		600	600	2000	No	No	No	No	No	No			242	19	223
SVOC	92-52-4	1,1'-Biphenyl	N	0.63	0.68	0.63773	0.630			0.083	0.083	0.083	Yes	Yes	Yes	Yes					158	0	158
SVOC	95-94-3	1,2,4,5-Tetrachlorobenzene	N	0.43	0.47	0.43534	0.430	0.97		0.17	0.17	0.97	Yes	Yes	Yes	Yes	No	No			158	0	158
SVOC	123-91-1	1,4-Dioxane	N	3.1	3.4	3.13804	3.100			0.46	0.46	0.46	Yes	Yes	Yes	Yes					158	0	158
SVOC	108-60-1	2,2'-oxybis[1-chloropropane]	N	0.93	1	0.94063	0.930	1400			1400	1400	No	No	No	No	No	No			158	0	158
SVOC	58-90-2	2,3,4,6-Tetrachlorophenol	N	0.69	0.75	0.69766	0.690			24	24	24	No	No	No	No					158	0	158
SVOC	95-95-4	2,4,5-Trichlorophenol	N	0.49	0.53	0.49532	0.490	1800		120	120	1800	No	No	No	No	No	No			158	0	158
SVOC	88-06-2	2,4,6-Trichlorophenol	N	0.53	0.58	0.53551	0.530	30		1.2	1.2	30	No	No	No	No	No	No			158	0	158
SVOC	120-83-2	2,4-Dichlorophenol	N	0.63	0.68	0.63747	0.630	77		4.6	4.6	77	No	No	No	No	No	No			158	0	158
SVOC	105-67-9	2,4-Dimethylphenol	N	0.91	0.99	0.92057	0.910	380		36	36	380	No	No	No	No	No	No			158	0	158
SVOC	51-28-5	2,4-Dinitrophenol	N	2.4	2.6	2.42215	2.400	69		3.9	3.9	69	No	No	No	No	No	No			158	0	158
SVOC	121-14-2	2,4-Dinitrotoluene	N	1	1.1	1.02722	1.000	1.1		0.24	0.24	1.1	Yes	Yes	Yes	Yes	No	No			158	0	158
SVOC	606-20-2	2,6-Dinitrotoluene	N	0.88	0.96	0.89044	0.880	0.5		0.049	0.049	0.5	Yes	Yes	Yes	Yes	Yes	Yes			158	0	158
SVOC	91-58-7	2-Chloronaphthalene	N	0.61	0.66	0.61734	0.610	1000			1000	1000	No	No	No	No	No	No			158	0	158
SVOC	95-57-8	2-Chlorophenol	N	0.74	0.8	0.74835	0.740	81		9.1	9.1	81	No	No	No	No	No	No			158	0	158
SVOC	91-57-6	2-Methylnaphthalene	N	0.88	0.96	0.89044	0.880			3.6	3.6	3.6	No	No	No	No					158	0	158
SVOC	95-48-7	2-Methylphenol	N	1.3	1.4	1.30443	1.300														158	0	158
SVOC	88-74-4	2-Nitroaniline	N	0.65	0.71	0.65759	0.650			19	19	19	No	No	No	No					158	0	158
SVOC	88-75-5	2-Nitrophenol	N	0.59	0.64	0.59620	0.590														158	0	158
SVOC	15831-10-4	3 & 4 Methylphenol	N	0.88	0.96	0.89032	0.880														158	3	155
SVOC	91-94-1	3,3'-Dichlorobenzidine	N	1	1.1	1.02722	1.000	0.21		0.13	0.13	0.21	Yes	Yes	Yes	Yes	Yes	Yes			158	0	158
SVOC	99-09-2	3-Nitroaniline	N	0.82	0.89	0.82905	0.820														158	0	158
SVOC	534-52-1	4,6-Dinitro-2-methylphenol	N	2	2.2	2.02739	2.000	13			13	13	No	No	No	No	No	No			158	1	157
SVOC	101-55-3	4-Bromophenyl phenyl ether	N	1	1.1	1.02215	1.000														158	0	158
SVOC	59-50-7	4-Chloro-3-methylphenol	N	0.76	0.83	0.76854	0.760	3000			3000	3000	No	No	No	No	No	No			158	0	158
SVOC	106-47-8	4-Chloroaniline	N	0.73	0.79	0.73791	0.730			0.37	0.37	0.37	Yes	Yes	Yes	Yes					158	0	158
SVOC	7005-72-3	4-Chlorophenyl phenyl ether	N	0.96	1	0.96994	0.960														158	0	158
SVOC	100-01-6	4-Nitroaniline	N	0.48	0.52	0.48532	0.480			3.8	3.8	3.8	No	No	No	No					158	0	158
SVOC	100-02-7	4-Nitrophenol	N	4.7	5.1	4.73291	4.700	60			60	60	No	No	No	No	No	No			158	0	158
SVOC	83-32-9	Acenaphthene	N	0.88	0.96	0.89044	0.880	670		53	53	670	No	No	No	No	No	No			158	0	158
SVOC	208-96-8	Acenaphthylene	N	0.65	0.71	0.65759	0.650														158	0	158
SVOC	98-86-2	Acetophenone	N	1	1.1	1.02722	1.000			190	190	190	No	No	No	No					158	0	158
SVOC	120-12-7	Anthracene	N	0.57	0.62	0.57614	0.570	2100		180	180	2100	No	No	No	No	No	No			158	0	158
SVOC	1912-24-9	Atrazine	N	0.77	0.84	0.77905	0.770	3	3	0.3	0.3	3	Yes	Yes	Yes	Yes	No	No	No	No	158	0	158
SVOC	100-52-7	Benzaldehyde	N	0.86	0.93	0.87025	0.860			190	190	190	No	No	No	No					158	0	158
SVOC	56-55-3	Benzo[a]anthracene	N	0.55	0.6	0.55614	0.550	0.5			0.5	0.5	Yes	Yes	Yes	Yes	Yes	Yes			158	0	158
SVOC	50-32-8	Benzo[a]pyrene	N	0.16	0.17	0.16222	0.160	0.05	0.2	0.0034	0.0034	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	158	0	158
SVOC	205-99-2	Benzo[b]fluoranthene	N	0.44	0.48	0.44519	0.440	0.5		0.034	0.034	0.5	Yes	Yes	Yes	Yes	No	No			158	0	158
SVOC	191-24-2	Benzo[g,h,i]perylene	N	0.75	0.82	0.75842	0.750														158	0	158
SVOC	207-08-9	Benzo[k]fluoranthene	N	0.18	0.2	0.18228	0.180	5		0.34	0.34	5	No	No	No	No	No	No			158	0	158
SVOC	111-91-1	Bis(2-chloroethoxy)methane	N	0.69	0.75	0.69766	0.690			5.9	5.9	5.9	No	No	No	No					158	0	158
SVOC	111-44-4	Bis(2-chloroethyl)ether	N	0.12	0.13	0.12209	0.120	0.3		0.014	0.014	0.3	Yes	Yes	Yes	Yes	No	No			158	0	158
SVOC	117-81-7	Bis(2-ethylhexyl) phthalate	N	0.72	0.78	0.72783	0.720	6	6	5.6	5.6	6	No	No	No	No	No	No	No	No	158	6	152
SVOC	85-68-7	Butyl benzyl phthalate	N	0.6	0.65	0.60734	0.600	1500		16	16	1500	No	No	No	No	No	No			158	0	158
SVOC	105-60-2	Caprolactam	N	1.1	1.1	1.10000	1.100			990	990	990	No	No	No	No					158	0	158
SVOC	86-74-8	Carbazole	N	0.85	0.92	0.86025	0.850														158	0	158
SVOC	218-01-9	Chrysene	N	0.67	0.73	0.67766	0.670	50		3.4	3.4	50	No	No	No	No	No	No			158	0	158
SVOC	53-70-3	Dibenz(a,h)anthracene	N	0.09	0.098	0.09106	0.090	0.05		0.0034	0.0034	0.05	Yes	Yes	Yes	Yes	Yes	Yes			158	0	158
SVOC	132-64-9	Dibenzofuran	N	0.85	0.92	0.86025	0.850			0.79	0.79	0.79	Yes	Yes	Yes	Yes					158	0	158
SVOC	84-66-2	Diethyl phthalate	N	1	1.1	1.00443	1.000	17000			17000	17000	No	No	No	No	No	No			158	0	158
SVOC	131-11-3	Dimethyl phthalate	N	0.98	1.1	0.98620	0.980	270000			270000	270000	No	No	No	No	No	No			158	0	158
SVOC	84-74-2	Di-n-butyl phthalate	N	0.82	0.89	0.82923	0.820	2000			2000	2000	No	No	No	No	No	No			158	3	155
SVOC	117-84-0	Di-n-octyl phthalate	N	0.69	0.75	0.69766	0.690			20	20	20	No	No	No	No					158	0	158
SVOC	206-44-0	Fluoranthene	N	0.72	0.78	0.72791	0.720	130		80	80	130	No	No	No	No	No	No			158	0	158
SVOC	86-73-7	Fluorene	N	0.8	0.87	0.80905	0.800	1100		29	29	1100	No	No	No	No	No	No			158	0	158
SVOC	118-74-1	Hexachlorobenzene	N	0.47	0.51	0.47532	0.470	0.2	1	0.0098	0.0098	1	Yes	Yes	Yes	Yes	Yes	Yes	No	No	158	0	158
SVOC	87-68-3	Hexachlorobutadiene	N	0.76	0.83	0.76854	0.760	5		0.14	0.14	5	Yes	Yes	Yes	Yes	No	No			158	0	158
SVOC	77-47-4	Hexachlorocyclopentadiene	N	0.61	0.66	0.61734	0.610	50	50	0.041	0.041	50	Yes	Yes	Yes	Yes	No	No	No	No	158	0	158
SVOC	67-72-1	Hexachloroethane	N	0.09	0.098	0.09106	0.090	30		0.33	0.33	30	No	No	No	No	No	No			158	0	158
SVOC	193-39-5	Indeno[1,2,3-cd]pyrene	N	0.21	0.23	0.21228	0.210	0.5		0.034	0.034	0.5	Yes	Yes	Yes	Yes	No	No			158	0	158
SVOC	78-59-1	Isophorone	N	0.67	0.73	0.67766	0.670	400		78	78	400	No	No	No	No	No	No			158	0	158

Appendix T1. Method Detection Limit Comparison Table in Groundwater
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	DEQ 7 HH	Drinking MCL	Tapwater RSL	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 HH	Median MDL> DEQ 7 HH	Mean MDL> EPA MCL	Median MDL> EPA MCL	Count	Detections	Non-Detects
SVOC	91-20-3	Naphthalene	N	0.8	0.87	0.80905	0.800	100		0.17	0.17	100	Yes	Yes	Yes	Yes	No	No			158	0	158
SVOC	98-95-3	Nitrobenzene	N	0.49	0.53	0.49532	0.490	17		0.14	0.14	17	Yes	Yes	Yes	Yes	No	No			158	0	158
SVOC	621-64-7	N-Nitrosodi-n-propylamine	N	0.83	0.9	0.83911	0.830	0.5		0.011	0.011	0.5	Yes	Yes	Yes	Yes	Yes	Yes			158	0	158
SVOC	86-30-6	N-Nitrosodiphenylamine	N	0.74	0.8	0.74835	0.740	33		12	12	33	No	No	No	No	No	No			158	0	158
SVOC	87-86-5	Pentachlorophenol	N	2.2	2.4	2.22229	2.200	1	1	0.041	0.041	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	157	0	157
SVOC	85-01-8	Phenanthrene	N	0.65	0.71	0.65759	0.650														158	0	158
SVOC	108-95-2	Phenol	N	0.41	0.45	0.41519	0.410	300		580	300	580	No	No	No	No	No	No			158	2	156
SVOC	129-00-0	Pyrene	N	0.83	0.9	0.83911	0.830	830		12	12	830	No	No	No	No	No	No			158	0	158
VOC	71-55-6	1,1,1-Trichloroethane	N	0.28	0.28	0.28000	0.280	200	200	800	200	800	No	No	No	No	No	No	No	No	158	4	154
VOC	79-34-5	1,1,2,2-Tetrachloroethane	N	0.19	0.19	0.19000	0.190	2			2	2	No	No	No	No	No	No			158	0	158
VOC	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	N	0.34	0.34	0.34000	0.340			5500	5500	5500	No	No	No	No					158	0	158
VOC	79-00-5	1,1,2-Trichloroethane	N	0.08	0.08	0.08000	0.080	3			3	3	No	No	No	No	No	No			158	0	158
VOC	75-34-3	1,1-Dichloroethane	N	0.24	0.24	0.24000	0.240	4		2.8	2.8	4	No	No	No	No	No	No			158	4	154
VOC	75-35-4	1,1-Dichloroethene	N	0.34	0.34	0.34000	0.340	7			7	7	No	No	No	No	No	No			158	0	158
VOC	87-61-6	1,2,3-Trichlorobenzene	N	0.35	0.35	0.35000	0.350	0.7		0.7	0.7	0.7	No	No	No	No	No	No			158	0	158
VOC	120-82-1	1,2,4-Trichlorobenzene	N	0.27	0.27	0.27000	0.270	70		0.4	0.4	70	No	No	No	No	No	No			158	0	158
VOC	96-12-8	1,2-Dibromo-3-Chloropropane	N	0.23	0.23	0.23000	0.230	0.2	0.2	0.00033	0.00033	0.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	158	0	158
VOC	95-50-1	1,2-Dichlorobenzene	N	0.22	0.22	0.22000	0.220	600	600	30	30	600	No	No	No	No	No	No	No	No	158	0	158
VOC	107-06-2	1,2-Dichloroethane	N	0.25	0.25	0.25000	0.250	4	5	0.17	0.17	5	Yes	Yes	Yes	Yes	No	No	No	No	158	1	157
VOC	78-87-5	1,2-Dichloropropane	N	0.18	0.18	0.18000	0.180	5	5	0.44	0.44	5	No	No	No	No	No	No	No	No	158	0	158
VOC	541-73-1	1,3-Dichlorobenzene	N	0.33	0.33	0.33000	0.330	600			600	600	No	No	No	No	No	No			158	0	158
VOC	106-46-7	1,4-Dichlorobenzene	N	0.33	0.33	0.33000	0.330	75	75	0.48	0.48	75	No	No	No	No	No	No	No	No	158	0	158
VOC	78-93-3	2-Butanone (MEK)	N	2.2	2.2	2.20000	2.200			560	560	560	No	No	No	No					158	1	157
VOC	591-78-6	2-Hexanone	N	0.72	0.72	0.72000	0.720			3.8	3.8	3.8	No	No	No	No					158	0	158
VOC	108-10-1	4-Methyl-2-pentanone (MIBK)	N	0.63	0.63	0.63000	0.630			630	630	630	No	No	No	No					158	0	158
VOC	67-64-1	Acetone	N	1.1	1.1	1.10000	1.100			1400	1400	1400	No	No	No	No					158	13	145
VOC	71-43-2	Benzene	N	0.09	0.09	0.09000	0.090	5	5	0.46	0.46	5	No	No	No	No	No	No	No	No	158	4	154
VOC	75-25-2	Bromoform	N	0.18	0.18	0.18000	0.180	80	80	3.3	3.3	80	No	No	No	No	No	No	No	No	158	0	158
VOC	74-83-9	Bromomethane	N	0.18	0.18	0.18000	0.180	10		0.75	0.75	10	No	No	No	No	No	No			158	0	158
VOC	75-15-0	Carbon disulfide	N	0.22	0.22	0.22000	0.220			81	81	81	No	No	No	No					158	2	156
VOC	56-23-5	Carbon tetrachloride	N	0.33	0.33	0.33000	0.330	3	5	0.46	0.46	5	No	No	No	No	No	No	No	No	158	0	158
VOC	108-90-7	Chlorobenzene	N	0.24	0.24	0.24000	0.240	100	100	7.8	7.8	100	No	No	No	No	No	No	No	No	158	0	158

Appendix T2. Method Detection Limit Comparison Table in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	DEQ 7 HH	Drinking MCL	Tapwater RSL	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 HH	Median MDL> DEQ 7 HH	Mean MDL> EPA MCL	Median MDL> EPA MCL	Count	Detections	Non-Detects
GENCHEM	STL00171	Alkalinity	N																		88	55	0
GENCHEM	7664-41-7	Ammonia	N	23	72	68.23077	72.0000														88	10	78
GENCHEM	16887-00-6	Chloride	N																		88	88	0
GENCHEM	16984-48-8	Fluoride	N					4000	4000	80	80	4000									88	88	0
GENCHEM	STL00009	Hardness as calcium carbonate	N																		88	88	0
GENCHEM	STL00217	Nitrate Nitrite as N	N	100	100	100.00000	100.0000	10000	10000		10000	10000	No	No	No	No	No	No	No	No	88	46	42
GENCHEM	STL00599	Orthophosphate as P	N	42	48	46.98592	48.0000														71	0	71
GENCHEM	14808-79-8	Sulfate	N																		88	88	0
GENCHEM	18496-25-8	Sulfide	N	579	579	579.00000	579.0000														23	0	23
GENCHEM	STL00242	Total Dissolved Solids	N																		88	88	0
GENCHEM	STL00161	Total Suspended Solids	N	1	1	1.00000	1.0000														88	76	12
METALS	7429-90-5	Aluminum	N	13.5	18.2	17.86429	18.2000			2000	2000	2000	No	No	No	No					88	74	14
METALS	7429-90-5	Aluminum	DI	2000	18.2	18.20000	18.2000			2000	2000	2000	No	No	No	No					23	1	22
METALS	7440-36-0	Antimony	N	0.62	0.76	0.63750	0.6200	5.6	6	0.78	0.78	6	No	No	No	No	No	No	No	No	88	8	80
METALS	7440-36-0	Antimony	DI	0.62	0.62	0.62000	0.6200	5.6	6	0.78	0.78	6	No	No	No	No	No	No	No	No	23	1	22
METALS	7440-38-2	Arsenic	N	0.64	0.71	0.64467	0.6400	10	10	0.052	0.052	10	Yes	Yes	Yes	Yes	No	No	No	No	88	13	75
METALS	7440-38-2	Arsenic	DI	0.64	0.64	0.64000	0.6400	10	10	0.052	0.052	10	Yes	Yes	Yes	Yes	No	No	No	No	23	3	20
METALS	7440-39-3	Barium	N					1000	2000	380	380	2000									88	88	0
METALS	7440-39-3	Barium	DI					1000	2000	380	380	2000									23	23	0
METALS	7440-41-7	Beryllium	N	0.24	0.29	0.24575	0.2400	4	4	2.5	2.5	4	No	No	No	No	No	No	No	No	88	1	87
METALS	7440-41-7	Beryllium	DI	0.24	0.24	0.24000	0.2400	4	4	2.5	2.5	4	No	No	No	No	No	No	No	No	23	1	22
METALS	7440-43-9	Cadmium	N	0.71	0.72	0.71115	0.7100	5	5	0.92	0.92	5	No	No	No	No	No	No	No	No	88	1	87
METALS	7440-43-9	Cadmium	DI	0.71	0.71	0.71000	0.7100	5	5	0.92	0.92	5	No	No	No	No	No	No	No	No	23	1	22
METALS	7440-70-2	Calcium	N																		88	88	0
METALS	7440-70-2	Calcium	DI																		23	23	0
METALS	7440-47-3	Chromium	N	1.3	1.5	1.32105	1.3000	100	100	0.035	0.035	0.035	Yes	Yes	Yes	Yes	No	No	No	No	88	12	76
METALS	7440-47-3	Chromium	DI	1.3	1.3	1.30000	1.3000	100	100	0.035	0.035	0.035	Yes	Yes	Yes	Yes	No	No	No	No	23	0	23
METALS	7440-48-4	Cobalt	N	1.3	1.5	1.32410	1.3000			0.6	0.6	0.6	Yes	Yes	Yes	Yes					88	5	83
METALS	7440-48-4	Cobalt	DI	1.3	1.3	1.30000	1.3000			0.6	0.6	0.6	Yes	Yes	Yes	Yes					23	0	23
METALS	7440-50-8	Copper	N	1.4	1.6	1.41000	1.4000	1300	1300	80	80	1300	No	No	No	No	No	No	No	No	88	28	60
METALS	7440-50-8	Copper	DI	1.4	1.4	1.40000	1.4000	1300	1300	80	80	1300	No	No	No	No	No	No	No	No	23	3	20
METALS	STL00131	Cyanide, Free	N	1.5	1.5	1.50000	1.5000	140	200	0.15	0.15	200	Yes	Yes	Yes	Yes	No	No	No	No	14	7	7
METALS	STL00131	Cyanide, Free	DI	1.5	1.5	1.50000	1.5000	140	200	0.15	0.15	200	Yes	Yes	Yes	Yes	No	No	No	No	7	5	2
METALS	57-12-5	Cyanide, Total	N	2	4	2.26866	2.0000	140	200	0.15	0.15	200	Yes	Yes	Yes	Yes	No	No	No	No	88	21	67
METALS	57-12-5	Cyanide, Total	DI	2	2	2.00000	2.0000	140	200	0.15	0.15	200	Yes	Yes	Yes	Yes	No	No	No	No	23	5	18
METALS	7439-89-6	Iron	N	42.4	49.1	43.02326	42.4000			1400	1400	1400	No	No	No	No					88	45	43
METALS	7439-89-6	Iron	DI	42.4	42.4	42.40000	42.4000			1400	1400	1400	No	No	No	No					23	3	20
METALS	7439-92-1	Lead	N	0.38	0.44	0.38909	0.3800	15	15	15	15	15	No	No	No	No	No	No	No	No	88	22	66
METALS	7439-92-1	Lead	DI	0.38	0.38	0.38000	0.3800	15	15	15	15	15	No	No	No	No	No	No	No	No	23	0	23
METALS	7439-95-4	Magnesium	N																		88	88	0
METALS	7439-95-4	Magnesium	DI																		23	23	0
METALS	7439-96-5	Manganese	N	2.5	3	2.55556	2.5000			43	43	43	No	No	No	No					88	70	18
METALS	7439-96-5	Manganese	DI	2.5	2.5	2.50000	2.5000			43	43	43	No	No	No	No					23	12	11
METALS	7439-97-6	Mercury	N	0.14	0.17	0.16659	0.1700	0.05	2	0.063	0.05	2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	88	0	88
METALS	7439-97-6	Mercury	DI	0.17	0.17	0.17000	0.1700	0.05	2	0.063	0.05	2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	23	0	23
METALS	7440-02-0	Nickel	N	1.4	1.6	1.42469	1.4000	100		39	39	100	No	No	No	No	No	No			88	7	81
METALS	7440-02-0	Nickel	DI	1.4	1.4	1.40000	1.4000	100		39	39	100	No	No	No	No	No	No			23	2	21
METALS	7440-09-7	Potassium	N																		88	88	0
METALS	7440-09-7	Potassium	DI																		23	23	0
METALS	7782-49-2	Selenium	N	0.73	0.79	0.73682	0.7300	50	50	10	10	50	No	No	No	No	No	No	No	No	88	0	88
METALS	7782-49-2	Selenium	DI	0.73	0.73	0.73000	0.7300	50	50	10	10	50	No	No	No	No	No	No	No	No	23	0	23
METALS	7440-22-4	Silver	N	1.3	1.5	1.32273	1.3000	100		9.4	9.4	100	No	No	No	No	No	No			88	0	88
METALS	7440-22-4	Silver	DI	1.3	1.3	1.30000	1.3000	100		9.4	9.4	100	No	No	No	No	No	No			23	0	23
METALS	7440-23-5	Sodium	N																		88	88	0
METALS	7440-23-5	Sodium	DI																		23	23	0
METALS	7440-28-0	Thallium	N	0.26	0.31	0.26575	0.2600	0.24	2	0.02	0.02	2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	88	1	87
METALS	7440-28-0	Thallium	DI	0.26	0.26	0.26000	0.2600	0.24	2	0.02	0.02	2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	23	0	23
METALS	7440-62-2	Vanadium	N	1.9	1.9	1.90000	1.9000			8.6	8.6	8.6	No	No	No	No					88	15	73
METALS	7440-62-2	Vanadium	DI	1.9	1.9	1.90000	1.9000			8.6	8.6	8.6	No	No	No	No					23	1	22
METALS	7440-66-6	Zinc	N	6.5	7	6.93506	7.0000	2000		600	600	2000	No	No	No	No	No	No			88	11	77
METALS	7440-66-6	Zinc	DI	7	7	7.00000	7.0000	2000		600	600	2000	No	No	No	No	No	No			23	1	22
OC_PEST	72-54-8	4,4'-DDD	N	0.005	0.006	0.00525	0.0050	0.0031		0.032	0.0031	0.032	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4

Appendix T2. Method Detection Limit Comparison Table in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	DEQ 7 HH	Drinking MCL	Tapwater RSL	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 HH	Median MDL> DEQ 7 HH	Mean MDL> EPA MCL	Median MDL> EPA MCL	Count	Detections	Non-Detects
OC_PEST	72-55-9	4,4'-DDE	N	0.002	0.004	0.00350	0.0040	0.0022		0.046	0.0022	0.046	No	Yes	Yes	Yes	Yes	Yes			4	0	4
OC_PEST	50-29-3	4,4'-DDT	N	0.004	0.004	0.00400	0.0040	0.0022		0.23	0.0022	0.23	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
OC_PEST	309-00-2	Aldrin	N	0.003	0.004	0.00375	0.0040	0.00049		0.00092	0.00049	0.00092	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
OC_PEST	319-84-6	alpha-BHC	N	0.006	0.007	0.00625	0.0060	0.026		0.0072	0.0072	0.026	No	No	No	No	No	No			4	0	4
OC_PEST	5103-71-9	alpha-Chlordane	N	0.002	0.004	0.00350	0.0040	0.008			0.008	0.008	No	No	No	No	No	No			4	0	4
OC_PEST	319-85-7	beta-BHC	N	0.004	0.005	0.00475	0.0050	0.091		0.025	0.025	0.091	No	No	No	No	No	No			4	0	4
OC_PEST	319-86-8	delta-BHC	N	0.005	0.006	0.00575	0.0060														4	0	4
OC_PEST	60-57-1	Dieldrin	N	0.003	0.004	0.00375	0.0040	0.00052		0.0018	0.00052	0.0018	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
OC_PEST	959-98-8	Endosulfan I	N	0.002	0.005	0.00425	0.0050	62			62	62	No	No	No	No	No	No			4	0	4
OC_PEST	33213-65-9	Endosulfan II	N	0.004	0.004	0.00400	0.0040	62			62	62	No	No	No	No	No	No			4	0	4
OC_PEST	1031-07-8	Endosulfan sulfate	N	0.005	0.006	0.00525	0.0050	62			62	62	No	No	No	No	No	No			4	0	4
OC_PEST	72-20-8	Endrin	N	0.004	0.004	0.00400	0.0040	0.059	2	0.23	0.059	2	No	No	No	No	No	No	No	No	4	0	4
OC_PEST	7421-93-4	Endrin aldehyde	N	0.004	0.008	0.00500	0.0040	0.29			0.29	0.29	No	No	No	No	No	No			4	0	4
OC_PEST	53494-70-5	Endrin ketone	N	0.004	0.008	0.00500	0.0040														4	0	4
OC_PEST	58-89-9	gamma-BHC (Lindane)	N	0.004	0.012	0.00600	0.0040	0.2	0.2	0.042	0.042	0.2	No	No	No	No	No	No	No	No	4	0	4
OC_PEST	5103-74-2	gamma-Chlordane	N	0.003	0.005	0.00450	0.0050														4	0	4
OC_PEST	76-44-8	Heptachlor	N	0.003	0.004	0.00375	0.0040	0.00079	0.4	0.0014	0.00079	0.4	Yes	Yes	Yes	Yes	Yes	Yes	No	No	4	0	4
OC_PEST	1024-57-3	Heptachlor epoxide	N	0.004	0.005	0.00425	0.0040	0.00039	0.2	0.0014	0.00039	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	4	0	4
OC_PEST	72-43-5	Methoxychlor	N	0.004	0.004	0.00400	0.0040	40	40	3.7	3.7	40	No	No	No	No	No	No	No	No	4	0	4
OC_PEST	8001-35-2	Toxaphene	N	0.06	0.11	0.07250	0.0600	0.0028	3	0.071	0.0028	3	Yes	Yes	Yes	Yes	Yes	Yes	No	No	4	0	4
PCB	12674-11-2	Aroclor 1016	N	0.098	0.1	0.09850	0.0980	0.00064		0.14	0.00064	0.14	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
PCB	11104-28-2	Aroclor 1221	N	0.098	0.1	0.09850	0.0980	0.00064		0.0047	0.00064	0.0047	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
PCB	11141-16-5	Aroclor 1232	N	0.098	0.1	0.09850	0.0980	0.00064		0.0047	0.00064	0.0047	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
PCB	53469-21-9	Aroclor 1242	N	0.098	0.1	0.09850	0.0980	0.00064		0.0078	0.00064	0.0078	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
PCB	12672-29-6	Aroclor 1248	N	0.098	0.1	0.09850	0.0980	0.00064		0.0078	0.00064	0.0078	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
PCB	11097-69-1	Aroclor 1254	N	0.084	0.099	0.08775	0.0840	0.00064		0.0078	0.00064	0.0078	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
PCB	11096-82-5	Aroclor 1260	N	0.084	0.099	0.08775	0.0840	0.00064		0.0078	0.00064	0.0078	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
PCB	11100-14-4	Aroclor 1268	N	0.084	0.099	0.08775	0.0840	0.00064			0.00064	0.00064	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
PCB	37324-23-5	Aroclor-1262	N	0.084	0.099	0.08775	0.0840														4	0	4
PCB	1336-36-3	Polychlorinated biphenyls, Total	N	0.098	0.1	0.09850	0.0980	0.00064			0.00064	0.00064	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
SVOC	92-52-4	1,1'-Biphenyl	N	0.63	0.68	0.65000	0.6450			0.083	0.083	0.083	Yes	Yes	Yes	Yes					4	0	4
SVOC	95-94-3	1,2,4,5-Tetrachlorobenzene	N	0.43	0.47	0.44500	0.4400	0.97		0.17	0.17	0.97	Yes	Yes	Yes	Yes	No	No			4	0	4
SVOC	123-91-1	1,4-Dioxane	N	3.1	3.4	3.20000	3.1500			0.46	0.46	0.46	Yes	Yes	Yes	Yes					4	0	4
SVOC	108-60-1	2,2'-oxybis[1-chloropropane]	N	0.93	1	0.95750	0.9500	1400			1400	1400	No	No	No	No	No	No			4	0	4
SVOC	58-90-2	2,3,4,6-Tetrachlorophenol	N	0.69	0.75	0.71250	0.7050			24	24	24	No	No	No	No					4	0	4
SVOC	95-95-4	2,4,5-Trichlorophenol	N	0.49	0.53	0.50500	0.5000	1800		120	120	1800	No	No	No	No	No	No			4	0	4
SVOC	88-06-2	2,4,6-Trichlorophenol	N	0.53	0.58	0.54750	0.5400	14		1.2	1.2	14	No	No	No	No	No	No			4	0	4
SVOC	120-83-2	2,4-Dichlorophenol	N	0.63	0.68	0.65000	0.6450	77		4.6	4.6	77	No	No	No	No	No	No			4	0	4
SVOC	105-67-9	2,4-Dimethylphenol	N	0.91	0.99	0.94000	0.9300	380		36	36	380	No	No	No	No	No	No			4	0	4
SVOC	51-28-5	2,4-Dinitrophenol	N	2.4	2.6	2.47500	2.4500	69		3.9	3.9	69	No	No	No	No	No	No			4	0	4
SVOC	121-14-2	2,4-Dinitrotoluene	N	1	1.1	1.05000	1.0500	1.1		0.24	0.24	1.1	Yes	Yes	Yes	Yes	No	No			4	0	4
SVOC	606-20-2	2,6-Dinitrotoluene	N	0.88	0.96	0.91000	0.9000	0.5		0.049	0.049	0.5	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
SVOC	91-58-7	2-Chloronaphthalene	N	0.61	0.66	0.63000	0.6250	1000			1000	1000	No	No	No	No	No	No			4	0	4
SVOC	95-57-8	2-Chlorophenol	N	0.74	0.8	0.76250	0.7550	81		9.1	9.1	81	No	No	No	No	No	No			4	0	4
SVOC	91-57-6	2-Methylnaphthalene	N	0.88	0.96	0.91000	0.9000			3.6	3.6	3.6	No	No	No	No					4	0	4
SVOC	95-48-7	2-Methylphenol	N	1.3	1.4	1.32500	1.3000														4	0	4
SVOC	88-74-4	2-Nitroaniline	N	0.65	0.71	0.67250	0.6650			19	19	19	No	No	No	No					4	0	4
SVOC	88-75-5	2-Nitrophenol	N	0.59	0.64	0.60750	0.6000														4	0	4
SVOC	15831-10-4	3 & 4 Methylphenol	N	0.88	0.96	0.91000	0.9000														4	0	4
SVOC	91-94-1	3,3'-Dichlorobenzidine	N	1	1.1	1.05000	1.0500	0.21		0.13	0.13	0.21	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
SVOC	99-09-2	3-Nitroaniline	N	0.82	0.89	0.84500	0.8350														4	0	4
SVOC	534-52-1	4,6-Dinitro-2-methylphenol	N	2	2.2	2.07500	2.0500	13			13	13	No	No	No	No	No	No			4	0	4
SVOC	101-55-3	4-Bromophenyl phenyl ether	N	1	1.1	1.05000	1.0500														4	0	4
SVOC	59-50-7	4-Chloro-3-methylphenol	N	0.76	0.83	0.78500	0.7750	3000			3000	3000	No	No	No	No	No	No			4	0	4
SVOC	106-47-8	4-Chloroaniline	N	0.73	0.79	0.75250	0.7450			0.37	0.37	0.37	Yes	Yes	Yes	Yes					4	0	4
SVOC	7005-72-3	4-Chlorophenyl phenyl ether	N	0.96	1	0.98000	0.9800														4	0	4
SVOC	100-01-6	4-Nitroaniline	N	0.48	0.52	0.49500	0.4900			3.8	3.8	3.8	No	No	No	No					4	0	4
SVOC	100-02-7	4-Nitrophenol	N	4.7	5.1	4.82500	4.7500	60			60	60	No	No	No	No	No	No			4	0	4
SVOC	83-32-9	Acenaphthene	N	0.88	0.96	0.91000	0.9000	670		53	53	670	No	No	No	No	No	No			4	0	4
SVOC	208-96-8	Acenaphthylene	N	0.65	0.71	0.67250	0.6650														4	0	4
SVOC	98-86-2	Acetophenone	N	1	1.1	1.05000	1.0500			190	190	190	No	No	No	No					4	0	4
SVOC	120-12-7	Anthracene	N	0.57	0.62	0.58750	0.5800	8300		180	180	8300	No	No	No	No	No	No			4	0	4

Appendix T2. Method Detection Limit Comparison Table in Surface Water – Human Health Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	DEQ 7 HH	Drinking MCL	Tapwater RSL	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 HH	Median MDL> DEQ 7 HH	Mean MDL> EPA MCL	Median MDL> EPA MCL	Count	Detections	Non-Detects
SVOC	1912-24-9	Atrazine	N	0.77	0.84	0.79500	0.7850	3	3	0.3	0.3	3	Yes	Yes	Yes	Yes	No	No	No	No	4	0	4
SVOC	100-52-7	Benzaldehyde	N	0.86	0.93	0.88750	0.8800			19	19	19	No	No	No	No					4	0	4
SVOC	56-55-3	Benzo[a]anthracene	N	0.55	0.6	0.57333	0.5700	0.038			0.038	0.038	Yes	Yes	Yes	Yes	Yes	Yes			4	1	3
SVOC	50-32-8	Benzo[a]pyrene	N	0.16	0.17	0.16667	0.1700	0.038	0.2	0.0034	0.0034	0.2	Yes	Yes	Yes	Yes	Yes	Yes	No	No	4	1	3
SVOC	205-99-2	Benzo[b]fluoranthene	N	0.44	0.48	0.46000	0.4600	0.038		0.034	0.034	0.038	Yes	Yes	Yes	Yes	Yes	Yes			4	1	3
SVOC	191-24-2	Benzo[g,h,i]perylene	N	0.75	0.82	0.78333	0.7800														4	1	3
SVOC	207-08-9	Benzo[k]fluoranthene	N	0.18	0.2	0.18750	0.1850	0.038		0.34	0.038	0.34	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
SVOC	111-91-1	Bis(2-chloroethoxy)methane	N	0.69	0.75	0.71250	0.7050			5.9	5.9	5.9	No	No	No	No					4	0	4
SVOC	111-44-4	Bis(2-chloroethyl)ether	N	0.12	0.13	0.12500	0.1250	0.3		0.014	0.014	0.3	Yes	Yes	Yes	Yes	No	No			4	0	4
SVOC	117-81-7	Bis(2-ethylhexyl) phthalate	N	0.72	0.78	0.74250	0.7350	6	6	5.6	5.6	6	No	No	No	No	No	No	No	No	4	0	4
SVOC	85-68-7	Butyl benzyl phthalate	N	0.6	0.65	0.62000	0.6150	1500		16	16	1500	No	No	No	No	No	No			4	0	4
SVOC	105-60-2	Caprolactam	N	1.1	1.1	1.10000	1.1000			990	990	990	No	No	No	No					4	0	4
SVOC	86-74-8	Carbazole	N	0.85	0.92	0.87750	0.8700														4	0	4
SVOC	218-01-9	Chrysene	N	0.67	0.73	0.70000	0.7000	0.038		3.4	0.038	3.4	Yes	Yes	Yes	Yes	Yes	Yes			4	1	3
SVOC	53-70-3	Dibenz(a,h)anthracene	N	0.09	0.098	0.09300	0.0920	0.038		0.0034	0.0034	0.038	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
SVOC	132-64-9	Dibenzofuran	N	0.85	0.92	0.87750	0.8700			0.79	0.79	0.79	Yes	Yes	Yes	Yes					4	0	4
SVOC	84-66-2	Diethyl phthalate	N	1	1.1	1.02500	1.0000	17000			17000	17000	No	No	No	No	No	No			4	0	4
SVOC	131-11-3	Dimethyl phthalate	N	0.98	1.1	1.01500	0.9900	270000			270000	270000	No	No	No	No	No	No			4	0	4
SVOC	84-74-2	Di-n-butyl phthalate	N	0.82	0.89	0.84500	0.8350	2000			2000	2000	No	No	No	No	No	No			4	0	4
SVOC	117-84-0	Di-n-octyl phthalate	N	0.69	0.75	0.71250	0.7050			20	20	20	No	No	No	No					4	0	4
SVOC	206-44-0	Fluoranthene	N	0.72	0.78	0.75000	0.7500	130		80	80	130	No	No	No	No	No	No			4	1	3
SVOC	86-73-7	Fluorene	N	0.8	0.87	0.82500	0.8150	1100		29	29	1100	No	No	No	No	No	No			4	0	4
SVOC	118-74-1	Hexachlorobenzene	N	0.47	0.51	0.48500	0.4800	0.0028	1	0.0098	0.0028	1	Yes	Yes	Yes	Yes	Yes	Yes	No	No	4	0	4
SVOC	87-68-3	Hexachlorobutadiene	N	0.76	0.83	0.78500	0.7750	4.4		0.14	0.14	4.4	Yes	Yes	Yes	Yes	No	No			4	0	4
SVOC	77-47-4	Hexachlorocyclopentadiene	N	0.61	0.66	0.63000	0.6250	40	50	0.041	0.041	50	Yes	Yes	Yes	Yes	No	No	No	No	4	0	4
SVOC	67-72-1	Hexachloroethane	N	0.09	0.098	0.09300	0.0920	14		0.33	0.33	14	No	No	No	No	No	No			4	0	4
SVOC	193-39-5	Indeno[1,2,3-cd]pyrene	N	0.21	0.23	0.22000	0.2200	0.038		0.034	0.034	0.038	Yes	Yes	Yes	Yes	Yes	Yes			4	1	3
SVOC	78-59-1	Isophorone	N	0.67	0.73	0.69250	0.6850	350		78	78	350	No	No	No	No	No	No			4	0	4
SVOC	91-20-3	Naphthalene	N	0.8	0.87	0.82500	0.8150	100		0.17	0.17	100	Yes	Yes	Yes	Yes	No	No			4	0	4
SVOC	98-95-3	Nitrobenzene	N	0.49	0.53	0.50500	0.5000	17		0.14	0.14	17	Yes	Yes	Yes	Yes	No	No			4	0	4
SVOC	621-64-7	N-Nitrosodi-n-propylamine	N	0.83	0.9	0.85500	0.8450	0.05		0.011	0.011	0.05	Yes	Yes	Yes	Yes	Yes	Yes			4	0	4
SVOC	86-30-6	N-Nitrosodiphenylamine	N	0.74	0.8	0.76250	0.7550	33		12	12	33	No	No	No	No	No	No			4	0	4
SVOC	87-86-5	Pentachlorophenol	N	2.2	2.4	2.27500	2.2500	1	1	0.041	0.041	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4	0	4
SVOC	85-01-8	Phenanthrene	N	0.65	0.71	0.68000	0.6800														4	1	3
SVOC	108-95-2	Phenol	N	0.41	0.45	0.42500	0.4200	300		580	300	580	No	No	No	No	No	No			4	0	4
SVOC	129-00-0	Pyrene	N	0.83	0.9	0.86333	0.8600	830		12	12	830	No	No	No	No	No	No			4	1	3
VOC	71-55-6	1,1,1-Trichloroethane	N	0.28	0.28	0.28000	0.2800	200	200	800	200	800	No	No	No	No	No	No	No	No	4	0	4
VOC	79-34-5	1,1,2,2-Tetrachloroethane	N	0.19	0.19	0.19000	0.1900	1.7			1.7	1.7	No	No	No	No	No	No			4	0	4
VOC	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	N	0.34	0.34	0.34000	0.3400			5500	5500	5500	No	No	No	No					4	0	4
VOC	79-00-5	1,1,2-Trichloroethane	N	0.08	0.08	0.08000	0.0800	3			3	3	No	No	No	No	No	No			4	0	4
VOC	75-34-3	1,1-Dichloroethane	N	0.24	0.24	0.24000	0.2400			2.8	2.8	2.8	No	No	No	No					4	0	4
VOC	75-35-4	1,1-Dichloroethene	N	0.34	0.34	0.34000	0.3400	7			7	7	No	No	No	No	No	No			4	0	4
VOC	87-61-6	1,2,3-Trichlorobenzene	N	0.35	0.35	0.35000	0.3500			0.7	0.7	0.7	No	No	No	No					4	0	4
VOC	120-82-1	1,2,4-Trichlorobenzene	N	0.27	0.27	0.27000	0.2700	35		0.4	0.4	35	No	No	No	No	No	No			4	0	4
VOC	96-12-8	1,2-Dibromo-3-Chloropropane	N	0.23	0.23	0.23000	0.2300	0.2	0.2	0.00034	0.00034	0.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	4	0	4
VOC	95-50-1	1,2-Dichlorobenzene	N	0.22	0.22	0.22000	0.2200	420	600	30	30	600	No	No	No	No	No	No	No	No	4	0	4
VOC	107-06-2	1,2-Dichloroethane	N	0.25	0.25	0.25000	0.2500	3.8	5	0.17	0.17	5	Yes	Yes	Yes	Yes	No	No	No	No	4	0	4
VOC	78-87-5	1,2-Dichloropropane	N	0.18	0.18	0.18000	0.1800	5	5	0.44	0.44	5	No	No	No	No	No	No	No	No	4	0	4
VOC	541-73-1	1,3-Dichlorobenzene	N	0.33	0.33	0.33000	0.3300	320			320	320	No	No	No	No	No	No			4	0	4
VOC	106-46-7	1,4-Dichlorobenzene	N	0.33	0.33	0.33000	0.3300	75	75	0.48	0.48	75	No	No	No	No	No	No	No	No	4	0	4
VOC	78-93-3	2-Butanone (MEK)	N	2.2	2.2	2.20000	2.2000			560	560	560	No	No	No	No					4	0	4
VOC	591-78-6	2-Hexanone	N	0.72	0.72	0.72000	0.7200			3.8	3.8	3.8	No	No	No	No					4	0	4
VOC	108-10-1	4-Methyl-2-pentanone (MIBK)	N	0.63	0.63	0.63000	0.6300			630	630	630	No	No	No	No					4	0	4
VOC	67-64-1	Acetone	N	1.1	1.1	1.10000	1.1000			1400	1400	1400	No	No	No	No					4	1	3
VOC	71-43-2	Benzene	N	0.09	0.09	0.09000	0.0900	5	5	0.46	0.46	5	No	No	No	No	No	No	No	No	4	0	4
VOC	75-25-2	Bromoform	N	0.18	0.18	0.18000	0.1800	43	80	3.3	3.3	80	No	No	No	No	No	No	No	No	4	0	4
VOC	74-83-9	Bromomethane	N	0.18	0.18	0.18000	0.1800	47		0.75	0.75	47	No	No	No	No	No	No			4	0	4
VOC	75-15-0	Carbon disulfide	N	0.22	0.22	0.22000	0.2200			81	81	81	No	No	No	No					4	0	4
VOC	56-23-5	Carbon tetrachloride	N	0.33	0.33	0.33000	0.3300	2.3	5	0.46	0.46	5	No	No	No	No	No	No	No	No	4	0	4
VOC	108-90-7	Chlorobenzene	N	0.24	0.24	0.24000	0.2400	100	100	7.8	7.8	100	No	No	No	No	No	No	No	No	4	0	4
VOC	74-97-5	Chlorobromomethane	N	0.3	0.3	0.30000	0.3000			8.3	8.3	8.3	No	No	No	No					4	0	4

Appendix T3. Method Detection Limit Comparison Table in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	Minimum ESV	DEQ-7 Acute	DEQ-7 Chronic	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 Acute	Median MDL> DEQ 7 Acute	Mean MDL> DEQ 7 Chronic	Median MDL> DEQ 7 Chronic	Count	Detections	Non-Detects
GENCHEM	STL00171	Alkalinity	N																		88	55	0
GENCHEM	7664-41-7	Ammonia	N	23	72	68.23077	72.0000						Yes	Yes	Yes	Yes			Yes	Yes	88	10	78
GENCHEM	16887-00-6	Chloride	N					120000			120000	120000									88	88	0
GENCHEM	16984-48-8	Fluoride	N					120			120	120									88	88	0
GENCHEM	STL00009	Hardness as calcium carbonate	N																		88	88	0
GENCHEM	STL00217	Nitrate Nitrite as N	N	100	100	100.00000	100.0000						Yes	Yes	Yes	Yes			Yes	Yes	88	46	42
GENCHEM	STL00599	Orthophosphate as P	N	42	48	46.98592	48.0000						Yes	Yes	Yes	Yes			Yes	Yes	71	0	71
GENCHEM	14808-79-8	Sulfate	N																		88	88	0
GENCHEM	18496-25-8	Sulfide	N	579	579	579.00000	579.0000														23	0	23
GENCHEM	STL00242	Total Dissolved Solids	N																		88	88	0
GENCHEM	STL00161	Total Suspended Solids	N	1	1	1.00000	1.0000												Yes	Yes	88	76	12
METALS	7429-90-5	Aluminum	N	13.5	18.2	17.86429	18.2000	87	750	87	87	750	No	No	No	No	No	No	No	No	88	74	14
METALS	7429-90-5	Aluminum	DI	2000	18.2	18.20000	18.2000	87	750	87	87	750	Yes	No	No	No	No	No	No	No	23	1	22
METALS	7440-36-0	Antimony	N	0.62	0.76	0.63750	0.6200	30			30	30	No	No	No	No					88	8	80
METALS	7440-36-0	Antimony	DI	0.62	0.62	0.62000	0.6200	30			30	30	No	No	No	No					23	1	22
METALS	7440-38-2	Arsenic	N	0.64	0.71	0.64467	0.6400	3.1	340	150	3.1	340	No	No	No	No	No	No	No	No	88	13	75
METALS	7440-38-2	Arsenic	DI	0.64	0.64	0.64000	0.6400	3.1	340	150	3.1	340	No	No	No	No	No	No	No	No	23	3	20
METALS	7440-39-3	Barium	N					4			4	4									88	88	0
METALS	7440-39-3	Barium	DI					4			4	4									23	23	0
METALS	7440-41-7	Beryllium	N	0.24	0.29	0.24575	0.2400	0.66			0.66	0.66	No	No	No	No					88	1	87
METALS	7440-41-7	Beryllium	DI	0.24	0.24	0.24000	0.2400	0.66			0.66	0.66	No	No	No	No					23	1	22
METALS	7440-43-9	Cadmium	N	0.71	0.72	0.71115	0.7100	0.09	0.52	0.237827934	0.09	0.52	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	88	1	87
METALS	7440-43-9	Cadmium	DI	0.71	0.71	0.71000	0.7100	0.09	0.52	0.237827934	0.09	0.52	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	23	1	22
METALS	7440-70-2	Calcium	N					116000			116000	116000									88	88	0
METALS	7440-70-2	Calcium	DI					116000			116000	116000									23	23	0
METALS	7440-47-3	Chromium	N	1.3	1.5	1.32105	1.3000	64.3		74.7	64.3	74.7	No	No	No	No			No	No	88	12	76
METALS	7440-47-3	Chromium	DI	1.3	1.3	1.30000	1.3000	64.3		74.7	64.3	74.7	No	No	No	No			No	No	23	0	23
METALS	7440-48-4	Cobalt	N	1.3	1.5	1.32410	1.3000	5.1			5.1	5.1	No	No	No	No					88	5	83
METALS	7440-48-4	Cobalt	DI	1.3	1.3	1.30000	1.3000	5.1			5.1	5.1	No	No	No	No					23	0	23
METALS	7440-50-8	Copper	N	1.4	1.6	1.41000	1.4000	0.23	3.79	8.037619479	0.23	8.03761948	Yes	Yes	Yes	Yes	No	No	No	No	88	28	60
METALS	7440-50-8	Copper	DI	1.4	1.4	1.40000	1.4000	0.23	3.79	8.037619479	0.23	8.03761948	Yes	Yes	Yes	Yes	No	No	No	No	23	3	20
METALS	STL00131	Cyanide, Free	N	1.5	1.5	1.50000	1.5000	5	22	5.2	5	22	No	No	No	No	No	No	No	No	14	7	7
METALS	STL00131	Cyanide, Free	DI	1.5	1.5	1.50000	1.5000	5	22	5.2	5	22	No	No	No	No	No	No	No	No	7	5	2
METALS	57-12-5	Cyanide, Total	N	2	4	2.26866	2.0000	5	22	5.2	5	22	No	No	No	No	No	No	No	No	88	21	67
METALS	57-12-5	Cyanide, Total	DI	2	2	2.00000	2.0000	5	22	5.2	5	22	No	No	No	No	No	No	No	No	23	5	18
METALS	7439-89-6	Iron	N	42.4	49.1	43.02326	42.4000	158		1000	158	1000	No	No	No	No			No	No	88	45	43
METALS	7439-89-6	Iron	DI	42.4	42.4	42.40000	42.4000	158		1000	158	1000	No	No	No	No			No	No	23	3	20
METALS	7439-92-1	Lead	N	0.38	0.44	0.38909	0.3800	0.54	13.98	2.548308447	0.54	13.98	No	No	No	No	No	No	No	No	88	22	66
METALS	7439-92-1	Lead	DI	0.38	0.38	0.38000	0.3800	0.54	13.98	2.548308447	0.54	13.98	No	No	No	No	No	No	No	No	23	0	23
METALS	7439-95-4	Magnesium	N					82000			82000	82000									88	88	0
METALS	7439-95-4	Magnesium	DI					82000			82000	82000									23	23	0
METALS	7439-96-5	Manganese	N	2.5	3	2.55556	2.5000	120			120	120	No	No	No	No					88	70	18
METALS	7439-96-5	Manganese	DI	2.5	2.5	2.50000	2.5000	120			120	120	No	No	No	No					23	12	11
METALS	7439-97-6	Mercury	N	0.14	0.17	0.16659	0.1700	0.026	1.7	0.91	0.026	1.7	Yes	Yes	Yes	Yes	No	No	No	No	88	0	88
METALS	7439-97-6	Mercury	DI	0.17	0.17	0.17000	0.1700	0.026	1.7	0.91	0.026	1.7	Yes	Yes	Yes	Yes	No	No	No	No	23	0	23
METALS	7440-02-0	Nickel	N	1.4	1.6	1.42469	1.4000	5	145	45.00938447	5	145	No	No	No	No	No	No	No	No	88	7	81
METALS	7440-02-0	Nickel	DI	1.4	1.4	1.40000	1.4000	5	145	45.00938447	5	145	No	No	No	No	No	No	No	No	23	2	21
METALS	7440-09-7	Potassium	N					53000			53000	53000									88	88	0
METALS	7440-09-7	Potassium	DI					53000			53000	53000									23	23	0
METALS	7782-49-2	Selenium	N	0.73	0.79	0.73682	0.7300	1	20	5	1	20	No	No	No	No	No	No	No	No	88	0	88
METALS	7782-49-2	Selenium	DI	0.73	0.73	0.73000	0.7300	1	20	5	1	20	No	No	No	No	No	No	No	No	23	0	23
METALS	7440-22-4	Silver	N	1.3	1.5	1.32273	1.3000	0.067	0.374		0.067	0.374	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	88	0	88
METALS	7440-22-4	Silver	DI	1.3	1.3	1.30000	1.3000	0.067	0.374		0.067	0.374	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	23	0	23
METALS	7440-23-5	Sodium	N					680000			680000	680000									88	88	0
METALS	7440-23-5	Sodium	DI					680000			680000	680000									23	23	0
METALS	7440-28-0	Thallium	N	0.26	0.31	0.26575	0.2600	0.8			0.8	0.8	No	No	No	No					88	1	87
METALS	7440-28-0	Thallium	DI	0.26	0.26	0.26000	0.2600	0.8			0.8	0.8	No	No	No	No					23	0	23
METALS	7440-62-2	Vanadium	N	1.9	1.9	1.90000	1.9000	20			20	20	No	No	No	No					88	15	73
METALS	7440-62-2	Vanadium	DI	1.9	1.9	1.90000	1.9000	20			20	20	No	No	No	No					23	1	22
METALS	7440-66-6	Zinc	N	6.5	7	6.93506	7.0000	30	37	103.3613472	30	103.361347	No	No	No	No	No	No	No	No	88	11	77
METALS	7440-66-6	Zinc	DI	7	7	7.00000	7.0000	30	37	103.3613472	30	103.361347	No	No	No	No	No	No	No	No	23	1	22
OC_PEST	72-54-8	4,4'-DDD	N	0.005	0.006	0.00525	0.0050	0.001			0.001	0.001	Yes	Yes	Yes	Yes					4	0	4

Appendix T3. Method Detection Limit Comparison Table in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

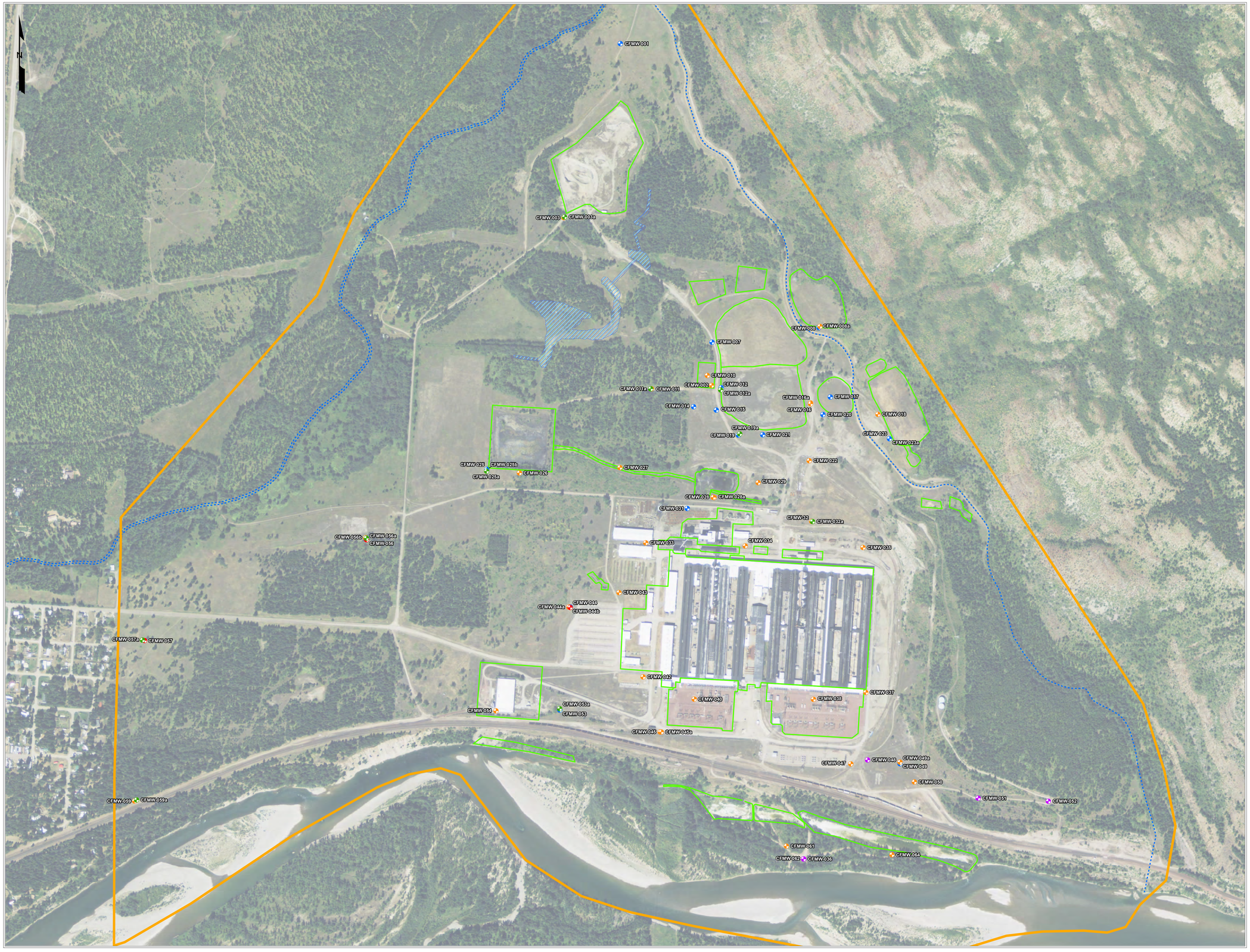
Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	Minimum ESV	DEQ-7 Acute	DEQ-7 Chronic	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 Acute	Median MDL> DEQ 7 Acute	Mean MDL> DEQ 7 Chronic	Median MDL> DEQ 7 Chronic	Count	Detections	Non-Detects
OC_PEST	72-55-9	4,4'-DDE	N	0.002	0.004	0.00350	0.0040	0.001			0.001	0.001	Yes	Yes	Yes	Yes					4	0	4
OC_PEST	50-29-3	4,4'-DDT	N	0.004	0.004	0.00400	0.0040	0.0005	0.5	0.001	0.0005	0.5	Yes	Yes	Yes	Yes	No	No	Yes	Yes	4	0	4
OC_PEST	309-00-2	Aldrin	N	0.003	0.004	0.00375	0.0040	0.004	1.5	1.5	0.004	1.5	No	No	No	No	No	No	No	No	4	0	4
OC_PEST	319-84-6	alpha-BHC	N	0.006	0.007	0.00625	0.0060	2.2			2.2	2.2	No	No	No	No					4	0	4
OC_PEST	5103-71-9	alpha-Chlordane	N	0.002	0.004	0.00350	0.0040	0.0043		0.0043	0.0043	0.0043	No	No	No	No			No	No	4	0	4
OC_PEST	319-85-7	beta-BHC	N	0.004	0.005	0.00475	0.0050	2.2			2.2	2.2	No	No	No	No					4	0	4
OC_PEST	319-86-8	delta-BHC	N	0.005	0.006	0.00575	0.0060	2.2			2.2	2.2	No	No	No	No					4	0	4
OC_PEST	60-57-1	Dieldrin	N	0.003	0.004	0.00375	0.0040	0.056	0.24	0.056	0.056	0.24	No	No	No	No	No	No	No	No	4	0	4
OC_PEST	959-98-8	Endosulfan I	N	0.002	0.005	0.00425	0.0050	0.003	0.11	0.056	0.003	0.11	No	Yes	Yes	Yes	No	No	No	No	4	0	4
OC_PEST	33213-65-9	Endosulfan II	N	0.004	0.004	0.00400	0.0040	0.051	0.11	0.056	0.051	0.11	No	No	No	No	No	No	No	No	4	0	4
OC_PEST	1031-07-8	Endosulfan sulfate	N	0.005	0.006	0.00525	0.0050	0.051			0.051	0.051	No	No	No	No					4	0	4
OC_PEST	72-20-8	Endrin	N	0.004	0.004	0.00400	0.0040	0.0023	0.086	0.036	0.0023	0.086	Yes	Yes	Yes	Yes	No	No	No	No	4	0	4
OC_PEST	7421-93-4	Endrin aldehyde	N	0.004	0.008	0.00500	0.0040	0.036			0.036	0.036	No	No	No	No					4	0	4
OC_PEST	53494-70-5	Endrin ketone	N	0.004	0.008	0.00500	0.0040	0.036			0.036	0.036	No	No	No	No					4	0	4
OC_PEST	58-89-9	gamma-BHC (Lindane)	N	0.004	0.012	0.00600	0.0040	0.01		0.95	0.01	0.95	No	Yes	No	No			No	No	4	0	4
OC_PEST	5103-74-2	gamma-Chlordane	N	0.003	0.005	0.00450	0.0050	0.0043		0.0043	0.0043	0.0043	No	Yes	Yes	Yes			Yes	Yes	4	0	4
OC_PEST	76-44-8	Heptachlor	N	0.003	0.004	0.00375	0.0040	0.0019	0.26	0.0038	0.0019	0.26	Yes	Yes	Yes	Yes	No	No	No	Yes	4	0	4
OC_PEST	1024-57-3	Heptachlor epoxide	N	0.004	0.005	0.00425	0.0040	0.0019	0.26	0.0038	0.0019	0.26	Yes	Yes	Yes	Yes	No	No	Yes	Yes	4	0	4
OC_PEST	72-43-5	Methoxychlor	N	0.004	0.004	0.00400	0.0040	0.019		0.03	0.019	0.03	No	No	No	No			No	No	4	0	4
OC_PEST	8001-35-2	Toxaphene	N	0.06	0.11	0.07250	0.0600	0.0002	0.73	0.0002	0.0002	0.73	Yes	Yes	Yes	Yes	No	No	Yes	Yes	4	0	4
PCB	12674-11-2	Aroclor 1016	N	0.098	0.1	0.09850	0.0980	0.000074		0.014	0.000074	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	11104-28-2	Aroclor 1221	N	0.098	0.1	0.09850	0.0980	0.000074		0.014	0.000074	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	11141-16-5	Aroclor 1232	N	0.098	0.1	0.09850	0.0980	0.000074		0.014	0.000074	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	53469-21-9	Aroclor 1242	N	0.098	0.1	0.09850	0.0980	0.000074		0.014	0.000074	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	12672-29-6	Aroclor 1248	N	0.098	0.1	0.09850	0.0980	0.000074		0.014	0.000074	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	11097-69-1	Aroclor 1254	N	0.084	0.099	0.08775	0.0840	0.000074		0.014	0.000074	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	11096-82-5	Aroclor 1260	N	0.084	0.099	0.08775	0.0840	0.000074		0.014	0.000074	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	11100-14-4	Aroclor 1268	N	0.084	0.099	0.08775	0.0840	0.014		0.014	0.014	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	37324-23-5	Aroclor-1262	N	0.084	0.099	0.08775	0.0840						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
PCB	1336-36-3	Polychlorinated biphenyls, Total	N	0.098	0.1	0.09850	0.0980	0.000074		0.014	0.000074	0.014	Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	92-52-4	1,1'-Biphenyl	N	0.63	0.68	0.65000	0.6450	14			14	14	No	No	No	No					4	0	4
SVOC	95-94-3	1,2,4,5-Tetrachlorobenzene	N	0.43	0.47	0.44500	0.4400	3			3	3	No	No	No	No					4	0	4
SVOC	123-91-1	1,4-Dioxane	N	3.1	3.4	3.20000	3.1500						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	108-60-1	2,2'-oxybis[1-chloropropane]	N	0.93	1	0.95750	0.9500						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	58-90-2	2,3,4,6-Tetrachlorophenol	N	0.69	0.75	0.71250	0.7050	1			1	1	No	No	No	No					4	0	4
SVOC	95-95-4	2,4,5-Trichlorophenol	N	0.49	0.53	0.50500	0.5000						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	88-06-2	2,4,6-Trichlorophenol	N	0.53	0.58	0.54750	0.5400	4.9			4.9	4.9	No	No	No	No					4	0	4
SVOC	120-83-2	2,4-Dichlorophenol	N	0.63	0.68	0.65000	0.6450	11			11	11	No	No	No	No					4	0	4
SVOC	105-67-9	2,4-Dimethylphenol	N	0.91	0.99	0.94000	0.9300						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	51-28-5	2,4-Dinitrophenol	N	2.4	2.6	2.47500	2.4500						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	121-14-2	2,4-Dinitrotoluene	N	1	1.1	1.05000	1.0500	44			44	44	No	No	No	No					4	0	4
SVOC	606-20-2	2,6-Dinitrotoluene	N	0.88	0.96	0.91000	0.9000	81			81	81	No	No	No	No					4	0	4
SVOC	91-58-7	2-Chloronaphthalene	N	0.61	0.66	0.63000	0.6250						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	95-57-8	2-Chlorophenol	N	0.74	0.8	0.76250	0.7550	24			24	24	No	No	No	No					4	0	4
SVOC	91-57-6	2-Methylnaphthalene	N	0.88	0.96	0.91000	0.9000	4.7			4.7	4.7	No	No	No	No					4	0	4
SVOC	95-48-7	2-Methylphenol	N	1.3	1.4	1.32500	1.3000	13			13	13	No	No	No	No					4	0	4
SVOC	88-74-4	2-Nitroaniline	N	0.65	0.71	0.67250	0.6650						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	88-75-5	2-Nitrophenol	N	0.59	0.64	0.60750	0.6000	300			300	300	No	No	No	No					4	0	4
SVOC	15831-10-4	3 & 4 Methylphenol	N	0.88	0.96	0.91000	0.9000						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	91-94-1	3,3'-Dichlorobenzidine	N	1	1.1	1.05000	1.0500	4.5			4.5	4.5	No	No	No	No					4	0	4
SVOC	99-09-2	3-Nitroaniline	N	0.82	0.89	0.84500	0.8350						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	534-52-1	4,6-Dinitro-2-methylphenol	N	2	2.2	2.07500	2.0500						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	101-55-3	4-Bromophenyl phenyl ether	N	1	1.1	1.05000	1.0500	1.5			1.5	1.5	No	No	No	No					4	0	4
SVOC	59-50-7	4-Chloro-3-methylphenol	N	0.76	0.83	0.78500	0.7750						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	106-47-8	4-Chloroaniline	N	0.73	0.79	0.75250	0.7450	232			232	232	No	No	No	No					4	0	4
SVOC	7005-72-3	4-Chlorophenyl phenyl ether	N	0.96	1	0.98000	0.9800						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	100-01-6	4-Nitroaniline	N	0.48	0.52	0.49500	0.4900						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	100-02-7	4-Nitrophenol	N	4.7	5.1	4.82500	4.7500	60			60	60	No	No	No	No					4	0	4
SVOC	83-32-9	Acenaphthene	N	0.88	0.96	0.91000	0.9000	5.8			5.8	5.8	No	No	No	No					4	0	4
SVOC	208-96-8	Acenaphthylene	N	0.65	0.71	0.67250	0.6650						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	98-86-2	Acetophenone	N	1	1.1	1.05000	1.0500						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	120-12-7	Anthracene	N	0.57	0.62	0.58750	0.5800	0.012			0.012	0.012	Yes	Yes	Yes	Yes					4	0	4

Appendix T3. Method Detection Limit Comparison Table in Surface Water – Ecological Screening Levels
Columbia Falls Aluminum Company, LLC, GW/SW Data Summary Report, 2000 Aluminum Dr, Columbia Falls, MT

Analyte Group	Cas ID #	Analyte	Sample Fraction	MDL Statistics				Screening Criteria					Evaluation								Sample Counts		
				Min MDL	Max MDL	Mean MDL	Median MDL	Minimum ESV	DEQ-7 Acute	DEQ-7 Chronic	Min Standard	Max Standard	Min MDL> Min Standard	Max MDL> Min Standard	Mean MDL> Min Standard	Median MDL> Min Standard	Mean MDL> DEQ 7 Acute	Median MDL> DEQ 7 Acute	Mean MDL> DEQ 7 Chronic	Median MDL> DEQ 7 Chronic	Count	Detections	Non-Detects
SVOC	1912-24-9	Atrazine	N	0.77	0.84	0.79500	0.7850	1.8			1.8	1.8	No	No	No	No					4	0	4
SVOC	100-52-7	Benzaldehyde	N	0.86	0.93	0.88750	0.8800						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	56-55-3	Benzo[a]anthracene	N	0.55	0.6	0.57333	0.5700	0.018			0.018	0.018	Yes	Yes	Yes	Yes					4	1	3
SVOC	50-32-8	Benzo[a]pyrene	N	0.16	0.17	0.16667	0.1700	0.014			0.014	0.014	Yes	Yes	Yes	Yes					4	1	3
SVOC	205-99-2	Benzo[b]fluoranthene	N	0.44	0.48	0.46000	0.4600						Yes	Yes	Yes	Yes			Yes	Yes	4	1	3
SVOC	191-24-2	Benzo[g,h,i]perylene	N	0.75	0.82	0.78333	0.7800						Yes	Yes	Yes	Yes			Yes	Yes	4	1	3
SVOC	207-08-9	Benzo[k]fluoranthene	N	0.18	0.2	0.18750	0.1850						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	111-91-1	Bis(2-chloroethoxy)methane	N	0.69	0.75	0.71250	0.7050						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	111-44-4	Bis(2-chloroethyl)ether	N	0.12	0.13	0.12500	0.1250						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	117-81-7	Bis(2-ethylhexyl) phthalate	N	0.72	0.78	0.74250	0.7350	3			3	3	No	No	No	No					4	0	4
SVOC	85-68-7	Butyl benzyl phthalate	N	0.6	0.65	0.62000	0.6150	19			19	19	No	No	No	No					4	0	4
SVOC	105-60-2	Caprolactam	N	1.1	1.1	1.10000	1.1000						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	86-74-8	Carbazole	N	0.85	0.92	0.87750	0.8700						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	218-01-9	Chrysene	N	0.67	0.73	0.70000	0.7000						Yes	Yes	Yes	Yes			Yes	Yes	4	1	3
SVOC	53-70-3	Dibenz(a,h)anthracene	N	0.09	0.098	0.09300	0.0920						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	132-64-9	Dibenzofuran	N	0.85	0.92	0.87750	0.8700	3.7			3.7	3.7	No	No	No	No					4	0	4
SVOC	84-66-2	Diethyl phthalate	N	1	1.1	1.02500	1.0000	210			210	210	No	No	No	No					4	0	4
SVOC	131-11-3	Dimethyl phthalate	N	0.98	1.1	1.01500	0.9900						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	84-74-2	Di-n-butyl phthalate	N	0.82	0.89	0.84500	0.8350	19			19	19	No	No	No	No					4	0	4
SVOC	117-84-0	Di-n-octyl phthalate	N	0.69	0.75	0.71250	0.7050	22			22	22	No	No	No	No					4	0	4
SVOC	206-44-0	Fluoranthene	N	0.72	0.78	0.75000	0.7500	0.04			0.04	0.04	Yes	Yes	Yes	Yes					4	1	3
SVOC	86-73-7	Fluorene	N	0.8	0.87	0.82500	0.8150	3			3	3	No	No	No	No					4	0	4
SVOC	118-74-1	Hexachlorobenzene	N	0.47	0.51	0.48500	0.4800	0.0003			0.0003	0.0003	Yes	Yes	Yes	Yes					4	0	4
SVOC	87-68-3	Hexachlorobutadiene	N	0.76	0.83	0.78500	0.7750	1.3			1.3	1.3	No	No	No	No					4	0	4
SVOC	77-47-4	Hexachlorocyclopentadiene	N	0.61	0.66	0.63000	0.6250						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	67-72-1	Hexachloroethane	N	0.09	0.098	0.09300	0.0920	12			12	12	No	No	No	No					4	0	4
SVOC	193-39-5	Indeno[1,2,3-cd]pyrene	N	0.21	0.23	0.22000	0.2200						Yes	Yes	Yes	Yes			Yes	Yes	4	1	3
SVOC	78-59-1	Isophorone	N	0.67	0.73	0.69250	0.6850						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	91-20-3	Naphthalene	N	0.8	0.87	0.82500	0.8150	1.1			1.1	1.1	No	No	No	No					4	0	4
SVOC	98-95-3	Nitrobenzene	N	0.49	0.53	0.50500	0.5000						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	621-64-7	N-Nitrosodi-n-propylamine	N	0.83	0.9	0.85500	0.8450						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
SVOC	86-30-6	N-Nitrosodiphenylamine	N	0.74	0.8	0.76250	0.7550	210			210	210	No	No	No	No					4	0	4
SVOC	87-86-5	Pentachlorophenol	N	2.2	2.4	2.27500	2.2500	0.5	5.3	4	0.5	5.3	Yes	Yes	Yes	Yes	No	No	No	No	4	0	4
SVOC	85-01-8	Phenanthrene	N	0.65	0.71	0.68000	0.6800	0.4			0.4	0.4	Yes	Yes	Yes	Yes					4	1	3
SVOC	108-95-2	Phenol	N	0.41	0.45	0.42500	0.4200	4			4	4	No	No	No	No					4	0	4
SVOC	129-00-0	Pyrene	N	0.83	0.9	0.86333	0.8600	0.025			0.025	0.025	Yes	Yes	Yes	Yes					4	1	3
VOC	71-55-6	1,1,1-Trichloroethane	N	0.28	0.28	0.28000	0.2800	11			11	11	No	No	No	No					4	0	4
VOC	79-34-5	1,1,2,2-Tetrachloroethane	N	0.19	0.19	0.19000	0.1900	610			610	610	No	No	No	No					4	0	4
VOC	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	N	0.34	0.34	0.34000	0.3400						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
VOC	79-00-5	1,1,2-Trichloroethane	N	0.08	0.08	0.08000	0.0800	1200			1200	1200	No	No	No	No					4	0	4
VOC	75-34-3	1,1-Dichloroethane	N	0.24	0.24	0.24000	0.2400	47			47	47	No	No	No	No					4	0	4
VOC	75-35-4	1,1-Dichloroethene	N	0.34	0.34	0.34000	0.3400	25			25	25	No	No	No	No					4	0	4
VOC	87-61-6	1,2,3-Trichlorobenzene	N	0.35	0.35	0.35000	0.3500	8			8	8	No	No	No	No					4	0	4
VOC	120-82-1	1,2,4-Trichlorobenzene	N	0.27	0.27	0.27000	0.2700	24			24	24	No	No	No	No					4	0	4
VOC	96-12-8	1,2-Dibromo-3-Chloropropane	N	0.23	0.23	0.23000	0.2300						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
VOC	95-50-1	1,2-Dichlorobenzene	N	0.22	0.22	0.22000	0.2200	0.7			0.7	0.7	No	No	No	No					4	0	4
VOC	107-06-2	1,2-Dichloroethane	N	0.25	0.25	0.25000	0.2500	100			100	100	No	No	No	No					4	0	4
VOC	78-87-5	1,2-Dichloropropane	N	0.18	0.18	0.18000	0.1800						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
VOC	541-73-1	1,3-Dichlorobenzene	N	0.33	0.33	0.33000	0.3300	71			71	71	No	No	No	No					4	0	4
VOC	106-46-7	1,4-Dichlorobenzene	N	0.33	0.33	0.33000	0.3300	15			15	15	No	No	No	No					4	0	4
VOC	78-93-3	2-Butanone (MEK)	N	2.2	2.2	2.20000	2.2000	14000			14000	14000	No	No	No	No					4	0	4
VOC	591-78-6	2-Hexanone	N	0.72	0.72	0.72000	0.7200	99			99	99	No	No	No	No					4	0	4
VOC	108-10-1	4-Methyl-2-pentanone (MIBK)	N	0.63	0.63	0.63000	0.6300	170			170	170	No	No	No	No					4	0	4
VOC	67-64-1	Acetone	N	1.1	1.1	1.10000	1.1000	1500			1500	1500	No	No	No	No					4	1	3
VOC	71-43-2	Benzene	N	0.09	0.09	0.09000	0.0900	130			130	130	No	No	No	No					4	0	4
VOC	75-25-2	Bromoform	N	0.18	0.18	0.18000	0.1800	320			320	320	No	No	No	No					4	0	4
VOC	74-83-9	Bromomethane	N	0.18	0.18	0.18000	0.1800						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4
VOC	75-15-0	Carbon disulfide	N	0.22	0.22	0.22000	0.2200	0.92			0.92	0.92	No	No	No	No					4	0	4
VOC	56-23-5	Carbon tetrachloride	N	0.33	0.33	0.33000	0.3300	9.8			9.8	9.8	No	No	No	No					4	0	4
VOC	108-90-7	Chlorobenzene	N	0.24	0.24	0.24000	0.2400	1.3			1.3	1.3	No	No	No	No					4	0	4
VOC	74-97-5	Chlorobromomethane	N	0.3	0.3	0.30000	0.3000						Yes	Yes	Yes	Yes			Yes	Yes	4	0	4

PLATES

1. Monitoring Well Locations, Designations, and Screened Intervals
2. Surface Water Sampling Locations and Designations
3. Potentiometric Surface Contour Map, Upper Hydrogeologic Unit – August 30, 2016
4. Potentiometric Surface Contour Map, Upper Hydrogeologic Unit – November 29, 2016
5. Potentiometric Surface Contour Map, Upper Hydrogeologic Unit – March 14/15, 2017
6. Potentiometric Surface Contour Map, Upper Hydrogeologic Unit – June 16, 2017
7. Concentrations of Total Cyanide in Round 1, Round 2, Round 3, and Round 4 Groundwater
8. Concentrations of Total Cyanide and Free Cyanide in Round 3 Groundwater – March 2017
9. Concentrations of Total Cyanide and Free Cyanide in Round 4 Groundwater – June 2017
10. Concentrations of Fluoride in Round 1, Round 2, Round 3, and Round 4 Groundwater
11. Average Hydraulic Conductivity Estimated from Slug Testing in Monitoring Wells Screened in the Upper Hydrogeologic Unit
12. Average Hydraulic Conductivity Estimated from Slug Testing in Monitoring Wells Screened below the Upper Hydrogeologic Unit



LEGEND

- EXISTING MONITORING WELL LOCATIONS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- EXISTING MONITORING WELL LOCATIONS SCREENED IN UPPER HYDROGEOLOGIC UNIT
- PHASE 1 MONITORING WELL LOCATIONS SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- PHASE 1 MONITORING WELL LOCATIONS SCREENED IN UPPER HYDROGEOLOGIC UNIT
- FORMER PRODUCTION WELL LOCATIONS
- SITE FEATURES
- SITE BOUNDARY
- CREEK FEATURES
- NORTHERN SURFACE WATER FEATURE EXTENT

Well Location ID	Boring Depth (Ft-Bls)	Screen Interval (Ft-Bls)
CFMW-001	152.5	132.5 – 152.5
CFMW-002	80	70 – 80
CFMW-003	54	44 – 54
CFMW-003a	245.5	190 – 200
CFMW-007	160	91 – 102
CFMW-008	38.5	Open Bottom
CFMW-008a	300	88 – 98
CFMW-010	86	76 – 86
CFMW-011	50	40 – 50
CFMW-011a	300	156 – 166
CFMW-012	90	70 – 85
CFMW-012a	254	200 – 210
CFMW-014	92	72 – 87
CFMW-015	94	72 – 87
CFMW-016	95	85 – 95
CFMW-016a	300	121 – 126
CFMW-017	141	137 – 141
CFMW-018	125	112 – 122
CFMW-019	96	78 – 88
CFMW-019a	300	210 – 220
CFMW-020	130	113 – 118
CFMW-021	90	70 – 85
CFMW-022	85	70 – 80
CFMW-023	144.5	137.5 – 143.25
CFMW-023a	196	NA
CFMW-025	24.5	9.5 – 24.5
CFMW-025a	300	85 – 95
CFMW-025b	60	45 – 60
CFMW-026	50	35 – 45
CFMW-027	45	35 – 45
CFMW-028	60	50 – 60
CFMW-028a	300	110 – 120
CFMW-029	76	66 – 76
CFMW-031	50	35 – 50
CFMW-032	55	45 – 55
CFMW-032a	300	195 – 205
CFMW-033	60	50 – 60
CFMW-034	60	50 – 60
CFMW-035	70	60 – 70
CFMW-037	100	90 – 100
CFMW-038	105	95 – 105
CFMW-040	90	80 – 90
CFMW-042	60	50 – 60
CFMW-043	60	50 – 60
CFMW-044	53	Open Bottom
CFMW-044a	300	100 – 110
CFMW-044b	>200	Open Bottom
CFMW-045	96	86 – 96
CFMW-045a	300	150 – 160
CFMW-047	120	110 – 120
CFMW-049	113	100 – 111
CFMW-049a	30	138 – 148
CFMW-050	120	110 – 120
CFMW-053	77	47 – 77
CFMW-053a	300	150 – 160
CFMW-054	85	75 – 85
CFMW-056	181.08	Open Bottom
CFMW-056a	294	125 – 135
CFMW-056b	50	40 – 50
CFMW-057	185.75	NA
CFMW-057a	300	128 – 138
CFMW-059	90	80 – 90
CFMW-059a	300	158 – 168
CFMW-061	25	13 – 23
CFMW-064	30	20 – 30

NOTES

FT-BLS – FEET BELOW LAND SURFACE
NA – INFORMATION ABOUT SCREENED INTERVAL IS NOT AVAILABLE

400 0 400
Feet

Title:

MONITORING WELL LOCATIONS, DESIGNATIONS AND SCREENED INTERVALS

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 02NOV17	PLATE
Prepared by: M.R.	Scale: AS SHOWN	1
Project Mgr: M.R.	Project: 2476.0001Y002	
File: 2476.0001Y170.3		

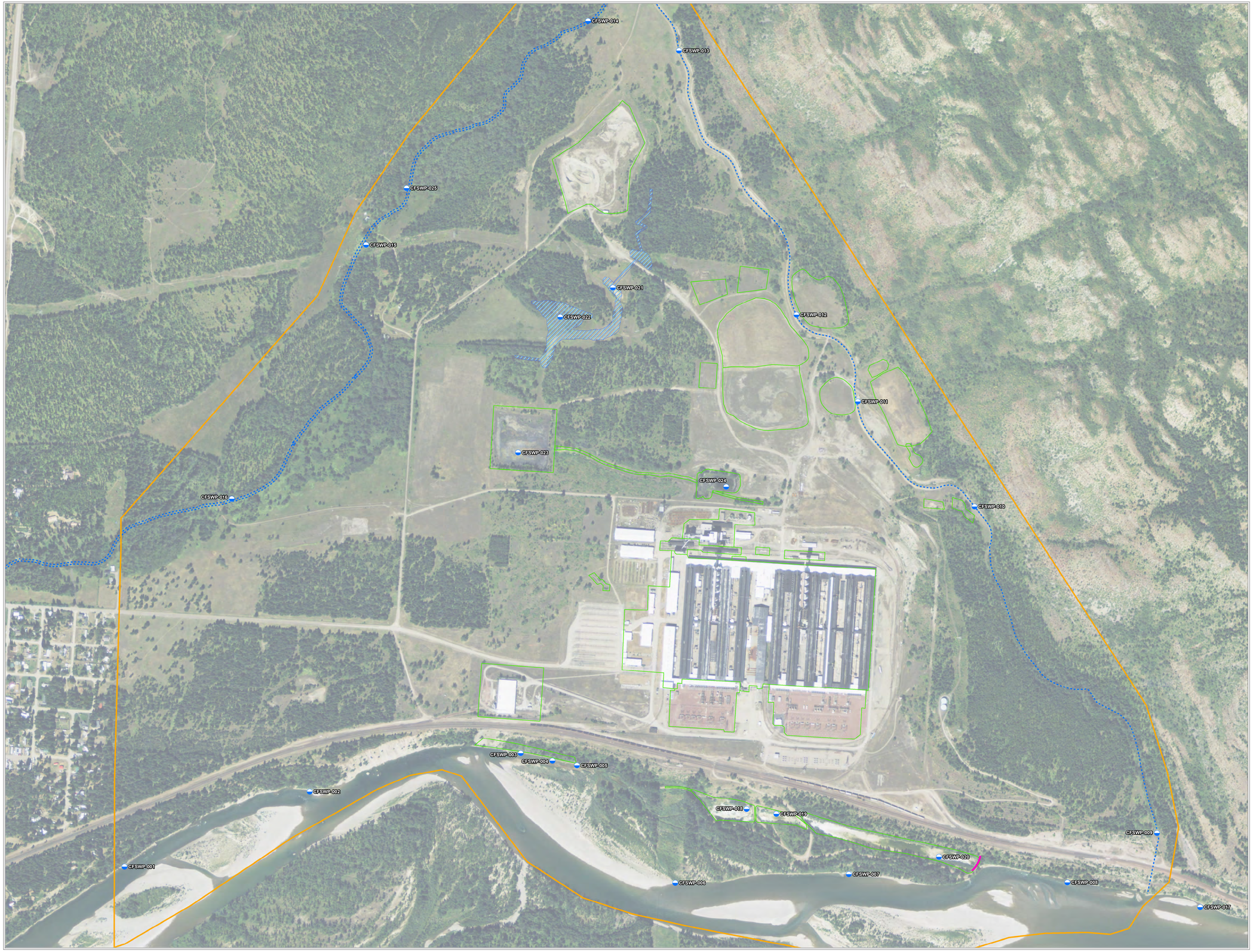


Image Source: 2013 National Agriculture Imagery Program

N

LEGEND

- SURFACE WATER SAMPLE LOCATIONS
- EXTENT OF BANK STABILIZATION SHEET PILING
- SITE FEATURES
- SITE BOUNDARY
- CREEK FEATURES
- NORTHERN SURFACE WATER FEATURE EXTENT

400 0 400
Feet

Title:

SURFACE WATER SAMPLING LOCATIONS AND DESIGNATIONS

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 10JAN18	PLATE
Prepared by: M.R.	Scale: AS SHOWN	2
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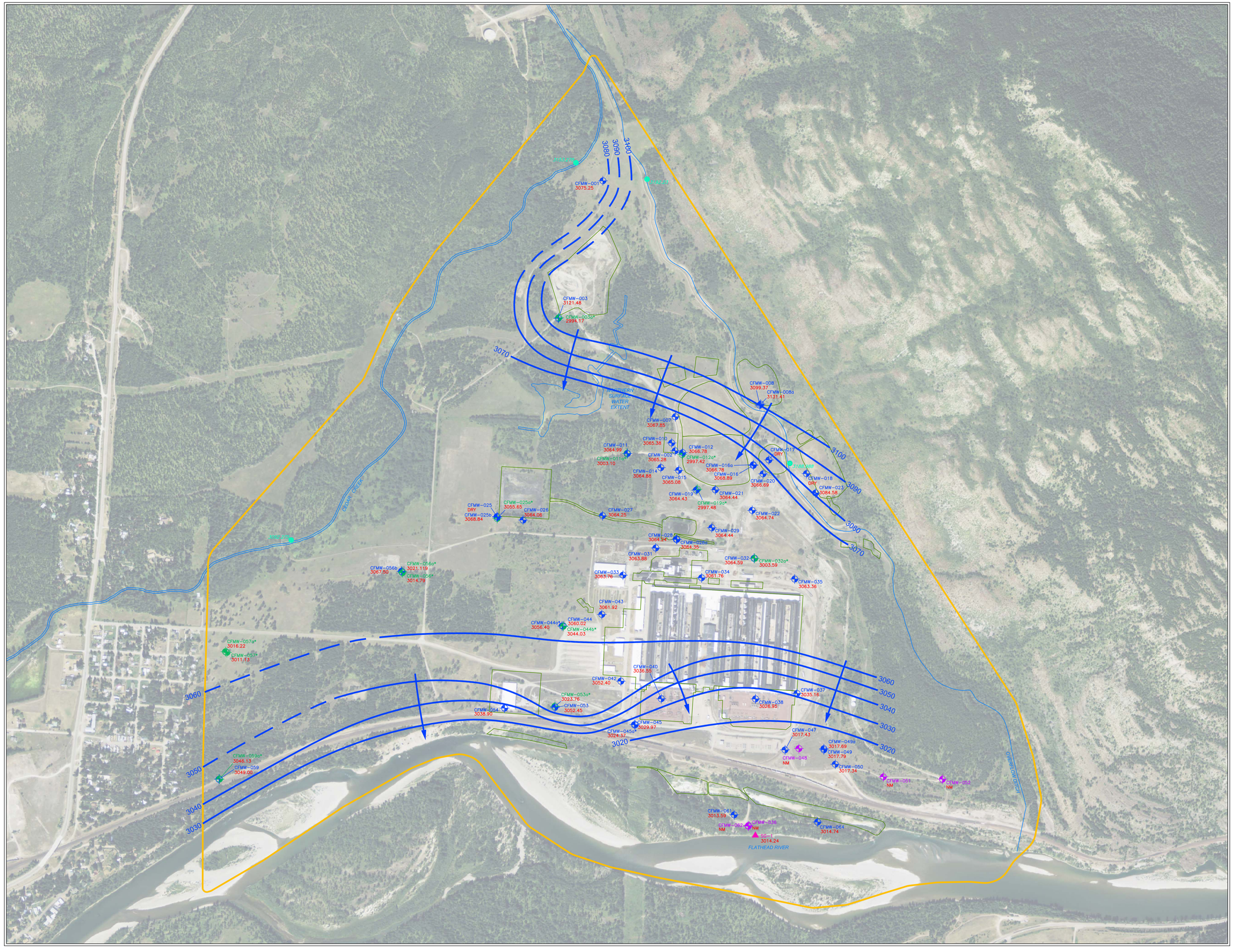

LEGEND

	RI/FS SITE BOUNDARY
	SURFACE WATER FEATURE
	SITE FEATURE
CFMW-035	LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN UPPER HYDROGEOLOGIC UNIT
CFMW-052	LOCATION AND DESIGNATION OF FORMER PRODUCTION WELL
CFMW-032a*	LOCATION AND DESIGNATION OF MONITORING WELL SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
SG-1	LOCATION AND DESIGNATION OF SURFACE WATER STAFF GAUGE
3188.988	LOCATION WHERE SITE FEATURE WAS SURVEYED
3071.06	POTENTIOMETRIC SURFACE IN FEET ABOVE MEAN SEA LEVEL
NM	NOT MEASURED
*	NOT USED IN CONTOURING
3080	CONTOUR LINE OF EQUAL POTENTIOMETRIC SURFACE (DASHED WHERE INFERRED)
	INFERRED FLOW DIRECTION

NOTE

MONITORING WELLS SCREENED BELOW THE UPPER HYDROGEOLOGIC UNIT ARE NOT USED IN CONTOURING.

500' 0 500'

Title:

POTENTIOMETRIC SURFACE CONTOUR MAP UPPER HYDROGEOLOGIC UNIT AUGUST 30, 2016

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	PLATE
Prepared by: G.M.	Scale: AS SHOWN	3
Project Mgr: M.R.	Project: 2476.0001Y002	
File: 2476.0001Y170.01.DWG		

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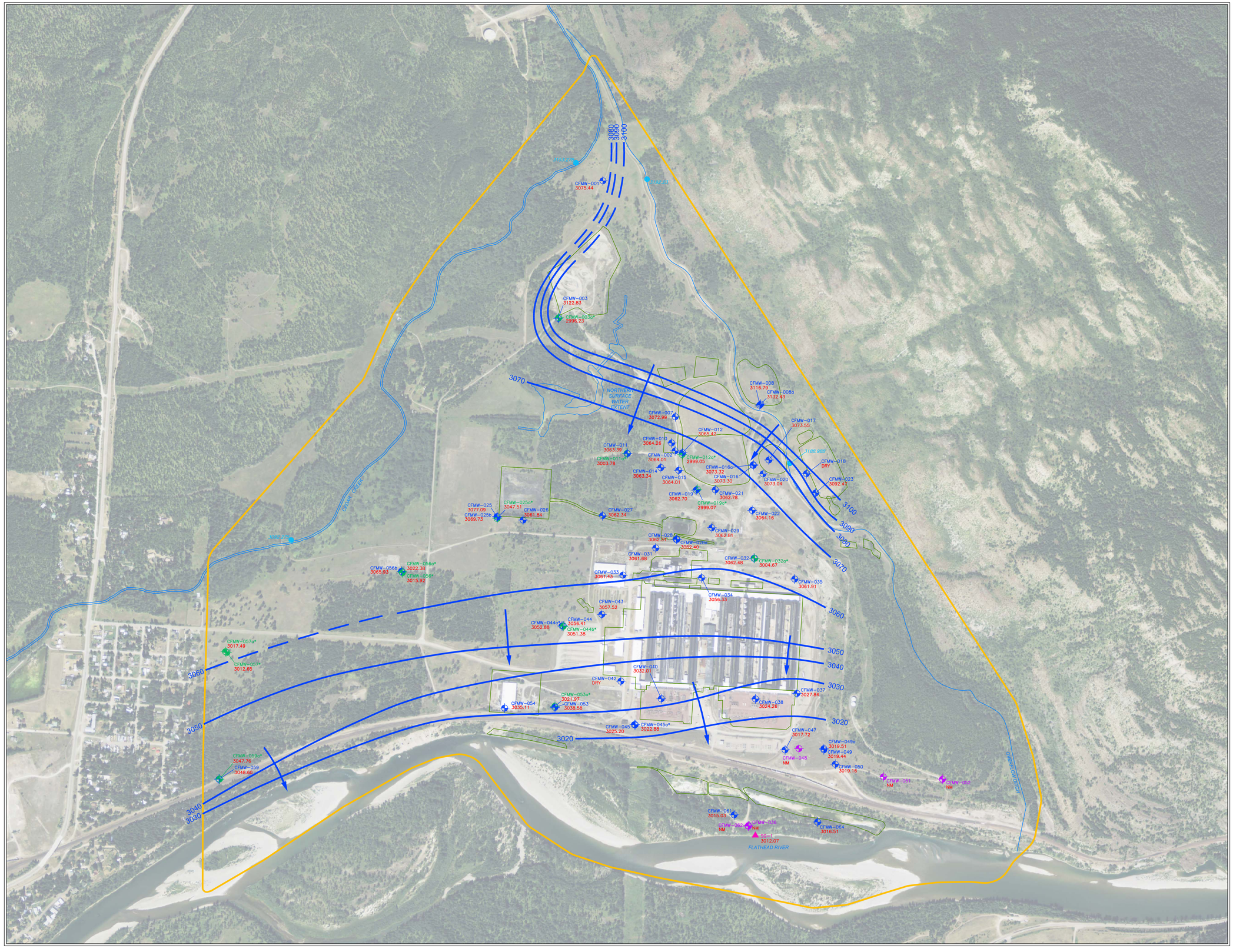

LEGEND

- RI/FS SITE BOUNDARY
- SURFACE WATER FEATURE
- SITE FEATURE
- CFMW-035 — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN UPPER HYDROGEOLOGIC UNIT
- CFMW-052 — LOCATION AND DESIGNATION OF FORMER PRODUCTION WELL
- CFMW-032s* — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- SG-1 — LOCATION AND DESIGNATION OF SURFACE WATER STAFF GAUGE
- 3188.988 — LOCATION WHERE SITE FEATURE WAS SURVEYED
- 30.52.88 — POTENTIOMETRIC SURFACE IN FEET ABOVE MEAN SEA LEVEL
- NM — NOT MEASURED
- * — NOT USED IN CONTOURING
- 3080 — CONTOUR LINE OF EQUAL POTENTIOMETRIC SURFACE (DASHED WHERE INFERRED)
- INFERRED FLOW DIRECTION

NOTE

MONITORING WELLS SCREENED BELOW THE UPPER HYDROGEOLOGIC UNIT ARE NOT USED IN CONTOURING.

500' 0 500'

Title:

POTENTIOMETRIC SURFACE CONTOUR MAP
UPPER HYDROGEOLOGIC UNIT
NOVEMBER 29, 2016

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: L.J.	Date: 13NOV17	PLATE
Prepared by: G.M.	Scale: AS SHOWN	4
Project Mgr: M.R.	Project: 2476.0001Y002	
File: 2476.0001Y170.02.DWG		

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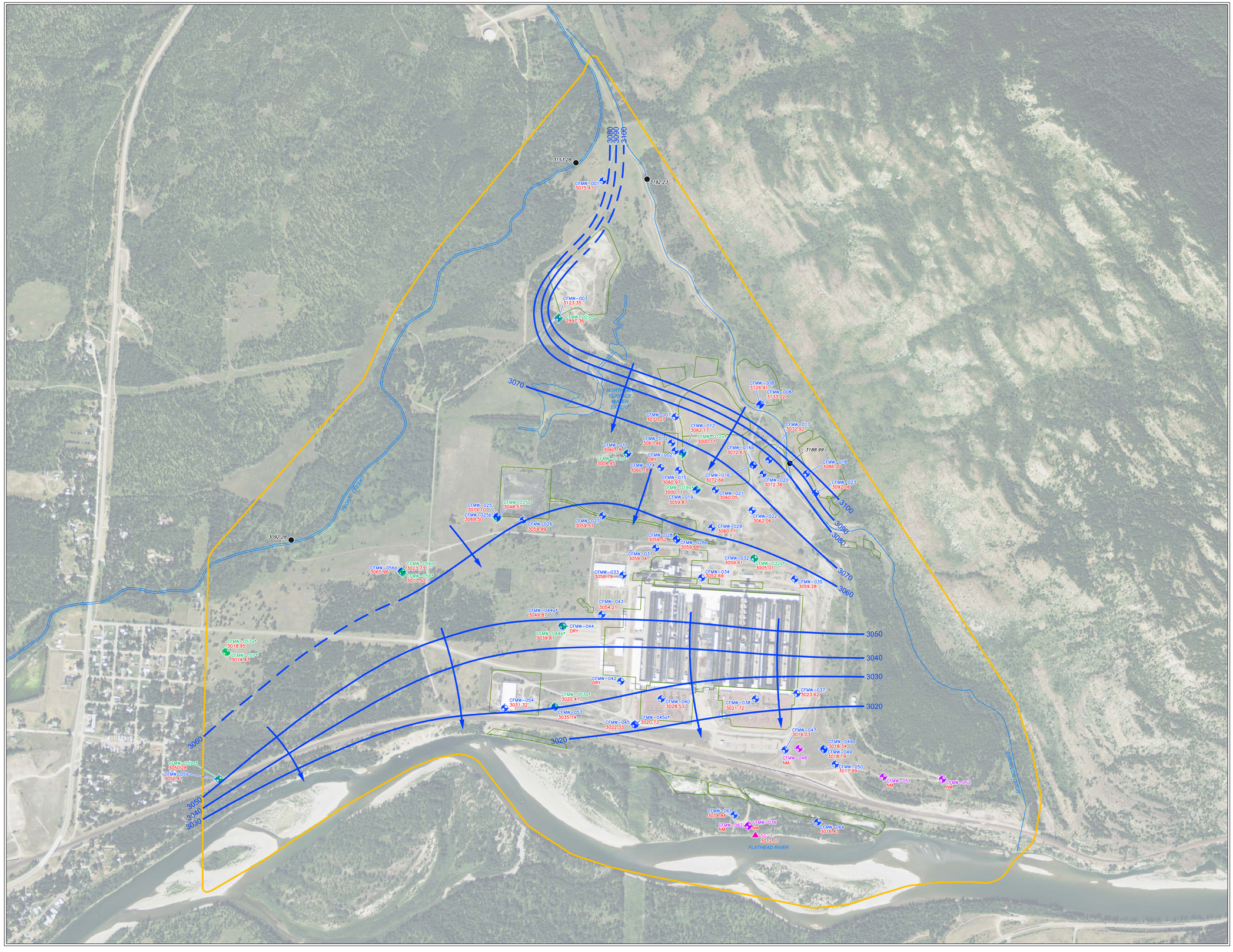

N

LEGEND

- RI/FS SITE BOUNDARY
- SURFACE WATER FEATURE
- SITE FEATURE
- CFMW-035 — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN UPPER HYDROGEOLOGIC UNIT
- CFMW-052 — LOCATION AND DESIGNATION OF FORMER PRODUCTION WELL
- CFMW-032a* — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- SG-1 — LOCATION AND DESIGNATION OF SURFACE WATER STAFF GAUGE
- 3188.99 — LOCATION WHERE SITE FEATURE WAS SURVEYED
- 3071.06 — POTENTIOMETRIC SURFACE IN FEET ABOVE MEAN SEA LEVEL
- NM — NOT MEASURED
- * — NOT USED IN CONTOURING
- 3080 — CONTOUR LINE OF EQUAL POTENTIOMETRIC SURFACE (DASHED WHERE INFERRED)
- INFERRED FLOW DIRECTION

NOTE

MONITORING WELLS SCREENED BELOW THE UPPER HYDROGEOLOGIC UNIT ARE NOT USED IN CONTOURING.

500' 0 500'

Title:

POTENTIOMETRIC SURFACE CONTOUR MAP UPPER HYDROGEOLOGIC UNIT MARCH 14/15, 2017

2000 ALUMINUM DRIVE, COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	PLATE
Prepared by: G.M.	Scale: AS SHOWN	
Project Mgr: M.R.	Project: 2476.0001Y002	5
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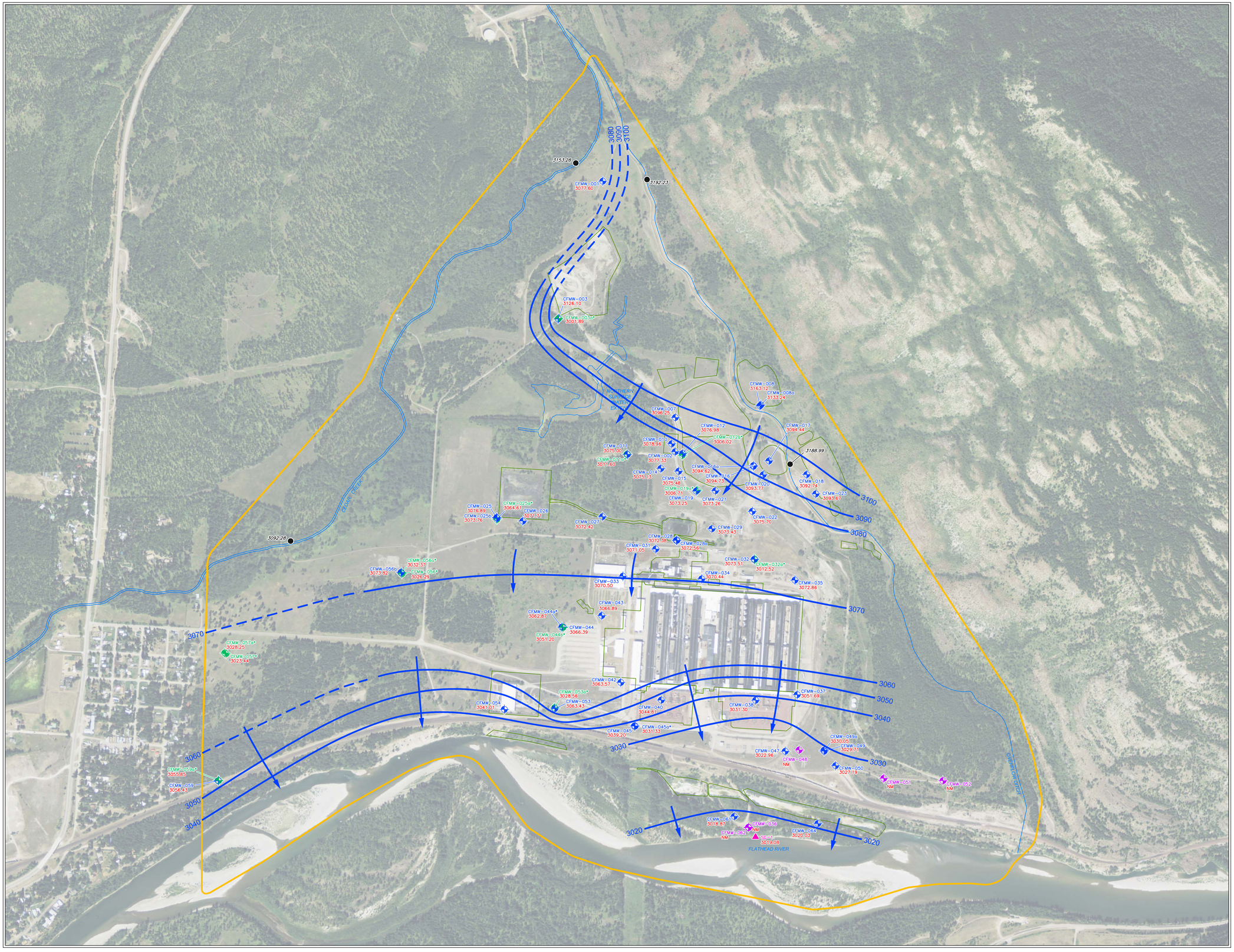

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LEGEND

- RI/FS SITE BOUNDARY
- SURFACE WATER FEATURE
- SITE FEATURE
- CFMW-035 — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN UPPER HYDROGEOLOGIC UNIT
- CFMW-052 — LOCATION AND DESIGNATION OF FORMER PRODUCTION WELL
- CFMW-032s* — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- SC-1 — LOCATION AND DESIGNATION OF SURFACE WATER STAFF GAUGE
- 3188.99 — LOCATION WHERE SITE FEATURE WAS SURVEYED
- 3071.06 — POTENTIOMETRIC SURFACE IN FEET ABOVE MEAN SEA LEVEL
- NM — NOT MEASURED
- * — NOT USED IN CONTOURING
- 3080 — CONTOUR LINE OF EQUAL POTENTIOMETRIC SURFACE (DASHED WHERE INFERRED)
- INFERRED FLOW DIRECTION

NOTE

MONITORING WELLS SCREENED BELOW THE UPPER HYDROGEOLOGIC UNIT ARE NOT USED IN CONTOURING.

500' 0 500'

Title:

POTENTIOMETRIC SURFACE CONTOUR MAP UPPER HYDROGEOLOGIC UNIT JUNE 16, 2017

2000 ALUMINUM DRIVE, COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	PLATE
Prepared by: G.M.	Scale: AS SHOWN	6
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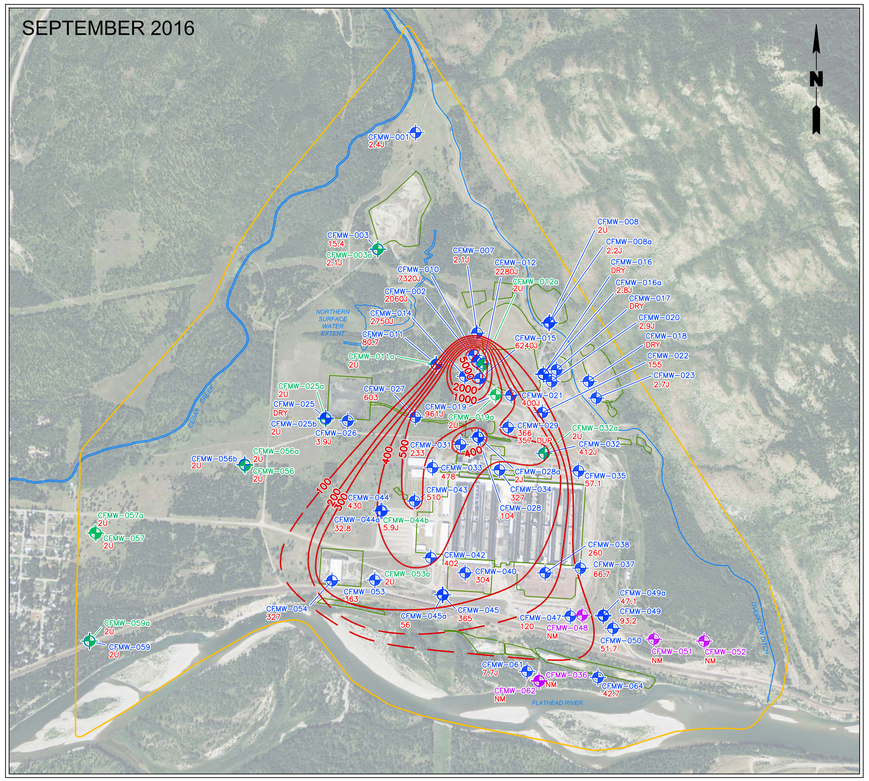
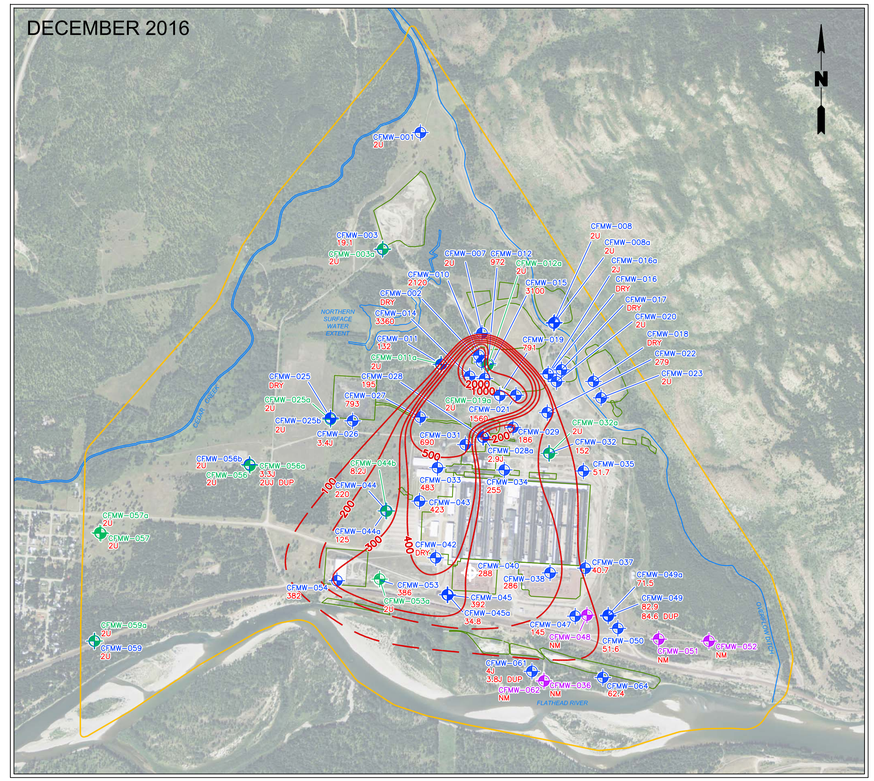
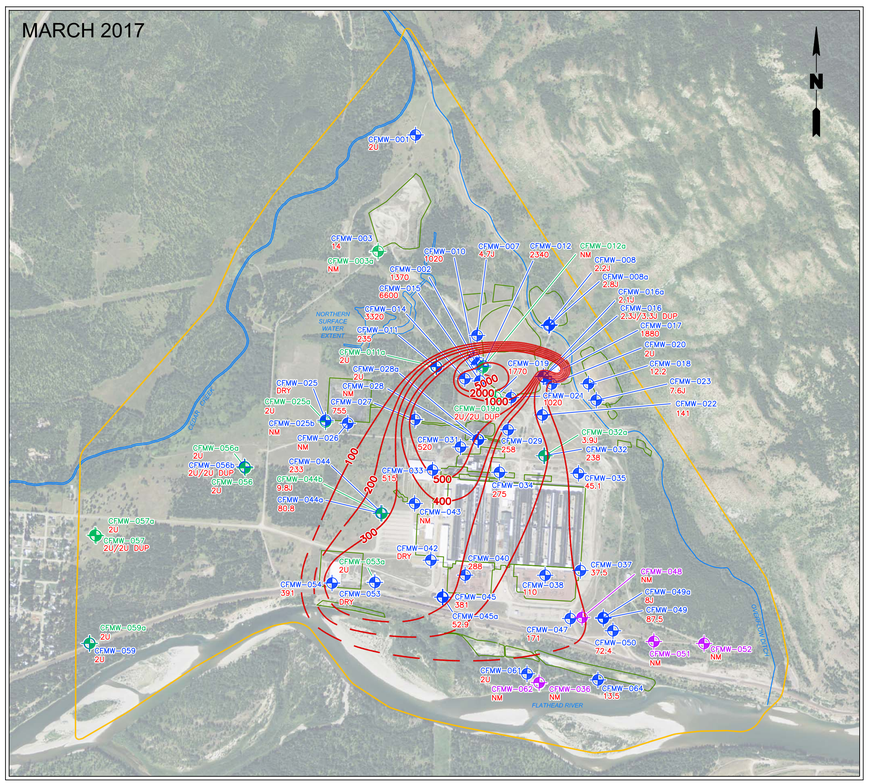
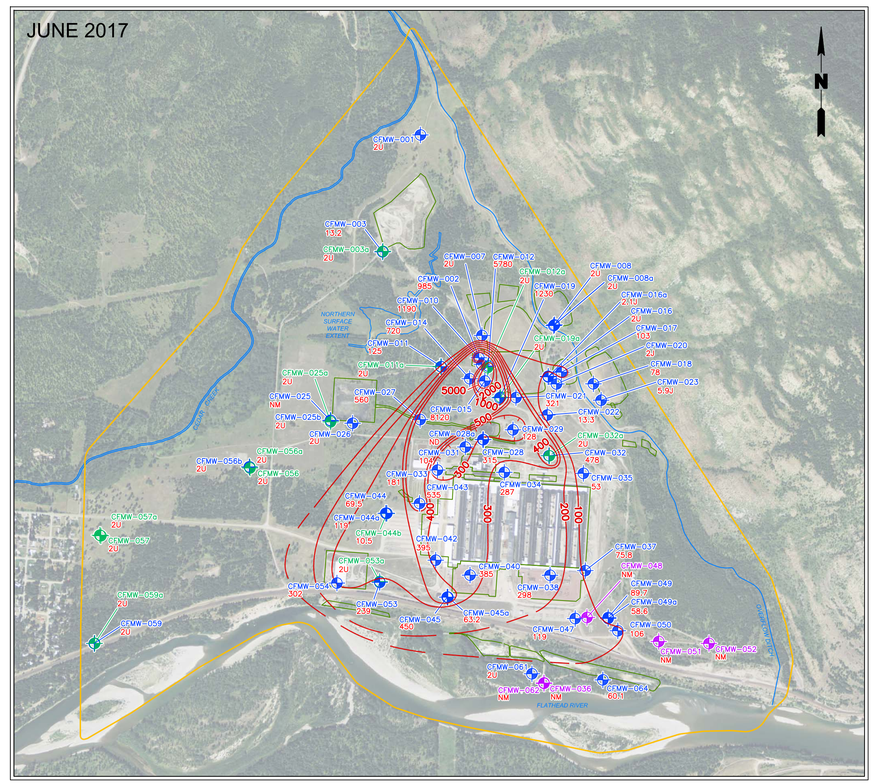








LEGEND

- RI/FS SITE BOUNDARY
- SURFACE WATER FEATURE
- SITE FEATURE
- CFMW-035 — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN UPPER HYDROGEOLOGIC UNIT
- CFMW-052 — LOCATION AND DESIGNATION OF FORMER PRODUCTION WELL
- CFMW-032a* — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- 405 — TOTAL CYANIDE CONCENTRATIONS IN GROUNDWATER (UNITS IN ug/L)
- * — NOT USED IN CONTOURING
- DUP — DUPLICATE SAMPLE
- J — ESTIMATED VALUE
- NM — NOT MEASURED
- U — INDICATES THAT ANALYTE WAS NOT DETECTED AT THE LIMIT REPORTED
- 1000 — CONTOUR LINE OF TOTAL CYANIDE CONCENTRATION (DASHED WHERE INFERRED)

NOTE

CONTOURS ARE FOR THE UPPER HYDROGEOLOGIC UNIT WELLS ONLY

1000' 0 1000'

Title:

CONCENTRATIONS OF TOTAL CYANIDE IN ROUND 1, ROUND 2, ROUND 3 & ROUND 4 GROUNDWATER

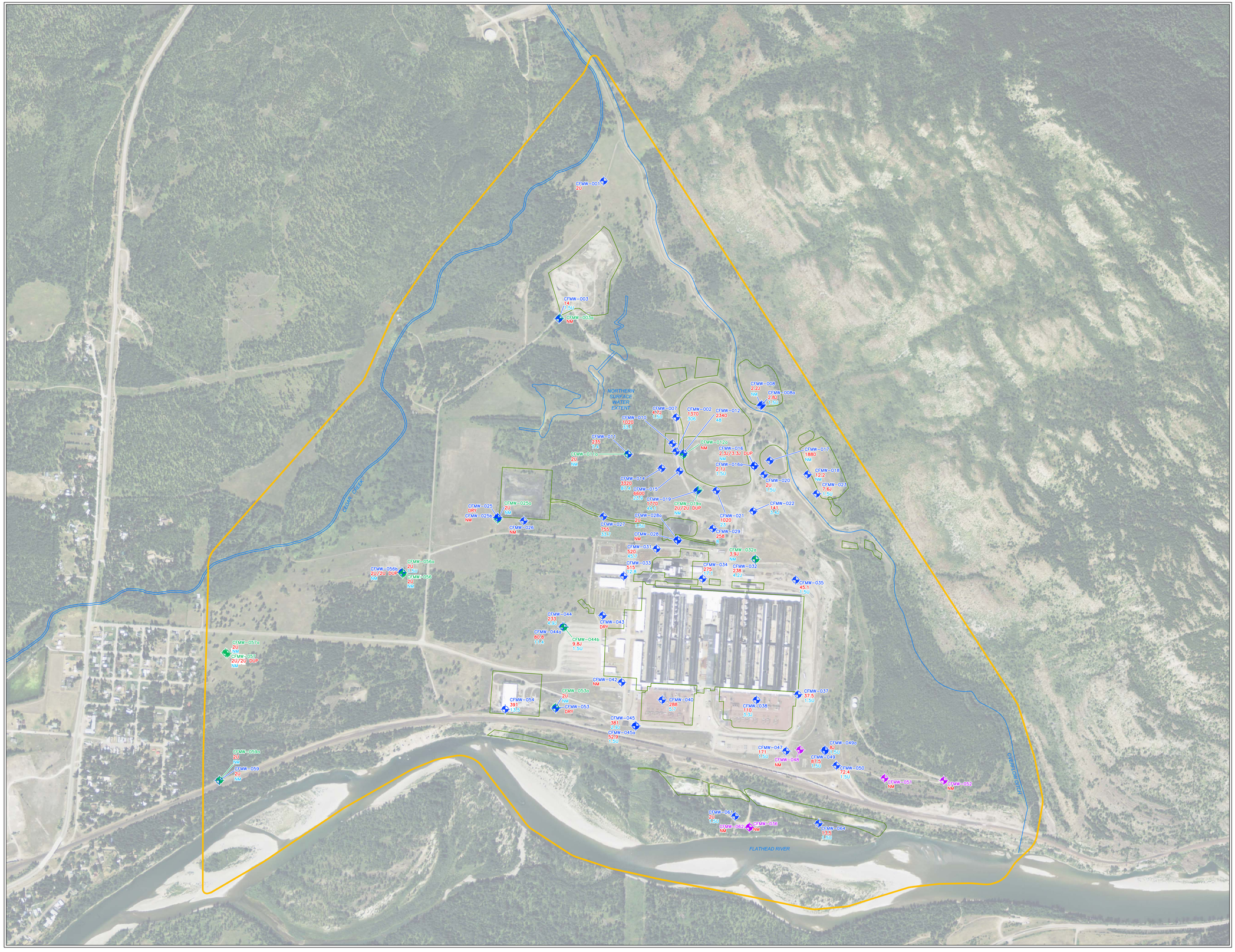
2000 ALUMINUM DRIVE, COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	PLATE
Prepared by: G.M.	Scale: AS SHOWN	7
Project Mgr: M.R.	Project: 2476.0001Y002	
File: 2476.0001Y170.05.DWG		



N

LEGEND

- RI/FS SITE BOUNDARY
- SURFACE WATER FEATURE
- SITE FEATURE
- CFMW-035 — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN UPPER HYDROGEOLOGIC UNIT
- CFMW-052 — LOCATION AND DESIGNATION OF FORMER PRODUCTION WELL
- CFMW-032a* — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- 45.1 — TOTAL CYANIDE CONCENTRATIONS IN GROUNDWATER (UNITS IN ug/L)
- 3.9 — FREE CYANIDE CONCENTRATIONS IN GROUNDWATER (UNITS IN ug/L)
- NM — NOT MEASURED

500' 0 500'

Title:

CONCENTRATIONS OF TOTAL CYANIDE AND FREE CYANIDE IN ROUND 3 GROUNDWATER MARCH 2017

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	PLATE
Prepared by: G.M.	Scale: AS SHOWN	8
Project Mgr: M.R.	Project: 2476.0001Y002	
File: 2476.0001Y170.06.DWG		

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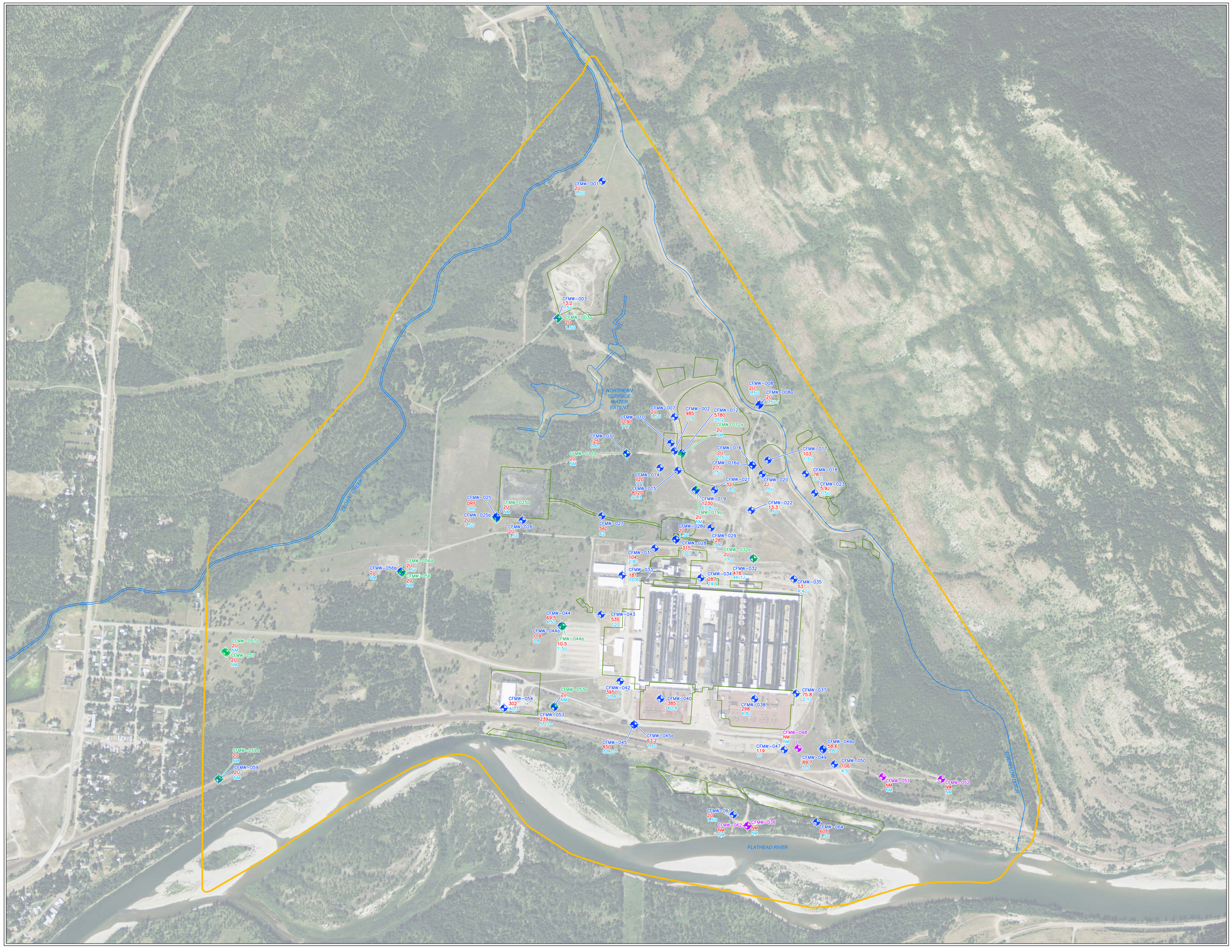

N

LEGEND

- RI/FS SITE BOUNDARY
- SURFACE WATER FEATURE
- SITE FEATURE
- CFMW-035 — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN UPPER HYDROGEOLOGIC UNIT
- CFMW-052 — LOCATION AND DESIGNATION OF FORMER PRODUCTION WELL
- CFMW-032o* — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- 985 — TOTAL CYANIDE CONCENTRATIONS IN GROUNDWATER (UNITS IN ug/L)
- 119 — FREE CYANIDE CONCENTRATIONS IN GROUNDWATER (UNITS IN ug/L)
- NM — NOT MEASURED

500' 0 500'

Title:

CONCENTRATIONS OF TOTAL CYANIDE AND FREE CYANIDE IN ROUND 4 GROUNDWATER JUNE 2017

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 13NOV17	PLATE
Prepared by: G.M.	Scale: AS SHOWN	9
Project Mgr: M.R.	Project: 2476.0001Y002	
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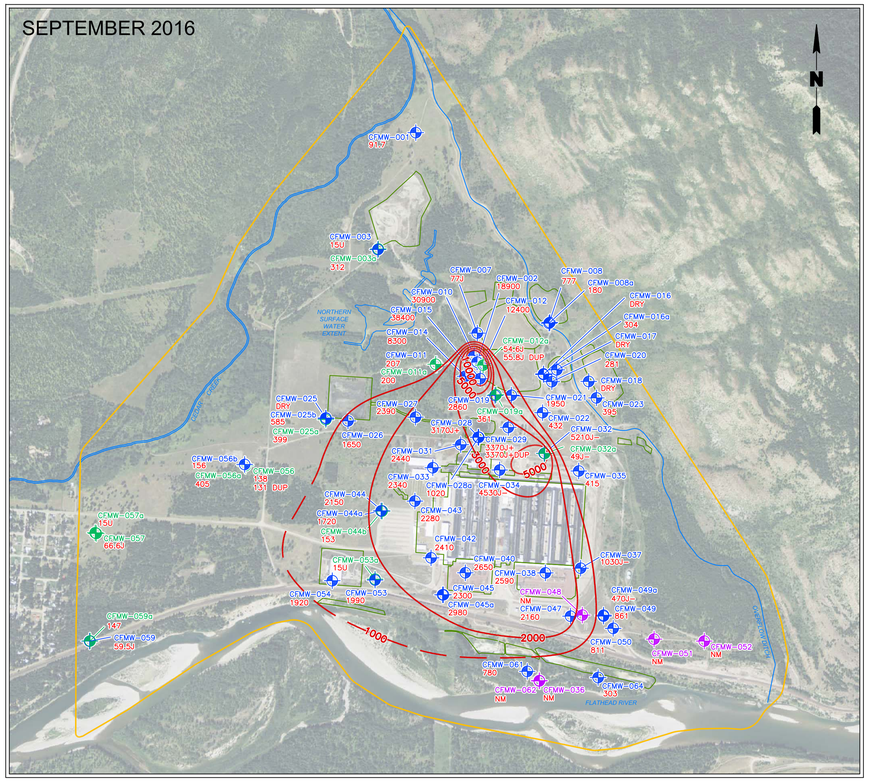

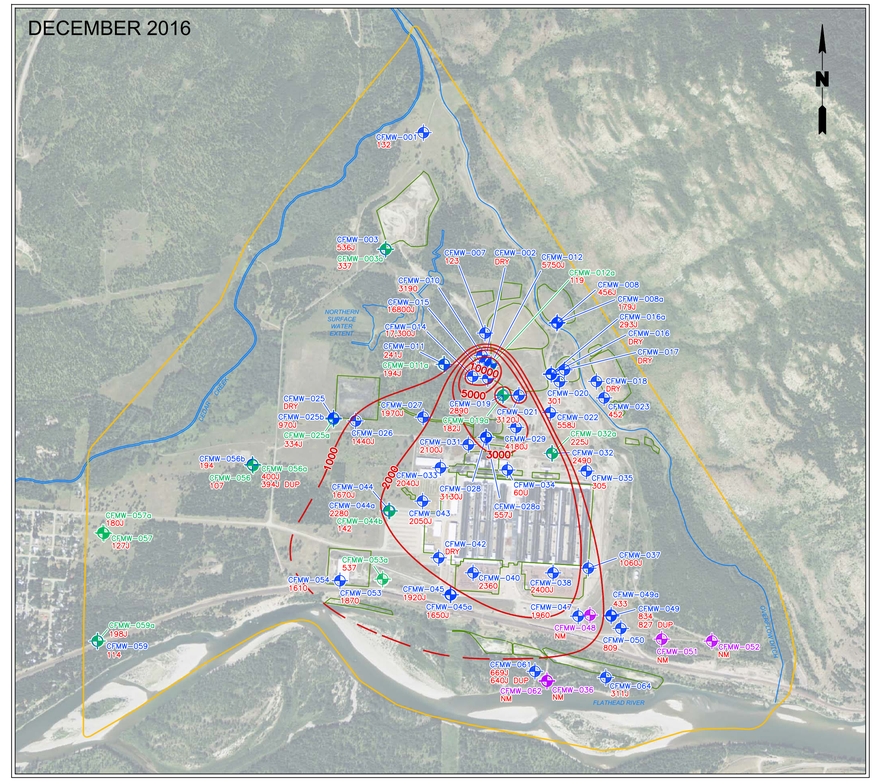

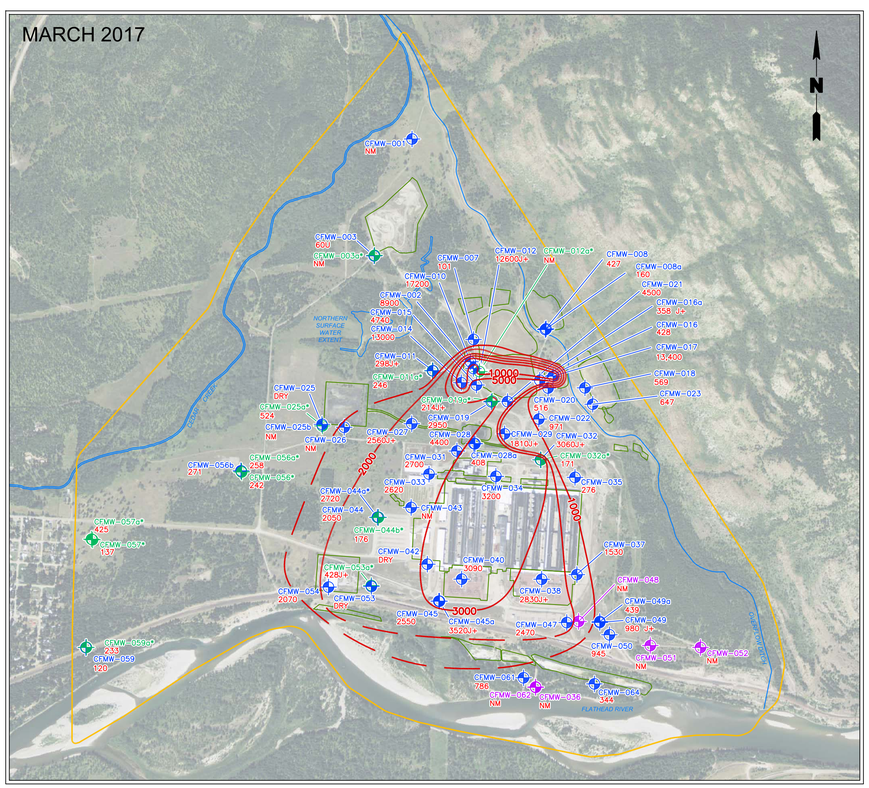

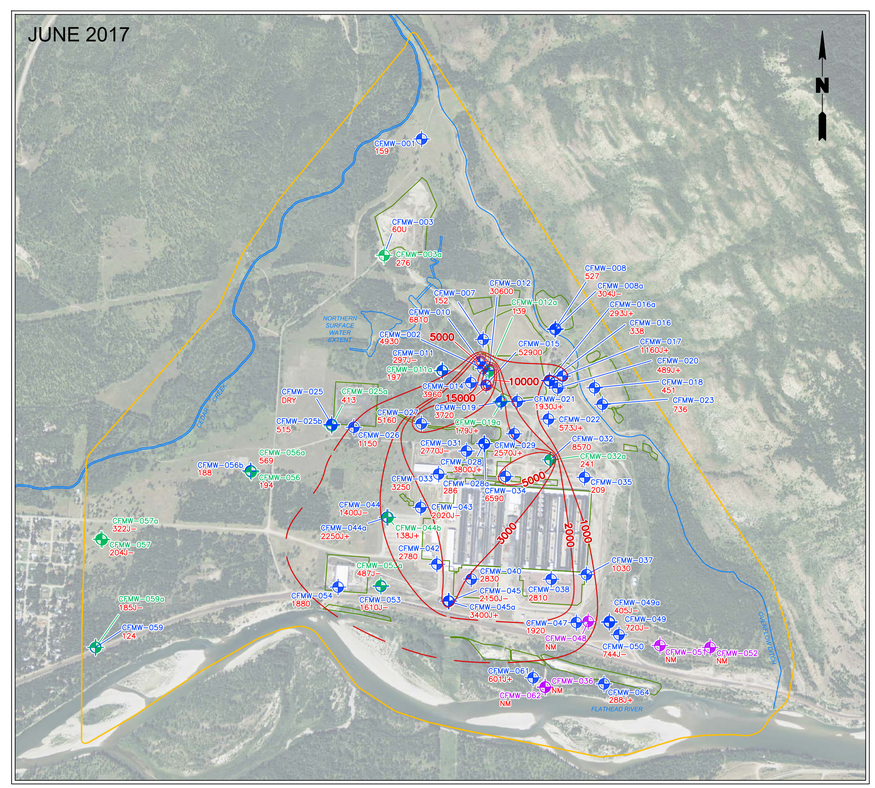

LEGEND

- RI/FS SITE BOUNDARY
- SURFACE WATER FEATURE
- SITE FEATURE
- CFMW-035 — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED IN UPPER HYDROGEOLOGIC UNIT
- CFMW-052 — LOCATION AND DESIGNATION OF FORMER PRODUCTION WELL
- CFMW-032a* — LOCATION AND DESIGNATION OF MONITORING WELL SCREENED BELOW UPPER HYDROGEOLOGIC UNIT
- 405 — FLUORIDE CONCENTRATIONS IN GROUNDWATER (UNITS IN ug/L)
- * — NOT USED IN CONTOURING
- DUP — DUPLICATE SAMPLE
- J — ESTIMATED VALUE
- NM — NOT MEASURED
- U — INDICATES THAT ANALYTE WAS NOT DETECTED AT THE LIMIT REPORTED
- 1000 — CONTOUR LINE OF FLUORIDE CONCENTRATION (DASHED WHERE INFERRED)

NOTE

CONTOURS ARE FOR THE UPPER HYDROGEOLOGIC UNIT WELLS ONLY

1,000 0 1,000

Title:

CONCENTRATIONS OF FLUORIDE IN ROUND 1, ROUND 2, ROUND 3 & ROUND 4 GROUNDWATER

2000 ALUMINUM DRIVE, COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: L.J.	Date: 13NOV17	PLATE
Prepared by: G.M.	Scale: AS SHOWN	10
Project Mgr: M.R.	Project: 2476.0001Y002	
File: 2476.0001Y170.08.DWG		

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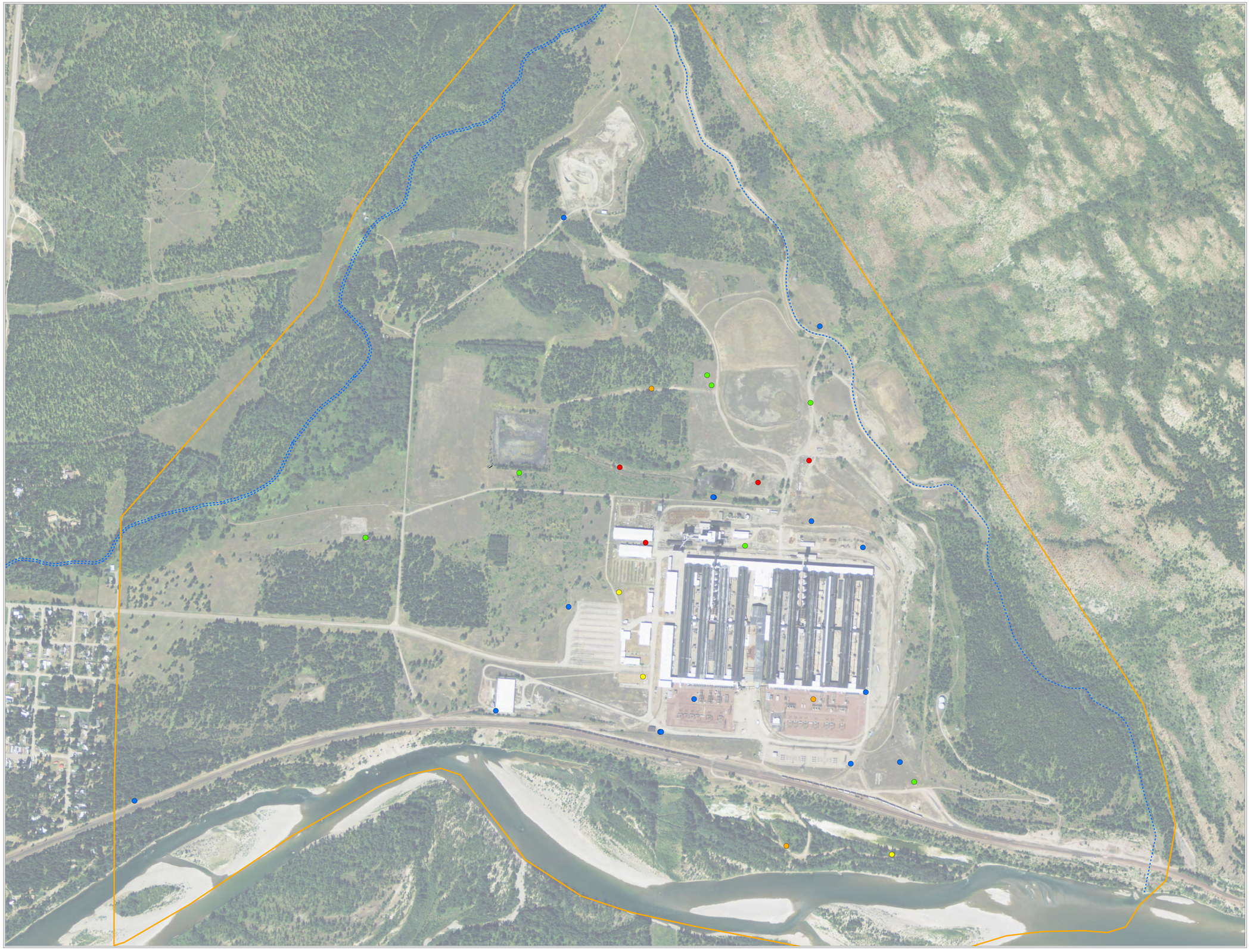

Hydraulic Conductivity Legend

- 0.00354 – 10
- 10 – 50
- 50 – 100
- 100 – 200
- >200
- CREEK FEATURES
- SITE BOUNDARY

NOTE

HYDRAULIC CONDUCTIVITY VALUES AS FEET PER DAY (FT/DAY)

400 0 400 Feet

Title: **AVERAGE HYDRAULIC CONDUCTIVITY ESTIMATED FROM SLUG TESTING IN MONITORING WELLS SCREENED IN THE UPPER HYDROGEOLOGIC UNIT**

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 15MAR18	PLATE
Prepared by: M.S.R.	Scale: AS SHOWN	11
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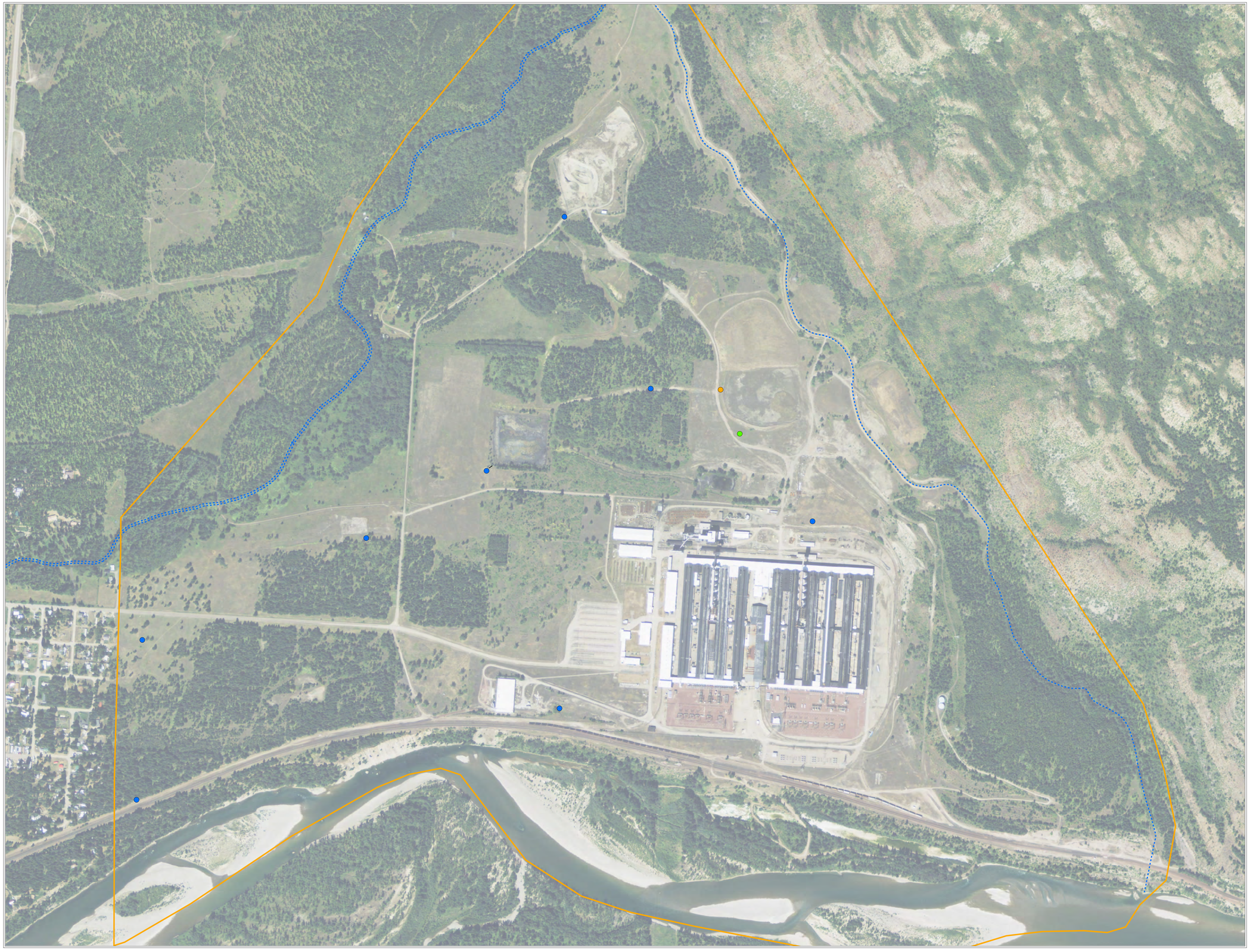

Hydraulic Conductivity Legend

- 0.00354 – 10
- 10 – 50
- 50 – 100
- 100 – 200
- >200
- CREEK FEATURES
- SITE BOUNDARY

NOTE

HYDRAULIC CONDUCTIVITY VALUES AS FEET PER DAY (FT/DAY)

400 0 400 Feet

Title:

AVERAGE HYDRAULIC CONDUCTIVITY ESTIMATED FROM SLUG TESTING IN MONITORING WELLS SCREENED BELOW THE UPPER HYDROGEOLOGIC UNIT

2000 ALUMINUM DRIVE
COLUMBIA FALLS, MONTANA

Prepared For:

COLUMBIA FALLS ALUMINUM COMPANY, LLC

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: M.R.	Date: 15MAR18	PLATE
Prepared by: M.S.R.	Scale: AS SHOWN	12
Project Mgr: M.R.	Project: 2476.0001Y002	
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