F I N A L

2017 Annual Groundwater Monitoring Report for the Limited Purpose Landfill at the TransAlta Centralia Mine, near Centralia, Washington

Prepared for

TransAlta Centralia Mining LLC

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CRAIG D SAUER

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Acronyms and Abbreviations

°C	degrees Celsius
CCR	coal combustion residuals
CCR SAP	*Groundwater Monitoring Sampling and Analysis Plan for the Limited Purpose Landfill at the TransAlta Centralia Mine*
CFR	Code of Federal Regulations
DQR	Double Quantification Rule
EPA	U.S. Environmental Protection Agency
HNO_3	nitric acid
LPLF	Limited Purpose Landfill
mg/L	milligram per liter
SSI	statistically significant increase
SWFPR	sitewide false positive rate
TCM	TransAlta Centralia Mine
UPL	Upper Prediction Limit
WAC	Washington Administrative Code

SECTION 1

Introduction

This section summarizes this annual report's purpose and objectives, the document organization, and provides the site description and the status of the monitoring program.

1.1 Purpose and Objectives

This document is the initial 2017 annual report for the Limited Purpose Landfill at the TransAlta Centralia Mine (TCM), as required per *CCR Groundwater Monitoring and Corrective Action* of 40 Code of Federal Regulations (CFR), 257.90(e), *Annual Groundwater Monitoring and Corrective Action Report*. Per the CCR Rule, the minimum requirements for each annual report submittal must include the following (as itemized per 40 CFR 257.90(e) [items 1 through 5]):

1. A map showing the Coal Combustion Residuals (CCR) unit (landfill) and the designated CCR groundwater monitoring network, including upgradient and downgradient wells with well identification numbers
2. The identification of monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description, and the reasons those actions were taken
3. A summary of the groundwater samples that were collected for analysis for each upgradient (or background) and downgradient well, the dates the samples were collected, and whether the sample was required by the detection or assessment monitoring program
4. A narrative discussion of transition between monitoring programs (the date and circumstances of transitioning from detection phase to assessment monitoring)
5. Other information required per 40 CFR 257.90 through 257.94, interpreted to include the following:
   - A map showing groundwater elevations, inferred groundwater elevation contours, and inferred groundwater flow direction from the sampling events conducted during the preceding year
   - A groundwater elevation hydrograph, including data over the period of record
   - Groundwater flow rates for the semiannual events conducted during the preceding year
   - Results from data quality review and data validation
   - A summary of the statistical method and the respective background (compliance) limits for Detection Monitoring (Appendix III) constituents
   - A summary of any Appendix III constituents that are identified as a statistically significant increase (SSI) greater than background levels

In addition to these technical information, the annual report must also include narrative of the following items:

- Documentation of the status of the monitoring program (that is, detection or assessment phase)
- Key actions completed for the preceding calendar year
- A description of problems encountered, and actions taken to resolve the problems (if needed)
- Key activities anticipated for the upcoming year

The annual reports are due by January 31, and summarize monitoring results from the preceding year. The CCR Rule requires specific reports and notifications throughout the monitoring process, with up to three forms of submittals:

- The site's operating record (40 CFR 257.105)
- Notifications to the State Director (40 CFR 257.106)
- The publicly accessible internet site (40 CFR 257.107)

1.2 Document Organization

The document is organized into the following sections:

- **Section 1. Introduction.** Presents the document purpose and objectives, site description, and status of monitoring program.
- **Section 2. Monitoring Program Description.** Summarizes the groundwater monitoring system design (well network) and the sampling program for the Limited Purpose Landfill.
- **Section 3. Groundwater Monitoring Results.** Summarizes the groundwater monitoring information related to background data collection and the initial compliance event, and provides a map showing groundwater elevations and inferred flow direction, estimates of groundwater seepage velocity, and a summary of groundwater quality results for the initial compliance event.
- **Section 4. Statistical Evaluation.** Summarizes the statistical method and the compliance limits, and compares the initial compliance results to the compliance limits to determine whether there is an SSI greater than background conditions for the Appendix III constituents.
- **Section 5. Summary.** Summarizes the key points of the initial annual report per the CCR regulatory requirements.
- **Section 6. References.** Lists the documents referenced to develop this report.

1.3 Site Description

TCM manages the Limited Purpose Landfill, which is approximately 7 miles east of Centralia, Washington (Figure 1). The Limited Purpose Landfill is north of Pit 7 in the Centralia Mine. The site is in the southern half of Section 33, Township 15N, Range 1W; Latitude 46°44'23" North, Longitude 122°49'55". The site address is 913 Big Hanaford Road, and the Property Tax Parcel (Account) Number is 023387001000. The permitted area encompassing the Limited Purpose Landfill is 57 acres, and the actual footprint of the waste disposal area is 18 acres (Figure 2). The Limited Purpose Landfill consists of the waste disposal area, and the surface impoundments immediately south of the waste disposal area to manage leachate generated at the disposal cell.

TransAlta Centralia Generation LLC operates a coal-burning power plant that is located adjacent to TCM and generates residual ash waste; the residual ash waste is disposed of into the Limited Purpose Landfill. The construction of Stage 1 began during the summer of 2009, and the Lewis County Environmental Health Department authorized TCM to begin waste disposal operations effective October 31, 2009. On December 21, 2009, the Lewis County Environmental Health Department amended the facility permit to approve the disposal of residual ash waste in Stage 1 Area A3a, in addition to Areas A1 and A2, which had been approved for disposal in the original permit. The Stage 2 Area of the Limited Purpose Landfill was constructed in three phases from 2011 through 2014 and was subsequently approved for the receipt of ash waste material.

1.4 Status of the Groundwater Monitoring Program

The groundwater monitoring program is currently in the detection phase, as described under 40 CFR 257.94, *Detection Monitoring Program*.

The following items summarize the key actions completed for the Limited Purpose Landfill to implement the CCR Rule:

- In July of 2016, a focused field investigation was completed to implement the detection groundwater monitoring network to satisfy CCR regulations as described in the *Groundwater Monitoring Well Construction Data Report for the Limited Purpose Landfill at the TransAlta Centralia Mining LLC Site* (CH2M, 2016a). The well completion data report describes the activities for drilling two borings and installing two new groundwater monitoring wells in the uppermost aquifer to augment the existing monitoring network.
- Beginning in November 2016, background groundwater monitoring and related data evaluation was initiated in support of establishing the CCR detection groundwater monitoring program, as described in the *Groundwater Monitoring Sampling and Analysis Plan for the Limited Purpose Landfill at the TransAlta Centralia Mine LLC* (hereafter the CCR SAP) (CH2M, 2016b).
- In October 2017, the groundwater monitoring system design was documented and posted to the publicly available website as described in the *Coal Combustion Residual Groundwater Monitoring System Certification for the Limited Purpose Landfill at the Centralia Mine Site near Centralia, Washington* (CH2M, 2017a).
- In October 2017, the selected statistical method was documented and posted to the publicly available website, as described in the *Coal Combustion Residual Statistical Method Certification for the Limited Purpose Landfill at the Centralia Mine near Centralia Washington* (CH2M, 2017b).

SECTION 2

Monitoring Program Description

This section summarizes the CCR groundwater monitoring program for the Limited Purpose Landfill.

2.1 Monitoring Program

Groundwater is monitored in accordance with the CCR SAP (CH2M, 2016). Details regarding the site hydrogeology, the stratigraphic sequence, the uppermost aquifer, and the lower aquitard/confining unit are presented in the groundwater monitoring system design document (CH2M, 2017a) posted to the publicly available website and are not reiterated herein. Details regarding the monitoring network, sampling, and field/laboratory quality control are described in the following sections.

2.2 Monitoring Network

Effective April 17, 2015, the CCR regulations (specifically, 40 CFR 257.91, *Groundwater Monitoring Systems*) require a facility to install a detection groundwater monitoring system at appropriate locations and depths to yield groundwater samples from the uppermost aquifer and monitoring of all potential contamination pathways. At least one upgradient well must accurately represent the quality of background groundwater unaffected by potential leakage from the CCR unit. The regulations also state that at least three downgradient wells must accurately represent the quality of groundwater passing the waste boundary for the detection of potential groundwater contamination in the uppermost aquifer.

Table 1 summarizes the groundwater monitoring well network and construction details for the Limited Purpose Landfill. Figure 2 shows the designated CCR groundwater monitoring network, which consists of five wells screened in the uppermost aquifer and located around the perimeter of the ash disposal area. Monitoring well LPLF-1 and LPLF-5 are effectively upgradient of the landfill and used to characterize background conditions unaffected by the landfill, and wells LPLF-2R, LPLF-7R, and LPLF-8 are downgradient and designated as compliance wells. As noted in Section 1.4, documentation of the CCR *Groundwater Monitoring Systems* design was submitted to the publicly available website in October 2017, as described in the *Coal Combustion Residual Groundwater Monitoring System Certification for the Limited Purpose Landfill at the Centralia Mine near Centralia, Washington* (CH2M, 2017a).

2.3 Groundwater Level Measurement

Static groundwater level measurements are collected during each monitoring event to calculate groundwater elevations, estimate groundwater flow direction, and calculate the groundwater seepage velocity. Groundwater elevations are calculated by subtracting the field measured static depth to water from the surveyed top-of-casing elevations relative to the local vertical datum (NAD 27, Washington State Plane, North 3601, Feet Intl). Field-measured groundwater levels are recorded on field forms (provided in Appendix A) and the groundwater level data are presented in Section 3.

2.4 Groundwater Sampling

Each well is equipped with dedicated tubing to facilitate low-flow sampling methods, except for LPLF-1, which is bailed to collect the sample. A perastltic pump is used to support sampling methods required for low-flow (minimal drawdown) groundwater sampling procedures as described under *Groundwater Sampling Guidelines for Superfund and RCRA Project Managers* (EPA, 2002). In accordance with the low-flow method, purging continues until field parameters have stabilized to acceptable tolerances as outlined in the CCR SAP (CH2M, 2016b). Field parameters are measured using factory-calibrated multiparameter probe. Appendix A includes copies of field sampling forms for the initial compliance event.

Groundwater samples are collected in laboratory-provided sample containers. Below are the test methods, reporting limits, and preservatives to collect groundwater samples for the Appendix III constituents for detection monitoring.

Constituent	Analytical Test Method	Reporting Limit (mg/L)	Preservative
Boron	EPA 6010C	0.01	HNO_3
Calcium	EPA 6010C	0.05	HNO_3
Chloride	EPA 9056A	2.5	Chill to 4°C
Fluoride	EPA 9056A	0.05	Chill to 4°C
pH	SM 4500H B	0.1	Chill to 4°C
Sulfate	EPA 9056A	10	Chill to 4°C
Total Dissolved Solids	SM 2540C	1	Chill to 4°C

°C = degrees Celsius
HNO_3 = nitric acid
mg/L = milligram per liter

Laboratory analyses are performed by an accredited and certified testing laboratory (ALS, from Kelso, Washington).

2.5 Field and Laboratory Quality Control

As described in the CCR SAP (CH2M, 2016b), field and laboratory quality control are guided by the field quality control procedures that included sample labeling, chain-of-custody documentation, and sealing of sample containers following sample collection. Field duplicate and matrix spike (with duplicates) samples are collected during each sampling event. Temperature and method blanks are included with each shipment.

Laboratory quality control procedures included analysis of method blanks, surrogates, duplicates, and matrix spike/matrix spike duplicates. Results from the laboratory quality control are included in the analytical data packages and are included in Appendix B.

SECTION 3

Groundwater Monitoring Results

This section summarizes the groundwater monitoring results related to the dates of sampling for the background monitoring events, the initial compliance event, the groundwater elevations, the groundwater flow direction, the estimates of groundwater seepage velocity, and the groundwater quality results from the initial compliance event.

3.1 Background and Compliance Monitoring Events

The CCR Rule requires at least eight background groundwater monitoring events before the October 17, 2017, deadline to establish background conditions. Monitoring events after the eighth background event are considered initial detection-phase compliance monitoring to determine whether there is an SSI greater than background conditions. Below are the background events, the initial compliance event, and the respective constituent suites for the sampling events.

Event #	Monitoring Event Type/Purpose	Date Completed	Appendix III, Detection Monitoring Constituents	Appendix IV, Assessment Monitoring Constituents
1	Establish Background	November 14-15, 2016	Yes	Yes
2	Establish Background	December 27-28, 2016	Yes	Yes
3	Establish Background	January 18, 2017	Yes	Yes
4	Establish Background	February 23-24, 2017	Yes	Yes
5	Establish Background	March 7, 2017	Yes	Yes
6	Establish Background	April 4-5, 2017	Yes	Yes
7	Establish Background	May 2-3, 2017	Yes	Yes
8	Establish Background	June 27-28, 2017	Yes	Yes
1	Detection Phase – Initial Compliance Event	October 5, 2017	Yes	No (not required)

3.2 Groundwater Levels and Hydrographs

Table 2 summarizes the most-recent field measured groundwater elevations from the initial compliance event collected on October 5, 2017. Figure 3 presents the groundwater elevation hydrograph from the CCR network wells from the nine consecutive monitoring events conducted from November 2016 through October 2017 (a 14-month period). In general, there are relatively limited fluctuations in groundwater elevations observed over this monitoring period, and supplemental monitoring spanning at least two or more hydrologic cycles (years) will be needed to assess whether there are noteworthy seasonal patterns, characteristics, or apparent trends in the site hydrograph.

3.3 Groundwater Flow Direction

Figure 4 shows the groundwater elevation contours and inferred flow direction for the initial compliance event conducted on October 5, 2017. The groundwater in the uppermost aquifer beneath the Limited Purpose Landfill generally flows to the southwest. Note that upgradient well LPLF-5 was dry at the time of October sampling event, which is consistent with observed groundwater conditions as monitored quarterly since 2007 under the Washington Administrative Code (WAC) 173-350-500 monitoring program administered by the Washington State Department of Ecology. A flow direction to the southwest is typical and representative of the background monitoring events, considering the limited changes observed in groundwater elevations, demonstrated by the site hydrograph (Figure 3).

3.4 Groundwater Flow Velocity Estimates

The estimated groundwater seepage velocity is 16 feet per year, which is based on the following equation and hydraulic assumptions for the uppermost aquifer:

$$v = \frac{K_a i}{n_e}$$ Equation from Fetter, 1994

where:

v	=	groundwater velocity (seepage velocity)
K_a	=	verage horizontal hydraulic conductivity
i	=	horizontal hydraulic gradient
n_e	=	effective porosity

- An average hydraulic conductivity estimate of 0.11 feet per day (equivalent to 3.88×10^{-5} centimeters per second), which is based on slug test analyses and as summarized in the *Coal Combustion Residual Groundwater Monitoring System Certification for the Limited Purpose Landfill at the Centralia Mine Site near Centralia, Washington* (CH2M, 2017a).
- Hydraulic gradient of 0.06 feet per foot, which is representative of groundwater elevation contours as shown in Figure 4 from the October 5, 2017 field measurements; this is considered a typical value based on previous monitoring performed under the pre-existing WAC program since 2007
- Effective porosity of 0.15 (assumed value generally representative of mine spoils)

3.5 Groundwater Quality Results

Table 3 presents the field readings and the groundwater quality results for the Appendix III constituents from the initial compliance event collected on October 5, 2017. Groundwater data from the initial compliance event collected on October 5, 2017, are compared to the background conditions (Events 1 through 8) per the selected statistical method to determine whether the initial compliance values exceed background concentrations, as presented in Section 4.

3.6 Data Quality Assessment

The groundwater quality data, including all background and the initial compliance data, were reviewed to assess the representativeness and usability of data before performing statistical evaluations as presented in Section 4. The method for performing the data quality review is documented in the CCR SAP (CH2M, 2016b) and follows procedures in the U.S. Environmental Protection Agency (EPA) *National Functional Guidelines for Inorganic Superfund Methods Data Review* (EPA, 2016). As shown in Table 3, the values for pH were flagged as "J" values (estimates) as they were analyzed outside their hold time, and also the value for chloride in well LPLF-2R was flagged as J-value since the matrix spike (MS) recovery was low and below the acceptance criteria. These estimated compliance values were reviewed and found to be comparable to background values, and are considered representative at the time of sampling. The data quality review confirmed the field and laboratory methods followed the procedures specified in the CCR SAP, the completeness target/goal of 100 percent was achieved, none of the data were rejected, and all the background and initial compliance data were found to satisfy the data quality objectives to be included for statistical evaluation as presented in Section 4.

SECTION 4

Statistical Evaluation

This section summarizes the CCR regulatory requirements for statistical evaluation under the detection phase, as well as the selected statistical method, and compares the initial compliance data to compliance levels to determine if compliance values exceed background concentrations.

4.1 Statistical Evaluation Regulatory Requirements

The CCR Rule specifically lists four methods acceptable for statistical analysis (40 CFR 257.93[f]):

1. Parametric or nonparametric analysis of variance
2. Tolerance intervals
3. Prediction intervals (limits)
4. Control charts

Another statistical test method also may be considered if it meets the performance standards listed in 40 CFR 297.93(g). Per the CCR Rule, the selected statistical method is required to be posted to the publicly available website by the October 17, 2017, deadline.

4.2 Statistical Evaluation Methods and Compliance Limits

Based on the site-specific groundwater conditions and results from an exploratory evaluation on the background data, the selected statistical method for evaluating groundwater detection monitoring data is a prediction interval (limit) method, which is a statistical method option, per 40 CFR 257.93(f)(3). The prediction interval method will be used separately for each well-constituent pair and was selected because the Appendix III constituents exhibited significant spatial variability, making an upgradient versus downgradient, also known as interwell, comparison infeasible. The method for six of the seven Appendix III constituents (including boron, calcium, chloride, pH, sulfate, and TDS) is an intra-well Prediction Limit; the seventh constituent, fluoride, is handled separately via the Double Quantification Rule (DQR). Per EPA *Unified Guidance* (2009), the DQR is applicable to constituents that exhibit 100 percent no-detect characteristics, and fluoride is 100 percent nondetect during the background period. The DQR method, which is applicable to fluoride only, assumes that a SSI is confirmed if both the original and retest values are confirmed to be detected values. Supplemental details and rationale for method selection are presented in *Coal Combustion Residual Statistical Method for the Limited Purpose Landfill at the Centralia Mine near Centralia, Washington* (CH2M, 2017b), which has been posted to the CCR public website prior to the October 17, 2017, deadline.

EPA's *Unified Guidance* (2009) recommends that prediction limits be combined with retesting for maintaining a low sitewide false positive rate (SWFPR) while providing high statistical power. The exploratory analysis confirmed a "1-of-2" retesting strategy is acceptable and will be used to verify an apparent SSI (that is, an initial SSI for Appendix III constituents). Retesting is an integral part of the statistical methodology for controlling the SWFPR when multiple monitoring locations and parameters are being evaluated. Assuming the "1-of-2" retesting approach, an apparent SSI cannot be confirmed or denied until the results of the resampling event have been obtained.

Following the prediction interval method, the compliance limits were calculated on the CCR Appendix III constituents for the three downgradient compliance wells (LPLF-2R, LPLF-8, and LPLF-7R). The calculation of intra-well prediction limits is used for six of the seven CCR constituents, including boron, calcium, chloride, pH, sulfate, and TDS; fluoride is evaluated separately via the DQR as a result of the 100 percent nondetects during background period. Assuming that sample background data are normally

distributed, or assuming that they can be transformed to fit a normal distribution, then the parametric upper prediction limit (UPL) is based on equation (1) as follows:

$$UPL = \overline{x} + Ks \quad (1)$$

where:

$\overline{x}$ is the sample mean,

s is the sample standard deviation, and

K is a multiplier factor that is chosen based on the evaluation schedule (nE), number of constituents (nc), number of wells (nw), number of background observations (n), overall SWFPR, and the specific retesting scheme selected.

For constituents such as pH, which require both lower and upper prediction limits, equation (2) is used:

$$LPL, UPL = \overline{x} \pm Ks \quad (2)$$

Table 4 presents the background (compliance) limits for each Appendix-III constituent derived from the equations above. For selected constituents exhibiting trends during background period, the background data were detrended before determining the background levels. As shown in Table 4, the constituents in which trends will be accounted for include boron, calcium, and TDS at well LPLF-2R; chloride, sulfate, and TDS at well LPLF-7R; and calcium, sulfate, and TDS at well LPLF-8. For the cases listed as 'no' for trend removal, the UPLs and lower prediction levels are the fixed compliance values to directly compare against future detection monitoring data to determine a SSI above background, and will be the levels to use until background is updated in the future. However, for cases listed as 'yes' for trend removal, the UPL is a calculated value dependent on time of sampling using equation (3) as follows:

Trend accounting UPL = Intercept + slope(time, in days) + residual value* (3)

Note that the trendline equations and variables for intercept, slope, time, and residual values are shown in Table 4; these UPLs are listed as 'calculated' as they are dependent upon the time when the compliance data were obtained. The time (in days) is assumed as the number of days starting from the initial background event (which was collected on November 14, 2017) to when the compliance data in question were collected (October 5, 2017, which is 325 days following the initial event on November 14, 2017). For TDS at well LPLF-2R, transformation was performed using the Tukey power transformation to convert it into a normal distribution before applying the simple regression to determine an appropriate relationship for trend removal.

4.3 Statistical Evaluation Results

Table 5 compares the initial compliance results from the October 5, 2017 sampling event to the background compliance limits to determine whether the compliance values exceed background compliance limits. The October 5, 2017, compliance values are less than or within the respective background compliance limits, except for the following four cases:

- Boron in LPLF-2R
- Calcium in LPLF-2R
- pH in LPLF-2R
- Total dissolved solids (TDS) in LPLF-2R

These four cases exceed the background compliance limits. However, as described above, retesting will be needed to determine whether these are validated SSI's. To satisfy CCR sampling requirements and deadlines, retesting is required to be completed before the next regularly scheduled sampling event (which would be late spring 2018).

SECTION 5

Summary

Key findings developed and/or confirmed from the initial 2017 annual groundwater report are summarized as follows:

- **Implementation of CCR Detection Monitoring Program.** TCM initiated the CCR requirements starting in summer of 2016 with the focused field investigation and well installation effort to augment the existing well network; functional details of the sampling plan were documented in the CCR SAP (CH2M, 2016b). Certification documents for the groundwater monitoring system design and the selection of statistical method were posted to the public website before the October 17, 2017, deadline. The Limited Purpose Landfill monitoring program is in the detection-phase status per 40 CFR 257.94, *Detection Monitoring Program.*
- **Background and Initial Detection-phase Compliance Monitoring Events.** The eight background monitoring events were completed from November 14, 2016, through June 28, 2017; the initial detection-phase compliance event was completed on October 5, 2017.
- **Groundwater Levels.** The groundwater elevations collected during background and initial compliance monitoring events were used to develop a site hydrograph with the nine consecutive sampling events spanning 14 months, which revealed limited fluctuations or seasonality over this relatively short interval of time. Additional measurements collected over several seasonal cycles (years) will be needed to assess if there are substantive seasonal changes or potential trends in groundwater elevations. The groundwater flow direction is to the southwest, with a typical gradient of 0.06 feet per foot, and an estimated groundwater seepage velocity of 16 feet per year.
- **Detection Monitoring Results/Statistical Evaluation.** The prediction limit method confirmed the October 5, 2017 compliance values were less than or within the background compliance limits, except for four cases which exceeded background compliance limits. These cases will require retesting to confirm whether these are valid SSI's.

Note that under 40 CFR 257.94 (Detection Monitoring Program), based on results from an apparent SSI, the site owner has the option to demonstrate that a source other than the regulated unit (ash landfill) caused the SSI exceeding background levels before automatically shifting into the assessment phase requirements. A potential shift to assessment monitoring and/or demonstrations require PE certification and to be completed within 90 days following determination of a valid SSI.

SECTION 6

References

CH2M HILL Engineers, Inc. (CH2M). 2016a. *Groundwater Monitoring Well Construction Data Report for the Limited Purpose Landfill at the TransAlta Centralia Mining LLC Site.*

CH2M HILL Engineers, Inc. (CH2M). 2016b. *Groundwater Monitoring Sampling and Analysis Plan for the Limited Purpose Landfill at the TransAlta Centralia Mine LLC.*

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Tables

Table 1. Groundwater Monitoring Well Network

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Well	Installation Date	Coordinates in NAD27[1]		Reference Point		Well Screen Elevation[2]		Sand Pack Elevation[2]		Well		
		Northing	Easting	Top of Casing Elevation[2]	Top of Ground Elevation[2]	Top	Bottom	Top	Bottom	Depth[3]	Aquifer Unit	Hydraulic Designation
LPLF-1	October 2007	520,881.45	1,420,272.06	347.80	344.58	305.58	285.58	309.58	282.58	59	Mine Spoils	Up or Cross-Gradient
LPLF-5	August 2008	521,931.70	1,419,921.73	359.90	357.88	349.88	344.88	351.38	343.38	13	Mine Spoils	Upgradient
LPLF-8	August 2008	521,235.37	1,419,233.53	298.75	296.93	279.93	274.93	282.93	273.93	22	Mine Spoils	Downgradient
LPLF-2R	July 2016	521,561.20	1,419,130.52	296.04	293.86	10.0	263.9	275.86	262.36	31	Mine Spoils	Downgradient
LPLF-7R	July 2016	521,180.82	1,419,531.95	299.00	297.04	279.7	269.7	282.04	269.04	28	Mine Spoils	Downgradient

General Notes:

1. Well LPLF-1 is low yield and sampled via bailer.

Column Header Footnotes:

[1]Washington State Plane Coordinates (NAD27).

[2]All elevations in feet above mean sea level (NGVD29).

[3]Well depth is feet below ground surface (rounded to nearest foot).

Table 2. Groundwater Elevations and Field Parameter Readings - Event #9

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Well	Date Sampled	Reference Point Elevation (ft)	Depth to Water (ft btc)	Groundwater Elevation (ft)	Temp (°C)	pH	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Conductivity (uS/cm)	Turbidity (NTU)	Hydraulic Designation	Hydrostratigraphic Unit	Comments
LPLF-1	10/5/17	347.80	57.72	290.08	13.8	6.2	2.60	74	3,163	15.5	Up or Cross Gradient	Backfill/Mine Spoils	Sampled via bailier - slow recharge
LPLF-5	10/5/17	359.90	NA	--	--	--	--	--	--	--	Upgradient	Backfill/Mine Spoils	Dry/no water in well. Not sampled.
LPLF-8	10/5/17	298.75	13.45	285.30	14.2	5.4	1.05	23	3,763	1.1	Downgradient	Backfill/Mine Spoils	
LPLF-2R	10/5/17	296.04	5.41	290.63	13.2	5.7	0.52	121	3,853	1.73	Downgradient	Backfill/Mine Spoils	
LPLF-7R	10/5/17	299.00	20.72	278.28	13.6	5.8	0.84	-7	2,862	1.4	Downgradient	Backfill/Mine Spoils	
Water Levels Only													
LPLF-3	10/5/17	295.64	5.91	289.73	--	--	--	--	--	--	Cross-Gradient	Backfill/Mine Spoils	--
LPLF-4	10/5/17	303.12	4.28	298.84	--	--	--	--	--	--	Cross-Gradient	Backfill/Mine Spoils	--

Notes:

" -- " = Not applicable, not available, and/or not measured.

Reference point elevation is top of PVC casing; all elevations are in feet above mean sea level (NAVD88).

Field parameter readings represent final stabilized readings obtained during low-flow purge immediately prior to collection of water-quality sample

ft = feet

ft btc = feet below top of casing

C = degrees celcius

mg/L = milligrams per liter

mV = millivolts

uS/cm = microsiemens per centimeter

NTU = Nephelometric Turbidity Units

Table 3. Groundwater Quality Data

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Well			**LPLF-1**	**LPLF-5***	**LPLF-8**	**LPLF-2R**	**LPLF-7R**
Sample ID			100517-CCR-LPLF1	NA	100517-CCR-LPLF8	100517-CCR-LPLF2R	100517-CCR-LPLF7R
Sample Date			10/5/2017	NA (dry)	10/5/2017	10/5/2017	10/5/2017
Hydraulic Designation			Up or Cross Gradient	Upgradient	Downgradient	Downgradient	Downgradient
Analyte	**Method**	**Units**					
Field Parameters							
pH	Field Probe	units	6.22	--	5.36	5.72	5.84
Temperature	Field Probe	C	13.8	--	14.2	13.2	13.6
Spec. Conductance	Field Probe	uS/cm	3,163	--	3,763	3,853	2,862
Dissolved Oxygen	Field Probe	mg/L	2.6	--	1.05	0.52	0.84
Oxygen Red. Potential	Field Probe	mV	73.7	--	23	121	-6.6
Turbidity	Field Probe	NTU	15.5	--	1.1	1.73	1.4
Detection Monitoring Constituents (Appendix III to Part 257)							
Boron	EPA 6010C	mg/L	0.612	--	0.968	0.363	0.377
Calcium	EPA 6010C	mg/L	230	--	411	546	210
Chloride	EPA 9056A	mg/L	2.95	--	5.79	8.03 J	6.29
Fluoride	EPA 9056A	mg/L	1 U	--	1 U	1 U	1 U
pH	SM 4500H B	unit	6.93 J	--	6.09 J	6.97 J	6.78 J
Sulfate	EPA 9056A	mg/L	1,460	--	2,410	1,910	1,220
Total Dissolved Solids	SM 2540C	mg/L	2,640	--	3,740	3,650	2,350

Notes:

* Sample not collected at well LPLF-5 since it was dry at time of October 5, 2017 sampling event.

Field parameters represent final stabilized readings obtained during sampling immediately prior to sample collection.

Non-detect values reported as "U" with the laboratory method detection limit; "J" is estimated value as determined from data validation.

Acronyms:

Data qualifiers: U = non-detect value, J = estimated value.

C = degrees celcius

mg/L = milligrams per liter

mV = millivolts

uS/cm = microsiemens per centimeter

NTU = Nephelometric Turbidity Units

Table 4. Statistical Method and Compliance Limits

2017 Annual Report for the Limited Purpose Landfill at the TransAlta Centralia Mine LLC

Well	Constituents	Units	Method	Transformation	Detrending Calculated UPL (if needed) = { Intercept + [Slope* Time(days)] + Residual }				K-Value	Lower Compliance Limit	Upper Compliance Limit
					Trend Removal	Intercept	Slope	Residual		LPL	UPL
LPLF-2R	Boron	mg/L	Parametric UPL	--	**Yes**	0.356	-0.0001155	0.0134	2.4	--	0.323 *
LPLF-2R	Calcium	mg/L	Parametric UPL	--	**Yes**	496.8	-0.217	33.6	2.4	--	458 *
LPLF-2R	Chloride	mg/L	Parametric UPL	--	No	--	--	--	2.4	--	9.77
LPLF-2R	Fluoride	mg/L	DQR	--	No	--	--	--	--	--	DQR
LPLF-2R	pH	pH units	Parametric UPL	--	No	--	--	--	2.79	6.08	6.86
LPLF-2R	Sulfate	mg/L	Parametric UPL	--	No	--	--	--	2.4	--	2,010
LPLF-2R	TDS	mg/L	Parametric UPL	Power, 9.975, divided by 1E35	**Yes**	3.878	-0.00899	2.23	2.4	--	3,440 *
LPLF-7R	Boron	mg/L	Parametric UPL	--	No	--	--	--	2.4	--	0.427
LPLF-7R	Calcium	mg/L	Parametric UPL	--	No	--	--	--	2.4	--	223
LPLF-7R	Chloride	mg/L	Parametric UPL	--	**Yes**	7.528	-0.00544	0.313	2.4	--	7.44 *
LPLF-7R	Fluoride	mg/L	DQR	--	No	--	--	--	--	--	DQR
LPLF-7R	pH	pH units	Parametric UPL	--	No	--	--	--	2.79	6.06	6.98
LPLF-7R	Sulfate	mg/L	Parametric UPL	--	**Yes**	706.6	3.027	167	2.4	--	1,930 *
LPLF-7R	TDS	mg/L	Parametric UPL	--	**Yes**	1615	3.776	253	2.4	--	3,280 *
LPLF-8	Boron	mg/L	Parametric UPL	--	No	--	--	--	2.4	--	0.988
LPLF-8	Calcium	mg/L	Parametric UPL	--	**Yes**	349.8	0.183	28.7	2.4	--	423 *
LPLF-8	Chloride	mg/L	Parametric UPL	--	No	--	--	--	2.4	--	7.39
LPLF-8	Fluoride	mg/L	DQR	--	No	--	--	--	--	--	DQR
LPLF-8	pH	pH units	Parametric UPL	--	No	--	--	--	2.79	5.61	6.36
LPLF-8	Sulfate	mg/L	Parametric UPL	--	**Yes**	1994	2.461	121	2.4	--	2,920 *
LPLF-8	TDS	mg/L	Parametric UPL	--	**Yes**	3240	2.185	258	2.4	--	4,280 *

Notes:

UPL = Upper Prediction Limit (compliance limit)
LPL = Lower Prediction Limit (compliance limit)
DQR = Double Quantification Rule as described in Section 4; a SSI occurs if there is a detected compliance value given that all background samples were non-detect, etc.
*Compliance limit dependent on time of sampling which was 325 days following the initial sample event and detrended as described in Section 4; compliance limits without an asterisk are fixed and are not dependent on time of sampling.

Table 5. Comparison of Compliance Results to Background Compliance Limits

2017 Annual Report for Limited Purpose Landfill at the TransAlta Centralia Mine LLC

Well	Constituents	Units	Method	Lower Compliance Limit	Upper Compliance Limit	Compliance Point Sampling Values	Exceedance of Background Compliance Limit (yes/no)
				LPL	UPL	10/5/2017 Event	
LPLF-2R	Boron	mg/L	Parametric UPL	--	**0.323**	**0.363**	**Yes**
LPLF-2R	Calcium	mg/L	Parametric UPL	--	**458**	**546**	**Yes**
LPLF-2R	Chloride	mg/L	Parametric UPL	--	9.77	8.03(J)	No
LPLF-2R	Fluoride	mg/L	DQR	--	DQR	<1 (non-detect)	No
LPLF-2R	pH	pH units	Parametric UPL	6.08	**6.86**	**6.97(J)**	**Yes**
LPLF-2R	Sulfate	mg/L	Parametric UPL	--	2,010	1,910	No
LPLF-2R	TDS	mg/L	Non-Parametric UPL	--	**3,440**	**3,650**	**Yes**
LPLF-7R	Boron	mg/L	Parametric UPL	--	0.427	0.377	No
LPLF-7R	Calcium	mg/L	Parametric UPL	--	223	210	No
LPLF-7R	Chloride	mg/L	Parametric UPL	--	7.44	6.29	No
LPLF-7R	Fluoride	mg/L	DQR	--	DQR	<1 (non-detect)	No
LPLF-7R	pH	pH units	Parametric UPL	6.06	6.98	6.78(J)	No
LPLF-7R	Sulfate	mg/L	Parametric UPL	--	1,930	1,220	No
LPLF-7R	TDS	mg/L	Parametric UPL	--	3,280	2,350	No
LPLF-8	Boron	mg/L	Parametric UPL	--	0.988	0.968	No
LPLF-8	Calcium	mg/L	Parametric UPL	--	423	411	No
LPLF-8	Chloride	mg/L	Parametric UPL	--	7.39	5.79	No
LPLF-8	Fluoride	mg/L	DQR	--	DQR	<1 (non-detect)	No
LPLF-8	pH	pH units	Parametric UPL	5.61	6.36	6.09(J)	No
LPLF-8	Sulfate	mg/L	Parametric UPL	--	2,920	2,410	No
LPLF-8	TDS	mg/L	Non-Parametric UPL	--	4,280	3,740	No

Notes:

DQR = Double Quantification Rule as described in Section 4.

UPL = Upper Prediction Limit (effectively upper compliance limit).

LPL = Lower Prediction Limit (effectively lower compliance limit).

Bold-font entries with 'yes' indicate a compliance value which exceeds compliance limit; retesting is needed to confirm if these cases are valid.

Figures

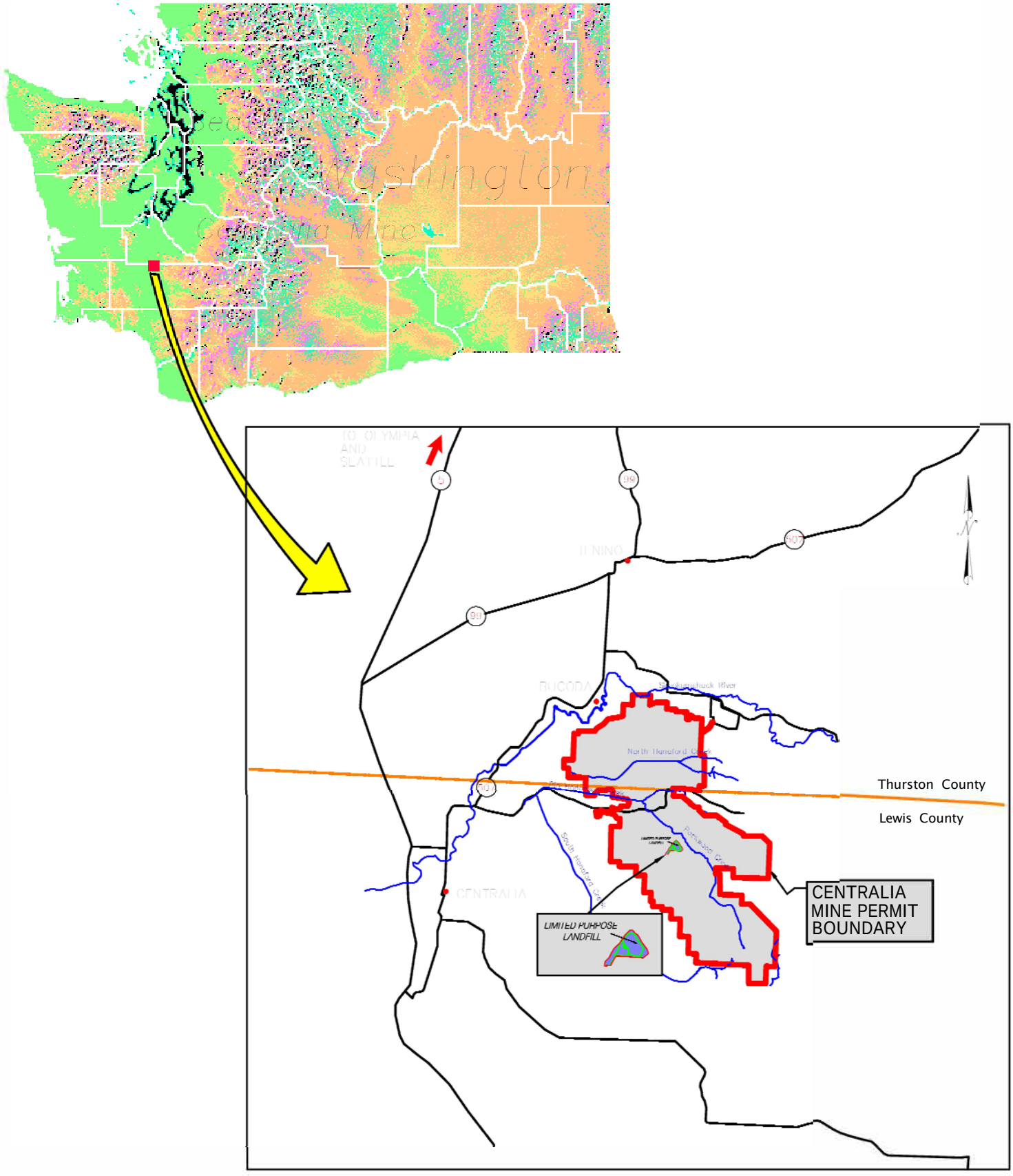


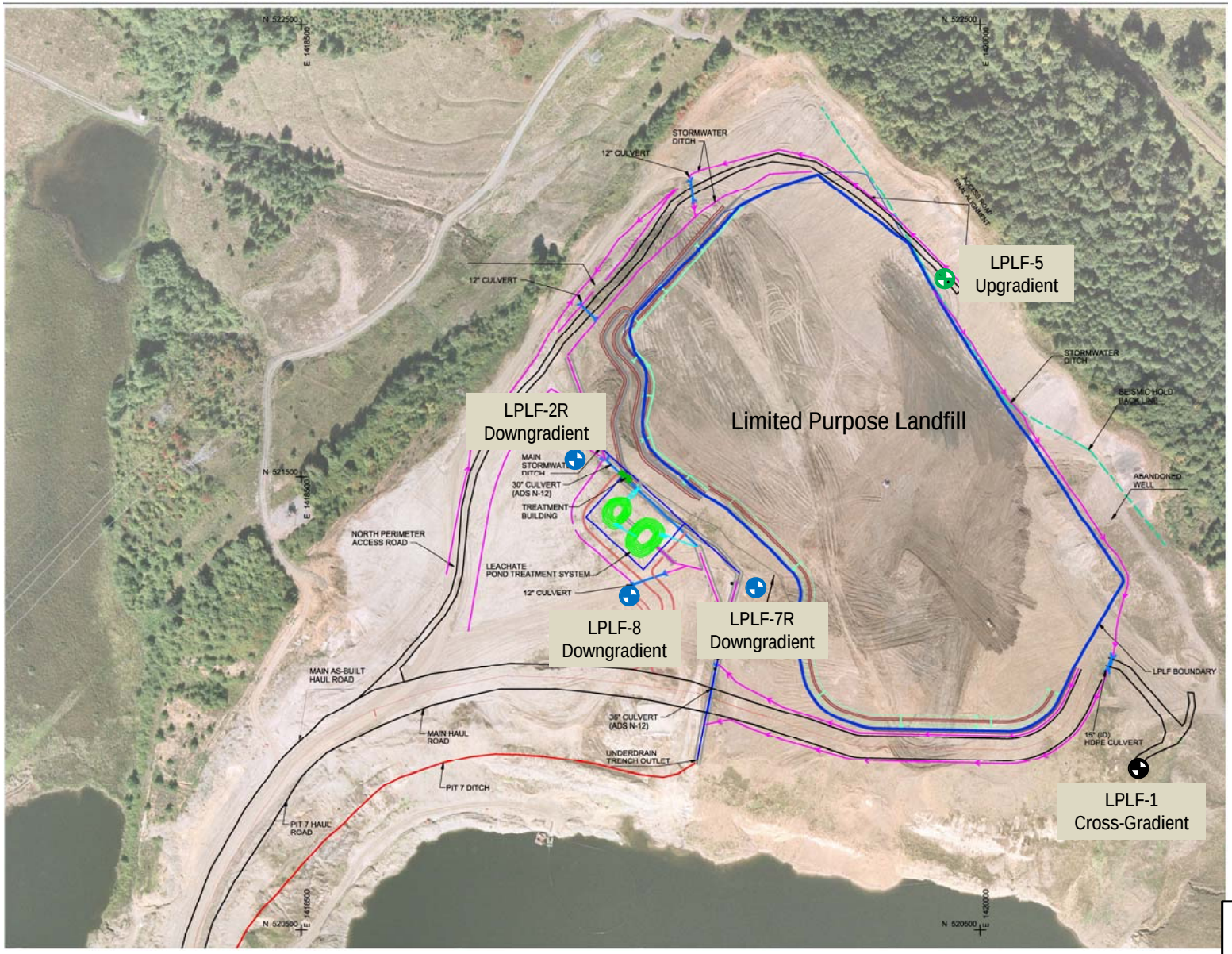
FIGURE 1

Vicinity Map

2017 Annual Groundwater Monitoring Report

Limited Purpose Landfill

January 2018



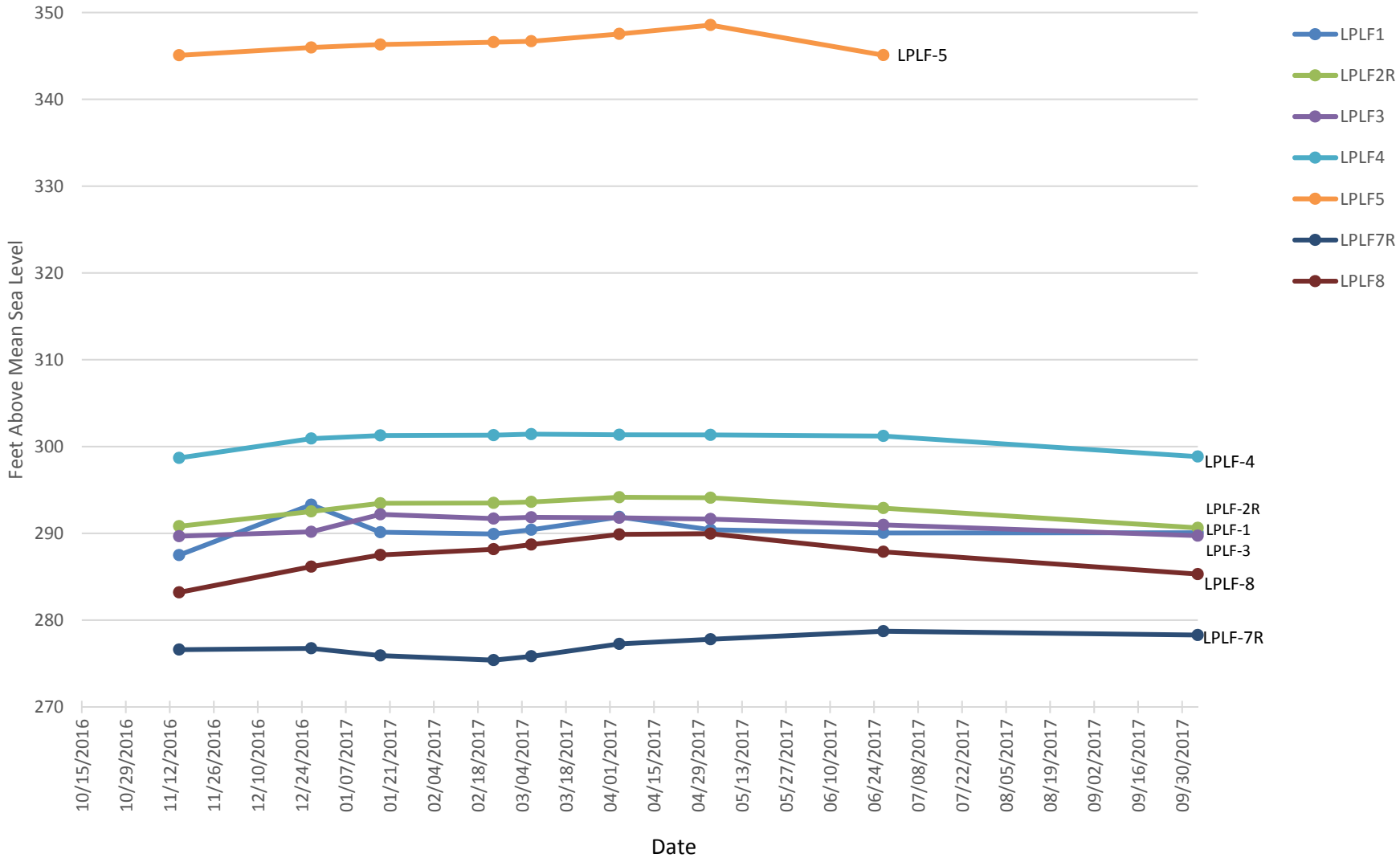
LEGEND

- FINAL ROADS
- PIT 7 DITCH
- STORMWATER DITCH
- LPLF FOOTPRINT
- SEISMIC HOLD BACK LINE
- UPGRADIENT MONITORING WELL
- CROSS-GRADIENT MONITORING WELL
- DOWNGRADIENT MONITORING WELL

0 250 500

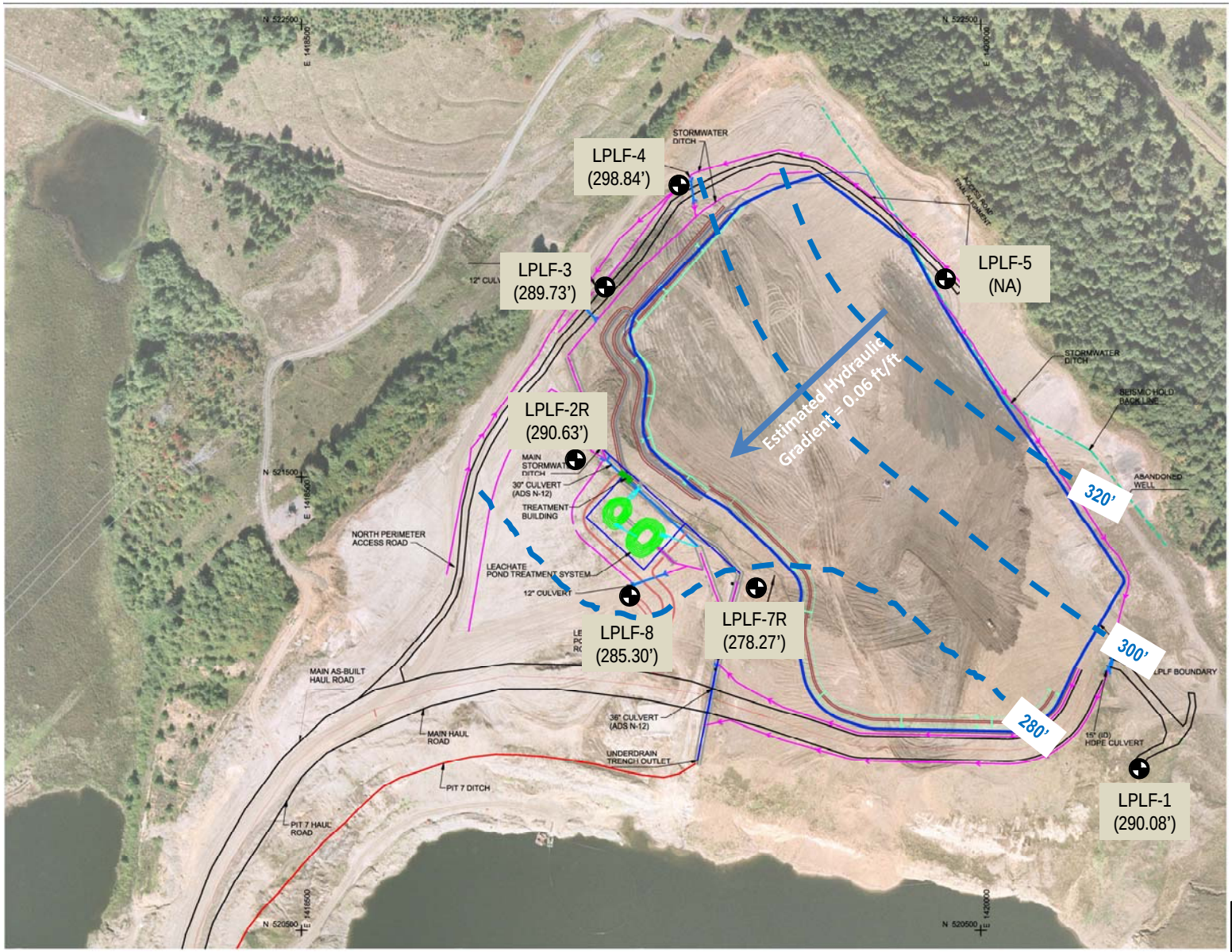
Scale: feet

Figure 2
Site Map and Groundwater Monitoring Network
2017 Annual Report for
Limited Purpose Landfill
January 2018



Notes:
1. LPLF-5 dry during October 5, 2017 sample event.

Figure 3. Groundwater Elevation Hydrograph
2017 Annual Report for Limited Purpose Landfill
January 2018



LEGEND

- FINAL ROADS
- PIT 7 DITCH
- STORMWATER DITCH
- LPLF FOOTPRINT
- SEISMIC HOLD BACK LINE
- LPLF-5 (345.09') — GROUNDWATER WELLS AND ELEVATIONS (ft msl)
- 340' — GROUNDWATER ELEVATION CONTOURS (ft msl)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTE:

1. Groundwater levels measured October 5, 2017.
2. LPLF-5 was dry during the October 5, 2017 sampling event and the elevation estimated at roughly the top of underlying aquitard at approximately 343.00 ft msl.

0 250 500

Scale: feet

ch2m

Figure 4
Groundwater Elevation Contours and Flow Map
2017 Annual Groundwater Monitoring Report for Limited Purpose Landfill
January 2018

Appendix A
Field Forms

Groundwater Purging and Sampling Form

SITE: TCM Project Number: LPLF CCR **Well ID:** LPLF1

Field Team: BILL SCHOCK Date: 10-5-17

Weather/Temp: SUN & WARM Arrival Time to Well: 13:00

Purge Method: ☐ Bladder ☐ Peristaltic ☐ Grab ☒ Other: BAILER **Initial DTW (ft btc):** (57.72)

Pump Setting [5]: — Notes:

Field Parameters									
Time [1]	DTW [2]	Purge Vol. (ml)	pH	Sp. Cond. (uS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
	Begin Pumping								
—	—	—	6.22	3163	2.6	13.8	73.7	15.5	
Stabilization Criteria [3]	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% [4]	-

[1] Collect field parameters in consistent 3-5 minute intervals for Low-Flow method [2] DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method
[3] Stabilization achieved after 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO
[4] For turbidity readings > 10 NTUs [5] Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: 100517-CCR-LPLF1 **Sample Time:** 13:05

Analysis: ☐ Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and TDS)
☐ Appendix IV (total metals, Radium 226, and Radium 228).
☐ Other, specify _____

QC SAMPLE : ☐ Field Duplicate ☐ MS/MSD ☐ EQ Rinsate Blank TOTAL PURGED (ml): —

QC Sample ID : _____ QC Sample Time: _____

Comments: _____

Groundwater Purging and Sampling Form

SITE: TCM Project Number: LPLF CCR **Well ID:** LPLF 2

Field Team: Bill Schoch Date: 10-5-17

Weather/Temp: Sunny WARM Arrival Time to Well: 8:15

Purge Method: ☐ Bladder ☐ Peristaltic ☐ Grab ☐ Other: _____ **Initial DTW (ft ~~btc~~ BGL):** (10.94)

Pump Setting [5]: _____ Notes: WATER LEVEL ONLY

Field Parameters									
Time [1]	DTW [2]	Purge Vol. (ml)	pH	Sp. Cond. (uS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
	Begin Pumping								
Stabilization Criteria [3]	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% [4]	-

[1] Collect field parameters in consistent 3-5 minute intervals for Low-Flow method [2] DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method

[3] Stabilization achieved after 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO

[4] For turbidity readings > 10 NTUs [5] Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: _____ **Sample Time:** _____

Analysis: ☐ Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and TDS)

☐ Appendix IV (total metals, Radium 226, and Radium 228).

☐ Other, specify _____

QC SAMPLE : ☐ Field Duplicate ☐ MS/MSD ☐ EQ Rinsate Blank TOTAL PURGED (ml): _____

QC Sample ID : _____ QC Sample Time: _____

Comments: _____

_____

Groundwater Purging and Sampling Form

SITE: TCM Project Number: LPLF CCR **Well ID:** LPLF2R

Field Team: Bill Schaar Date: 10/5/17

Weather/Temp: Sun & WARM Arrival Time to Well: 8:40

Purge Method: ☐ Bladder ☒ Peristaltic ☐ Grab ☐ Other: _____ **Initial DTW (ft btc):** (5.41)

Pump Setting [5]: 200 ml/min Notes: _____

Field Parameters									
Time [1]	DTW [2]	Purge Vol. (ml)	pH	Sp. Cond. (uS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
5	*Begin Pumping*								
10	5.54	2000	5.67	3892	.93	13.6	147.5	1.1	
15	5.57	3000	5.66	3889	.72	13.2	136.3	1.43	
20	5.82	4000	5.72	3853	.52	13.2	121.0	1.73	
Stabilization Criteria [3]	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% [4]	-

[1] Collect field parameters in consistent 3-5 minute intervals for Low-Flow method [2] DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method
[3] Stabilization achieved after 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO
[4] For turbidity readings > 10 NTUs [5] Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: 100517-CCR-LPLF2R **Sample Time:** 9:00

Analysis: ☐ Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and TDS)
☐ Appendix IV (total metals, Radium 226, and Radium 228).
☐ Other, specify _____

QC SAMPLE : ☐ Field Duplicate ☒ MS/MSD ☐ EQ Rinsate Blank TOTAL PURGED (ml): 4000

QC Sample ID : _____ QC Sample Time: _____

Comments: _____

Groundwater Purging and Sampling Form

SITE: TCM Project Number: LPLF CCR **Well ID:** LPLF 3

Field Team: Bill Schar Date: 10-5-17

Weather/Temp: Sun & warm Arrival Time to Well: 8:20

Purge Method: ☐ Bladder ☐ Peristaltic ☐ Grab ☐ Other: _____ **Initial DTW (ft BGL):** (5.91)

Pump Setting [5]: _____ Notes: WATER LEVEL ONLY

Field Parameters									
Time [1]	DTW [2]	Purge Vol. (ml)	pH	Sp. Cond. (uS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
	Begin Pumping								
Stabilization Criteria [3]	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% [4]	-

[1] Collect field parameters in consistent 3-5 minute intervals for Low-Flow method [2] DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method

[3] Stabilization achieved after 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO

[4] For turbidity readings > 10 NTUs [5] Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: _____ **Sample Time:** _____

Analysis: ☐ Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and TDS)

☐ Appendix IV (total metals, Radium 226, and Radium 228).

☐ Other, specify _____

QC SAMPLE : ☐ Field Duplicate ☐ MS/MSD ☐ EQ Rinsate Blank TOTAL PURGED (ml): _____

QC Sample ID : _____ QC Sample Time: _____

Comments: _____

_____

Groundwater Purging and Sampling Form

SITE: TCM Project Number: LPCF CCR **Well ID:** LPCF4

Field Team: Bill Schuck Date: 10-5-17

Weather/Temp: Sun & warm Arrival Time to Well: 8:25

Purge Method: ☐ Bladder ☐ Peristaltic ☐ Grab ☐ Other: _____ **Initial DTW (ft ~~btc~~ (RGL)):** (4.28)

Pump Setting [5]: ~~NA~~ Notes: WATER LEVEL ONLY

Field Parameters									
Time [1]	DTW [2]	Purge Vol. (ml)	pH	Sp. Cond. (uS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
	Begin Pumping								
Stabilization Criteria [3]	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% [4]	-

[1] Collect field parameters in consistent 3-5 minute intervals for Low-Flow method [2] DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method

[3] Stabilization achieved after 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO

[4] For turbidity readings > 10 NTUs [5] Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: _____ **Sample Time:** _____

Analysis: ☐ Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and TDS)

☐ Appendix IV (total metals, Radium 226, and Radium 228).

☐ Other, specify _____

QC SAMPLE : ☐ Field Duplicate ☐ MS/MSD ☐ EQ Rinsate Blank TOTAL PURGED (ml): _____

QC Sample ID : _____ QC Sample Time: _____

Comments: _____

_____

Groundwater Purging and Sampling Form

SITE: TCM Project Number: LRLF CCR, **Well ID:** LRLF 5

Field Team: Bill Schoch Date: 10/5/17

Weather/Temp: Sunny & Cool Arrival Time to Well: 8:35

Purge Method: ☐ Bladder ☐ Peristaltic ☐ Grab ☐ Other: _____ **Initial DTW (ft btc):** _____

Pump Setting [5]: _____ Notes: NO WATER IN WELL

Field Parameters									
Time [1]	DTW [2]	Purge Vol. (ml)	pH	Sp. Cond. (uS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
	Begin Pumping								
Stabilization Criteria [3]	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% [4]	-

[1] Collect field parameters in consistent 3-5 minute intervals for Low-Flow method
[2] DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method
[3] Stabilization achieved after 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO
[4] For turbidity readings > 10 NTUs
[5] Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: _____ **Sample Time:** _____

Analysis: ☐ Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and TDS)
☐ Appendix IV (total metals, Radium 226, and Radium 228).
☐ Other, specify _____

QC SAMPLE : ☐ Field Duplicate ☐ MS/MSD ☐ EQ Rinsate Blank TOTAL PURGED (ml): _____

QC Sample ID : _____ QC Sample Time: _____

Comments: _____

Groundwater Purging and Sampling Form

SITE: TCM Project Number: LPLF CCR **Well ID:** LPLF7R

Field Team: Bill Schuck Date: 10-5-17

Weather/Temp: Arrival Time to Well: 11:25

Purge Method: ☐ Bladder ☒ Peristaltic ☐ Grab ☐ Other: **Initial DTW (ft btc):** (20.72)

Pump Setting [5]: 200 ml/min Notes:

Field Parameters									
Time [1]	DTW [2]	Purge Vol. (ml)	pH	Sp. Cond. (uS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
5	*Begin Pumping*								
10	(21.25)	2000	5.82	2860	.98	13.4	-12.5	1.6	
15	(21.63)	3000	5.85	2864	.83	13.6	-7.3	1.8	
20	(21.80)	4000	5.84	2862	.84	13.6	-6.6	1.4	
Stabilization Criteria [3]	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% [4]	-

[1] Collect field parameters in consistent 3-5 minute intervals for Low-Flow method [2] DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method

[3] Stabilization achieved after 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO

[4] For turbidity readings > 10 NTUs [5] Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: ~~100517-CCR-LPLF7R~~ 100517-CCR-LPLF7R **Sample Time:** 11:45

Analysis: ☐ Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and TDS)

☐ Appendix IV (total metals, Radium 226, and Radium 228).

☐ Other, specify _____

QC SAMPLE : ☒ Field Duplicate ☐ MS/MSD ☐ EQ Rinsate Blank TOTAL PURGED (ml): 4000

QC Sample ID : FD QC Sample Time: _____

Comments: _____

Groundwater Purging and Sampling Form

SITE: TCM Project Number: LPLFCCR **Well ID:** LPLF8

Field Team: Bill Schock Date: 10-5-17

Weather/Temp: Sunny & WARM Arrival Time to Well: 9:50

Purge Method: ☐ Bladder ☑ Peristaltic ☐ Grab ☐ Other: _____ **Initial DTW (ft btc):** (13.45)

Pump Setting [5]: 100 ml/min Notes: _____

Field Parameters									
Time [1]	DTW [2]	Purge Vol. (ml)	pH	Sp. Cond. (uS/cm)	DO (mg/L)	Temp (°C)	ORP (mV)	Turbidity (NTU)	Note color, odor, etc.
5	*Begin Pumping*								
10	(14.15)	1000	5.38	3737	1.24	13.8	83	1.7	
15	(14.53)	1500	5.39	3790	1.05	14.1	2.5	1.3	
20	(14.87)	2000	5.36	3763	1.05	14.2	2.3	1.1	
Stabilization Criteria [3]	-	-	± 0.1 units	± 3%	± 0.3 mg/L	-	± 10 mV	± 10% [4]	-

[1] Collect field parameters in consistent 3-5 minute intervals for Low-Flow method [2] DTW: Total drawdown should not exceed 0.33 ft for Low-Flow method
[3] Stabilization achieved after 3 successive readings for Low-Flow method; minimum parameter subset: pH, sp. cond., and turbidity or DO
[4] For turbidity readings > 10 NTUs [5] Low-flow target purge rate is 0.1 - 0.5 L/min (0.03 - 0.13 gal/min)

Sample ID: 100517-CCR-LPLF8 **Sample Time:** 10:10

Analysis: ☐ Appendix III (boron, calcium, chloride, fluoride, pH, sulfate, and TDS)
☐ Appendix IV (total metals, Radium 226, and Radium 228).
☐ Other, specify _____

QC SAMPLE : ☐ Field Duplicate ☐ MS/MSD ☐ EQ Rinsate Blank TOTAL PURGED (ml): 2000

QC Sample ID : _____ QC Sample Time: _____

Comments: _____

Appendix B
Laboratory Report

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
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F : +1 360 636 1068
www.alsglobal.com

November 15, 2017

Analytical Report for Service Request No: K1710859

Dennis Morr
Transalta Centralia Mining, LLC
913 Big Hanaford Rd
Centralia, WA 98531

RE: LPLF CCR

Dear Dennis,

Enclosed are the results of the sample(s) submitted to our laboratory October 06, 2017
For your reference, these analyses have been assigned our service request number **K1710859.**

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3356. You may also contact me via email at Kurt.Clarkson@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kurt Clarkson
Sr. Project Manager

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Table of Contents

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
E	The result is an estimate amount because the value exceeded the instrument calibration range.
J	The result is an estimated value.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.
H	The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

#	The control limit criteria is not applicable. See case narrative.
J	The result is an estimated value.
E	The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
M	The duplicate injection precision was not met.
N	The Matrix Spike sample recovery is not within control limits. See case narrative.
S	The reported value was determined by the Method of Standard Additions (MSA).
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
W	The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
i	The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
X	See case narrative.
+	The correlation coefficient for the MSA is less than 0.995.
Q	See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

*	The result is an outlier. See case narrative.
#	The control limit criteria is not applicable. See case narrative.
A	A tentatively identified compound, a suspected aldol-condensation product.
B	The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
C	The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
D	The reported result is from a dilution.
E	The result is an estimated value.
J	The result is an estimated value.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
P	The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
U	The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
i	The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
X	See case narrative.
Q	See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

F	The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
L	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
H	The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
O	The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
Y	The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
Z	The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
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ALS ENVIRONMENTAL

Client:	Transalta Centralia Mining, LLC	**Service Request No.:**	K1710859
Project:	LPLF CCR	**Date Received:**	10/06/17
Sample Matrix:	Water		

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Matrix/Duplicate Matrix Spike (MS/DMS).

Sample Receipt

Five water samples were received for analysis at ALS Environmental on 10/06/17. The samples were received in good condition and consistent with the accompanying chain of custody form, except where noted on the cooler receipt and preservation form included in this report. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry Parameters

Fluoride by EPA Method 300.0:
The detection limit was elevated in all samples. The samples MRL were elevated due to sample matrix. The matrix interference prevented adequate resolution of the target compound at the normal limit. The results were flagged to indicate the matrix interference.

No other anomalies associated with the analysis of these samples were observed.

Total Metals

No anomalies associated with the analysis of these samples were observed.

Radium 226/228

The analysis for Radium 226/228 was performed at ALS Environmental, Fort Collins, Colorado. The data for this analysis is included in the corresponding section of this report.

Approved by 

Chain of Custody

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K1710859

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PHONE 1 360 577 7222 FAX 1 360 636 1068

Part of the ALS Group A Campbell Brothers Limited Company

Work Order No.: 80819 Chain of Custody

Project Manager:	Bill Scheer			**Bill to:**	Bill Scheer		
Client Name:	TransAlta Centralia Mining Company			**Company:**	TransAlta Centralia Mining		
Address:	913 Big Hanaford Road			**Address:**	913 Big Hanaford Road		
City, State ZIP:	Centralia, WA 98531			**City, State ZIP:**	Centralia, WA 98531		
Email:	bill_scheer@transalta.com	**Phone:**	360-330-2332	**Email:**	bill_scheer@transalta.com	**po#**	
Project Name:	LPLF CCR						
Project Number:							
P.O. Number:	4700067779						
Sampler's Name:	Bill Scheer						

SAMPLE RECEIPT

Temperature (°C):		Temp Blank Present			
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice	
Cooler Custody Seals:	Yes	No	N/A	Total Containers:	
Sample Custody Seals:	Yes	No	N/A		

REQUESTED ANALYSIS

TAT

- ☐ Routine 21day
- ☐ Same Day 100%
- ☐ Next Day ***
- ☐ 3 Day
- ☒ 5 Day 50%

Surcharges. Please call for availability

Due Date:

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers		SM 4500-H + B / pH	904.0 / Radium 228	SM 2540 C / TDS	7470A / Hg T	9056A / Chloride	9056A / F	9056A / SO4	6010C / Metals T	6020A / Metals T	903.0 Radium 226	Comments
100517-CCR-LPLF1	GW	10/05/2017	13:05		4		X	X	X	X	X	X	X	X	X	X	
100517-CCR-LPLF2R	GW	10/05/2017	9:00		12		X	X	X	X	X	X	X	X	X	X	MS/MSD
100517-CCR-LPLF8	GW	10/05/2017	10:10		4		X	X	X	X	X	X	X	X	X	X	
100517-CCR-LPLF7R	GW	10/05/2017	11:45		4		X	X	X	X	X	X	X	X	X	X	
FD	GW	-----	----		4		X	X	X	X	X	X	X	X	X	X	

Dissolved	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Si, Sn, Sr, Tl, V, Zn, Zr
Total	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Si, Sn, Sr, Tl, V, Zn, Zr

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
William Scheer		10/6/17 - 14:00			10/6/17 1605

PC KC

Cooler Receipt and Preservation Form

Client TransAtlq Service Request K17 10859

Received: 10/6/17 Opened: 10/6/17 By: Unloaded: 10/6/17 By:

1. Samples were received via? *USPS* *Fed Ex* *UPS* *DHL* *PDX* *Courier* *Hand Delivered*
2. Samples were received in: (circle) *Cooler* *Box* *Envelope* *Other* *NA*
3. Were custody seals on coolers? NA Y N If yes, how many and where? 1F+1B.
   If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number (NA)	Filed
1.7	1.6	—	—	-0.1	365			
1.5	1.7	—	—	+0.2	329			

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* gel Packs
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Were samples received in good condition (temperature, unbroken)? *Indicate in the table below.* NA Y N
   If applicable, tissue samples were received: *Frozen* *Partially Thawed* *Thawed*
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* NA Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* NA Y N
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time
1 Plastic HNO3 Bottles					X	HNO3	2mL	RE146-M	BM	1700

Notes, Discrepancies, & Resolutions:

RUSH SHORT HOLD TIME

General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/5/17
Sample Matrix:	Ground Water	**Date Received:**	10/6/17
Analysis Method:	9056A	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Chloride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
100517-CCR-LPLF1	K1710859-001	**2.95**	0.50	5	10/22/17 14:20	
100517-CCR-LPLF2R	K1710859-002	**8.03**	0.50	5	10/22/17 14:31	
100517-CCR-LPLF8	K1710859-003	**5.79**	0.50	5	10/22/17 16:03	
100517-CCR-LPLF7R	K1710859-004	**6.29**	0.50	5	10/22/17 16:14	
FD	K1710859-005	**6.19**	0.50	5	10/22/17 16:24	
Method Blank	K1710859-MB	ND U	0.10	1	10/22/17 08:30	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/22/17

Replicate Sample Summary

General Chemistry Parameters

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710859-002DUP Result	Average	RPD	RPD Limit
Chloride	9056A	0.50	8.03	7.92	7.98	1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/22/17
		Date Extracted:	NA

Duplicate Matrix Spike Summary
Chloride

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA
Analysis Method:	9056A		
Prep Method:	None		

		Matrix Spike			Duplicate Matrix Spike					
		K1710859-002MS			K1710859-002DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Chloride	8.03	16.9	10.0	89	16.6	10.0	86	80-120	2	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Analyzed:**	10/22/17
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Chloride

Analysis Method:	9056A	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	566901

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710859-LCS	4.82	5.00	96	80-120

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/5/17
Sample Matrix:	Ground Water	**Date Received:**	10/6/17
Analysis Method:	9056A	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Fluoride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
100517-CCR-LPLF1	K1710859-001	**ND Ui**	1.0	5	10/22/17 14:20	
100517-CCR-LPLF2R	K1710859-002	**ND Ui**	1.0	5	10/22/17 14:31	
100517-CCR-LPLF8	K1710859-003	**ND Ui**	1.0	5	10/22/17 16:03	
100517-CCR-LPLF7R	K1710859-004	**ND Ui**	1.0	5	10/22/17 16:14	
FD	K1710859-005	**ND Ui**	1.0	5	10/22/17 16:24	
Method Blank	K1710859-MB	ND U	0.20	1	10/22/17 08:30	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/22/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710859-002DUP Result	Average	RPD	RPD Limit
Fluoride	9056A	1.0	ND Ui	ND U	NC	NC	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/22/17
		Date Extracted:	NA

Duplicate Matrix Spike Summary
Fluoride

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA
Analysis Method:	9056A		
Prep Method:	None		

		Matrix Spike K1710859-002MS			**Duplicate Matrix Spike** K1710859-002DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Fluoride	ND Ui	9.3	10.0	93	9.3	10.0	93	80-120	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Analyzed:**	10/22/17
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Fluoride

Analysis Method:	9056A	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	566901

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710859-LCS	4.77	5.00	95	90-110

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/5/17
Sample Matrix:	Ground Water	**Date Received:**	10/6/17
Analysis Method:	9056A	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
100517-CCR-LPLF1	K1710859-001	**1460**	50	500	10/22/17 09:33	
100517-CCR-LPLF2R	K1710859-002	**1910**	50	500	10/22/17 09:44	
100517-CCR-LPLF8	K1710859-003	**2410**	50	500	10/22/17 09:55	
100517-CCR-LPLF7R	K1710859-004	**1220**	50	500	10/22/17 10:05	
FD	K1710859-005	**1220**	50	500	10/22/17 10:16	
Method Blank	K1710859-MB	ND U	0.10	1	10/22/17 08:30	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/22/17

Replicate Sample Summary

General Chemistry Parameters

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710859-002DUP Result	Average	RPD	RPD Limit
Sulfate	9056A	50	1910	1890	1900	1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/22/17
		Date Extracted:	NA

Duplicate Matrix Spike Summary
Sulfate

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA
Analysis Method:	9056A		
Prep Method:	None		

		Matrix Spike			**Duplicate Matrix Spike**					
		K1710859-002MS			K1710859-002DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfate	1910	2870	1000	97	2860	1000	95	90-110	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Analyzed:**	10/22/17
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Sulfate

Analysis Method:	9056A	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	566901

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710859-LCS	4.83	5.00	97	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/5/17
Sample Matrix:	Ground Water	**Date Received:**	10/6/17
Analysis Method:	SM 2540 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Solids, Total Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
100517-CCR-LPLF1	K1710859-001	**2640**	5.0	1	10/11/17 23:30	
100517-CCR-LPLF2R	K1710859-002	**3650**	5.0	1	10/11/17 23:30	
100517-CCR-LPLF8	K1710859-003	**3740**	5.0	1	10/11/17 23:30	
100517-CCR-LPLF7R	K1710859-004	**2350**	5.0	1	10/11/17 23:30	
FD	K1710859-005	**2300**	5.0	1	10/11/17 23:30	
Method Blank	K1710859-MB	ND U	5.0	1	10/11/17 23:30	

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/11/17

Replicate Sample Summary

General Chemistry Parameters

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710859-002DUP Result	Average	RPD	RPD Limit
Solids, Total Dissolved	SM 2540 C	5.0	3650	3650	3650	<1	10

Results flagged with an asterisk (*) indicate values outside control criteria.

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Analyzed:**	10/11/17
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Solids, Total Dissolved

Analysis Method:	SM 2540 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	565671

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710859-LCS	1620	1640	99	85-115

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Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/5/17
Sample Matrix:	Ground Water	**Date Received:**	10/6/17
Analysis Method:	SM 4500-H+ B	**Units:**	pH Units
Prep Method:	None	**Basis:**	NA

pH

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
100517-CCR-LPLF1	K1710859-001	**6.93**	-	1	10/09/17 16:54	H
100517-CCR-LPLF2R	K1710859-002	**6.97**	-	1	10/09/17 16:55	H
100517-CCR-LPLF8	K1710859-003	**6.09**	-	1	10/09/17 16:59	H
100517-CCR-LPLF7R	K1710859-004	**6.78**	-	1	10/09/17 17:01	H
FD	K1710859-005	**6.64**	-	1	10/09/17 17:04	H

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/09/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	100517-CCR-LPLF2R	**Units:**	pH Units
Lab Code:	K1710859-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710859-002DUP Result	Average	RPD	RPD Limit
pH	SM 4500-H+ B	-	6.97	6.95	6.96	<1	20

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Analyzed:**	10/09/17
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
pH

Analysis Method:	SM 4500-H+ B	**Units:**	pH Units
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	564996

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710859-LCS	8.44	8.41	100	85-115

Metals

ALS Environmental—Kelso Laboratory
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Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17 13:05
Sample Matrix:	Ground Water	**Date Received:**	10/06/17 16:05
Sample Name:	100517-CCR-LPLF1	**Basis:**	NA
Lab Code:	K1710859-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	**0.000210**	mg/L	0.000050	1	10/13/17 13:25	10/09/17	
Arsenic	6020A	**0.00411**	mg/L	0.00050	1	10/13/17 13:25	10/09/17	
Barium	6020A	**0.0561**	mg/L	0.000050	1	10/13/17 13:25	10/09/17	
Beryllium	6020A	**0.000204**	mg/L	0.000020	1	10/13/17 13:25	10/09/17	
Boron	6010C	**0.612**	mg/L	0.020	1	10/10/17 17:12	10/09/17	
Cadmium	6020A	**0.000323**	mg/L	0.000020	1	10/13/17 13:25	10/09/17	
Calcium	6010C	**230**	mg/L	0.020	1	10/10/17 17:12	10/09/17	
Chromium	6020A	**0.00407**	mg/L	0.00020	1	10/13/17 13:25	10/09/17	
Cobalt	6020A	**0.0105**	mg/L	0.000020	1	10/13/17 13:25	10/09/17	
Lead	6020A	**0.00363**	mg/L	0.000020	1	10/13/17 13:25	10/09/17	
Lithium	6010C	**0.118**	mg/L	0.020	1	10/10/17 17:12	10/09/17	
Mercury	7470A	ND	U	mg/L	0.00020	1	10/12/17 10:26	10/11/17
Molybdenum	6020A	**0.000881**	mg/L	0.000050	1	10/13/17 13:25	10/09/17	
Selenium	6020A	ND	U	mg/L	0.0010	1	10/13/17 13:25	10/09/17
Thallium	6020A	**0.000053**	mg/L	0.000020	1	10/13/17 13:25	10/09/17	

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Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17 13:05
Sample Matrix:	Ground Water	**Date Received:**	10/06/17 16:05
Sample Name:	100517-CCR-LPLF2R	**Basis:**	NA
Lab Code:	K1710859-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	ND U	mg/L	0.000050	1	10/13/17 13:28	10/09/17	
Arsenic	6020A	**0.00135**	mg/L	0.00050	1	10/13/17 13:28	10/09/17	
Barium	6020A	**0.0184**	mg/L	0.000050	1	10/13/17 13:28	10/09/17	
Beryllium	6020A	**0.000063**	mg/L	0.000020	1	10/13/17 13:28	10/09/17	
Boron	6010C	**0.363**	mg/L	0.020	1	10/10/17 16:33	10/09/17	
Cadmium	6020A	**0.000058**	mg/L	0.000020	1	10/13/17 13:28	10/09/17	
Calcium	6010C	**546**	mg/L	0.20	10	10/10/17 17:05	10/09/17	
Chromium	6020A	ND U	mg/L	0.00020	1	10/13/17 13:28	10/09/17	
Cobalt	6020A	**0.0895**	mg/L	0.000020	1	10/13/17 13:28	10/09/17	
Lead	6020A	ND U	mg/L	0.000020	1	10/13/17 13:28	10/09/17	
Lithium	6010C	**0.048**	mg/L	0.020	1	10/10/17 16:33	10/09/17	
Mercury	7470A	ND U	mg/L	0.00020	1	10/12/17 10:27	10/11/17	
Molybdenum	6020A	**0.000299**	mg/L	0.000050	1	10/13/17 13:28	10/09/17	
Selenium	6020A	ND U	mg/L	0.0010	1	10/13/17 13:28	10/09/17	
Thallium	6020A	ND U	mg/L	0.000020	1	10/13/17 13:28	10/09/17	

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Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17 13:05
Sample Matrix:	Ground Water	**Date Received:**	10/06/17 16:05
Sample Name:	100517-CCR-LPLF8	**Basis:**	NA
Lab Code:	K1710859-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	ND U	mg/L	0.000050	1	10/13/17 13:39	10/09/17	
Arsenic	6020A	**0.0168**	mg/L	0.00050	1	10/13/17 13:39	10/09/17	
Barium	6020A	**0.0126**	mg/L	0.000050	1	10/13/17 13:39	10/09/17	
Beryllium	6020A	ND U	mg/L	0.00010	5	10/13/17 13:56	10/09/17	
Boron	6010C	**0.968**	mg/L	0.020	1	10/10/17 17:15	10/09/17	
Cadmium	6020A	ND U	mg/L	0.000020	1	10/13/17 13:39	10/09/17	
Calcium	6010C	**411**	mg/L	0.020	1	10/10/17 17:15	10/09/17	
Chromium	6020A	ND U	mg/L	0.00020	1	10/13/17 13:39	10/09/17	
Cobalt	6020A	**0.0154**	mg/L	0.000020	1	10/13/17 13:39	10/09/17	
Lead	6020A	**0.000027**	mg/L	0.000020	1	10/13/17 13:39	10/09/17	
Lithium	6010C	**0.180**	mg/L	0.020	1	10/10/17 17:15	10/09/17	
Mercury	7470A	ND U	mg/L	0.00020	1	10/12/17 10:32	10/11/17	
Molybdenum	6020A	**0.000270**	mg/L	0.000050	1	10/13/17 13:39	10/09/17	
Selenium	6020A	ND U	mg/L	0.0010	1	10/13/17 13:39	10/09/17	
Thallium	6020A	ND U	mg/L	0.000020	1	10/13/17 13:39	10/09/17	

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17 13:05
Sample Matrix:	Ground Water	**Date Received:**	10/06/17 16:05
Sample Name:	100517-CCR-LPLF7R	**Basis:**	NA
Lab Code:	K1710859-004		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	ND U	mg/L	0.000050	1	10/13/17 13:41	10/09/17	
Arsenic	6020A	ND U	mg/L	0.00050	1	10/13/17 13:41	10/09/17	
Barium	6020A	**0.0271**	mg/L	0.000050	1	10/13/17 13:41	10/09/17	
Beryllium	6020A	**0.000109**	mg/L	0.000020	1	10/13/17 13:41	10/09/17	
Boron	6010C	**0.377**	mg/L	0.020	1	10/10/17 17:17	10/09/17	
Cadmium	6020A	**0.000070**	mg/L	0.000020	1	10/13/17 13:41	10/09/17	
Calcium	6010C	**210**	mg/L	0.020	1	10/10/17 17:17	10/09/17	
Chromium	6020A	ND U	mg/L	0.00020	1	10/13/17 13:41	10/09/17	
Cobalt	6020A	**0.0303**	mg/L	0.000020	1	10/13/17 13:41	10/09/17	
Lead	6020A	ND U	mg/L	0.000020	1	10/13/17 13:41	10/09/17	
Lithium	6010C	**0.048**	mg/L	0.020	1	10/10/17 17:17	10/09/17	
Mercury	7470A	ND U	mg/L	0.00020	1	10/12/17 10:34	10/11/17	
Molybdenum	6020A	**0.000160**	mg/L	0.000050	1	10/13/17 13:41	10/09/17	
Selenium	6020A	ND U	mg/L	0.0010	1	10/13/17 13:41	10/09/17	
Thallium	6020A	ND U	mg/L	0.000020	1	10/13/17 13:41	10/09/17	

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Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17 13:05
Sample Matrix:	Ground Water	**Date Received:**	10/06/17 16:05
Sample Name:	FD	**Basis:**	NA
Lab Code:	K1710859-005		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	ND U	mg/L	0.000050	1	10/13/17 13:53	10/09/17	
Arsenic	6020A	ND U	mg/L	0.00050	1	10/13/17 13:53	10/09/17	
Barium	6020A	**0.0272**	mg/L	0.000050	1	10/13/17 13:53	10/09/17	
Beryllium	6020A	**0.000106**	mg/L	0.000020	1	10/13/17 13:53	10/09/17	
Boron	6010C	**0.384**	mg/L	0.020	1	10/10/17 17:20	10/09/17	
Cadmium	6020A	**0.000072**	mg/L	0.000020	1	10/13/17 13:53	10/09/17	
Calcium	6010C	**215**	mg/L	0.020	1	10/10/17 17:20	10/09/17	
Chromium	6020A	ND U	mg/L	0.00020	1	10/13/17 13:53	10/09/17	
Cobalt	6020A	**0.0304**	mg/L	0.000020	1	10/13/17 13:53	10/09/17	
Lead	6020A	**0.000032**	mg/L	0.000020	1	10/13/17 13:53	10/09/17	
Lithium	6010C	**0.051**	mg/L	0.020	1	10/10/17 17:20	10/09/17	
Mercury	7470A	ND U	mg/L	0.00020	1	10/12/17 10:39	10/11/17	
Molybdenum	6020A	**0.000161**	mg/L	0.000050	1	10/13/17 13:53	10/09/17	
Selenium	6020A	ND U	mg/L	0.0010	1	10/13/17 13:53	10/09/17	
Thallium	6020A	ND U	mg/L	0.000020	1	10/13/17 13:53	10/09/17	

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	NA
Sample Matrix:	Ground Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	KQ1714774-02		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Boron	6010C	ND U	mg/L	0.020	1	10/10/17 16:29	10/09/17	
Calcium	6010C	ND U	mg/L	0.020	1	10/10/17 16:29	10/09/17	
Lithium	6010C	ND U	mg/L	0.020	1	10/10/17 16:29	10/09/17	

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	NA
Sample Matrix:	Ground Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	KQ1714772-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	ND U	mg/L	0.000050	1	10/13/17 13:22	10/09/17	
Arsenic	6020A	ND U	mg/L	0.00050	1	10/13/17 13:22	10/09/17	
Barium	6020A	ND U	mg/L	0.000050	1	10/13/17 13:22	10/09/17	
Beryllium	6020A	ND U	mg/L	0.000020	1	10/13/17 13:22	10/09/17	
Cadmium	6020A	ND U	mg/L	0.000020	1	10/13/17 13:22	10/09/17	
Chromium	6020A	ND U	mg/L	0.00020	1	10/13/17 13:22	10/09/17	
Cobalt	6020A	ND U	mg/L	0.000020	1	10/13/17 13:22	10/09/17	
Lead	6020A	ND U	mg/L	0.000020	1	10/13/17 13:22	10/09/17	
Molybdenum	6020A	ND U	mg/L	0.000050	1	10/13/17 13:22	10/09/17	
Selenium	6020A	ND U	mg/L	0.0010	1	10/13/17 13:22	10/09/17	
Thallium	6020A	ND U	mg/L	0.000020	1	10/13/17 13:22	10/09/17	

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	NA
Sample Matrix:	Ground Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	KQ1714769-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7470A	ND U	mg/L	0.00020	1	10/12/17 09:50	10/11/17	

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/10/17

Replicate Sample Summary

Total Metals

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1714774-03 Result	Average	RPD	RPD Limit
Boron	6010C	0.020	0.363	0.345	0.354	5	20
Calcium	6010C	0.20	546	527	537	4	20
Lithium	6010C	0.020	0.048	0.042	0.045	13	20

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Superset Reference:

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/13/17

Replicate Sample Summary
Total Metals

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1714772-05 Result	Average	RPD	RPD Limit
Antimony	6020A	0.000050	ND U	ND U	ND	-	20
Arsenic	6020A	0.00050	0.00135	0.00132	0.00134	2	20
Barium	6020A	0.000050	0.0184	0.0182	0.0183	1	20
Beryllium	6020A	0.000020	0.000063	0.000058	0.000061	8	20
Cadmium	6020A	0.000020	0.000058	0.000054	0.000056	7	20
Chromium	6020A	0.00020	ND U	ND U	ND	-	20
Cobalt	6020A	0.000020	0.0895	0.0884	0.0890	1	20
Lead	6020A	0.000020	ND U	0.000022	NC	NC	20
Molybdenum	6020A	0.000050	0.000299	0.000282	0.000291	6	20
Selenium	6020A	0.0010	ND U	ND U	ND	-	20
Thallium	6020A	0.000020	ND U	ND U	ND	-	20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/12/17

Replicate Sample Summary

Total Metals

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1714769-03 Result	Average	RPD	RPD Limit
Mercury	7470A	0.00020	ND U	ND U	ND	-	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/10/17
		Date Extracted:	10/9/17

Matrix Spike Summary
Total Metals

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA
Analysis Method:	6010C		
Prep Method:	EPA CLP-METALS ILM04.0		

Matrix Spike
KQ1714774-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Boron	0.363	0.794	0.500	86	75-125
Calcium	546	520	10.0	-260 #	75-125
Lithium	0.048	11.2	10.0	111	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/13/17
		Date Extracted:	10/9/17

Matrix Spike Summary
Total Metals

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA
Analysis Method:	6020A		
Prep Method:	EPA CLP-METALS ILM04.0		

Matrix Spike
KQ1714772-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Antimony	ND U	0.0114	0.0100	114	75-125
Arsenic	0.00135	0.0561	0.0500	110	75-125
Barium	0.0184	0.127	0.100	109	75-125
Beryllium	0.000063	0.00311	0.00250	122	75-125
Cadmium	0.000058	0.0251	0.0250	100	75-125
Chromium	ND U	0.0101	0.0100	101	75-125
Cobalt	0.0895	0.110	0.0250	82	75-125
Lead	ND U	0.0486	0.0500	97	75-125
Molybdenum	0.000299	0.0220	0.0200	109	75-125
Selenium	ND U	0.0540	0.0500	108	75-125
Thallium	ND U	0.0492	0.0500	98	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Printed 10/13/2017 3:33:51 PM Superset Reference:

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1710859
Project:	LPLF CCR	**Date Collected:**	10/05/17
Sample Matrix:	Ground Water	**Date Received:**	10/06/17
		Date Analyzed:	10/12/17
		Date Extracted:	10/11/17

Matrix Spike Summary
Total Metals

Sample Name:	100517-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1710859-002	**Basis:**	NA
Analysis Method:	7470A		
Prep Method:	Method		

Matrix Spike
KQ1714769-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Mercury	ND U	0.00467	0.00500	93	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Printed 10/13/2017 3:33:51 PM Superset Reference:

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Transalta Centralia Mining, LLC
Project: LPLF CCR
Sample Matrix: Ground Water

Service Request: K1710859
Date Analyzed: 10/10/17

Lab Control Sample Summary
Total Metals

Units:mg/L
Basis:NA

Lab Control Sample
KQ1714774-01

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Boron	6010C	0.474	0.500	95	80-120
Calcium	6010C	12.0	12.5	96	80-120
Lithium	6010C	9.91	10.0	99	80-120

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Transalta Centralia Mining, LLC
Project: LPLF CCR
Sample Matrix: Ground Water

Service Request: K1710859
Date Analyzed: 10/13/17

Lab Control Sample Summary
Total Metals

Units:mg/L
Basis:NA

Lab Control Sample
KQ1714772-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony	6020A	0.0112	0.0100	112	80-120
Arsenic	6020A	0.0555	0.0500	111	80-120
Barium	6020A	0.109	0.100	109	80-120
Beryllium	6020A	0.00280	0.00250	112	80-120
Cadmium	6020A	0.0277	0.0250	111	80-120
Chromium	6020A	0.0104	0.0100	104	80-120
Cobalt	6020A	0.0270	0.0250	108	80-120
Lead	6020A	0.0533	0.0500	107	80-120
Molybdenum	6020A	0.0215	0.0200	108	80-120
Selenium	6020A	0.0539	0.0500	108	80-120
Thallium	6020A	0.0535	0.0500	107	80-120

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Transalta Centralia Mining, LLC
Project: LPLF CCR
Sample Matrix: Ground Water

Service Request: K1710859
Date Analyzed: 10/12/17

Lab Control Sample Summary
Total Metals

Units:mg/L
Basis:NA

Lab Control Sample
KQ1714769-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7470A	0.00524	0.00500	105	80-120

Subcontract Lab Results

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Wednesday, November 08, 2017

Kurt Clarkson
ALS Environmental
1317 South 13th Ave
Kelso, WA 98626

Re: ALS Workorder: 1710191
Project Name:
Project Number: K1710859

Dear Mr. Clarkson:

Five water samples were received from ALS Environmental, on 10/10/2017. The samples were scheduled for the following analyses:

Radium-226
Radium-228

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
For Jeff R. Kujawa
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1710191

Radium-228:

The samples were analyzed for the presence of ^{228}Ra by low background gas flow proportional counting of ^{228}Ac, which is the ingrown progeny of ^{228}Ra, according to the current revision of SOP 724.

All acceptance criteria were met.

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1710191
Client Name: ALS Environmental
Client Project Name:
Client Project Number: K1710859
Client PO Number: 51K1710859

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
100517-CCR-LPLF1	1710191-1		WATER	05-Oct-17	13:05
100517-CCR-LPLF2R	1710191-2		WATER	05-Oct-17	13:05
100517-CCR-LPLF8	1710191-3		WATER	05-Oct-17	13:05
100517-CCR-LPLF7R	1710191-4		WATER	05-Oct-17	13:05
FD	1710191-5		WATER	05-Oct-17	13:05

ALS Environmental Chain of Custody

1317 South 13th Avenue • Kelso, WA 98626 • 1-360-577-7222 • FAX 1-360-636-1068

ALS Contact: Kurt Clarkson

1710191

Project Number: K1710859
Project Manager: Kurt Clarkson
QAP: LAB QAP

	Lab Code	Sample ID	# of Cont.	Matrix	Sample Date	Time	Lab ID	Radium 226 903.0	Radium 228 904.0
1	K1710859-001	100517-CCR-LPLF1	2	Water	10/5/17	1305	Fort Collins ALS	X	X
2	K1710859-002	100517-CCR-LPLF2R	6	Water	10/5/17	1305	Fort Collins ALS	X	X
3	K1710859-003	100517-CCR-LPLF8	2	Water	10/5/17	1305	Fort Collins ALS	X	X
4	K1710859-004	100517-CCR-LPLF7R	2	Water	10/5/17	1305	Fort Collins ALS	X	X
5	K1710859-005	FD	2	Water	10/5/17	1305	Fort Collins ALS	X	X

Run QC on sample K1710859-002 for 903.0/Radium 226, 904.0/Radium 228

Special Instructions/Comments
Please provide the electronic (PDF and EDD) report to the following e-mail address: ALKLS.Data@alsglobal.com.

NPDES

H - Test is On Hold P - Test is Authorized for Prep Only

Turnaround Requirements
_X_ **RUSH** (Surcharges Apply)
PLEASE CIRCLE WORK DAYS
1 2 3 4 5
___ **STANDARD**
Requested FAX Date: _____
Requested Report Date: 10/13/17

Report Requirements
___ I. Results Only
___ II. Results + QC Summaries
___ III. Results + QC and Calibration Summaries
___ IV. Data Validation Report with Raw Data
PQL/MDL/J N
EDD Y

Invoice Information
PO# 51K1710859
Bill to

Relinquished By: _____ 10/9/17

Received By: _____ 10.10.17 @ 1000

Airbill Number: _____

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS KELSO Workorder No: 1710191

Project Manager: JK Initials: JA Date: 10.10.17

1.	Does this project require any special handling in addition to standard ALS procedures?		YES	(NO)
2.	Are custody seals on shipping containers intact?	NONE	(YES)	NO
3.	Are Custody seals on sample containers intact?	(NONE)	YES	NO
4.	Is there a COC (Chain-of-Custody) present or other representative documents?		(YES)	NO
5.	Are the COC and bottle labels complete and legible?		(YES)	NO
6.	Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7.	Were airbills / shipping documents present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	(NO)
9.	Are all aqueous non-preserved samples pH 4-9?	(N/A)	YES	NO
10.	Is there sufficient sample for the requested analyses?		(YES)	NO
11.	Were all samples placed in the proper containers for the requested analyses?		(YES)	NO
12.	Are all samples within holding times for the requested analyses?		(YES)	NO
13.	Were all sample containers received intact? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____ heavy	N/A	YES	(NO)
16.	Were the samples shipped on ice?		(YES)	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	RAD ONLY	(YES)	NO

Cooler #:	1								
Temperature (°C):	2.8								
No. of custody seals on cooler:	1								
DOT Survey/ Acceptance Information — External µR/hr reading:	10								
Background µR/hr reading:	10								

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? **YES / NO / NA** (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? **YES / NO / (NA)** Contact: _____ Date/Time: _____

Project Manager Signature / Date: _____ 10.10.17

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of ___

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS KELSO Workorder No: 1710191

Project Manager: JK Initials: JA Date: 10-10-17

NOTE:

No pH adjustments shall be made without prior consent of Project Manager. After pH adjustments, hold metals and radchem samples ≥ 16 hrs. before analysis.

Was the pH of any sample adjusted by the laboratory? **YES** (See Table below) / **NO**

pH Excursion:

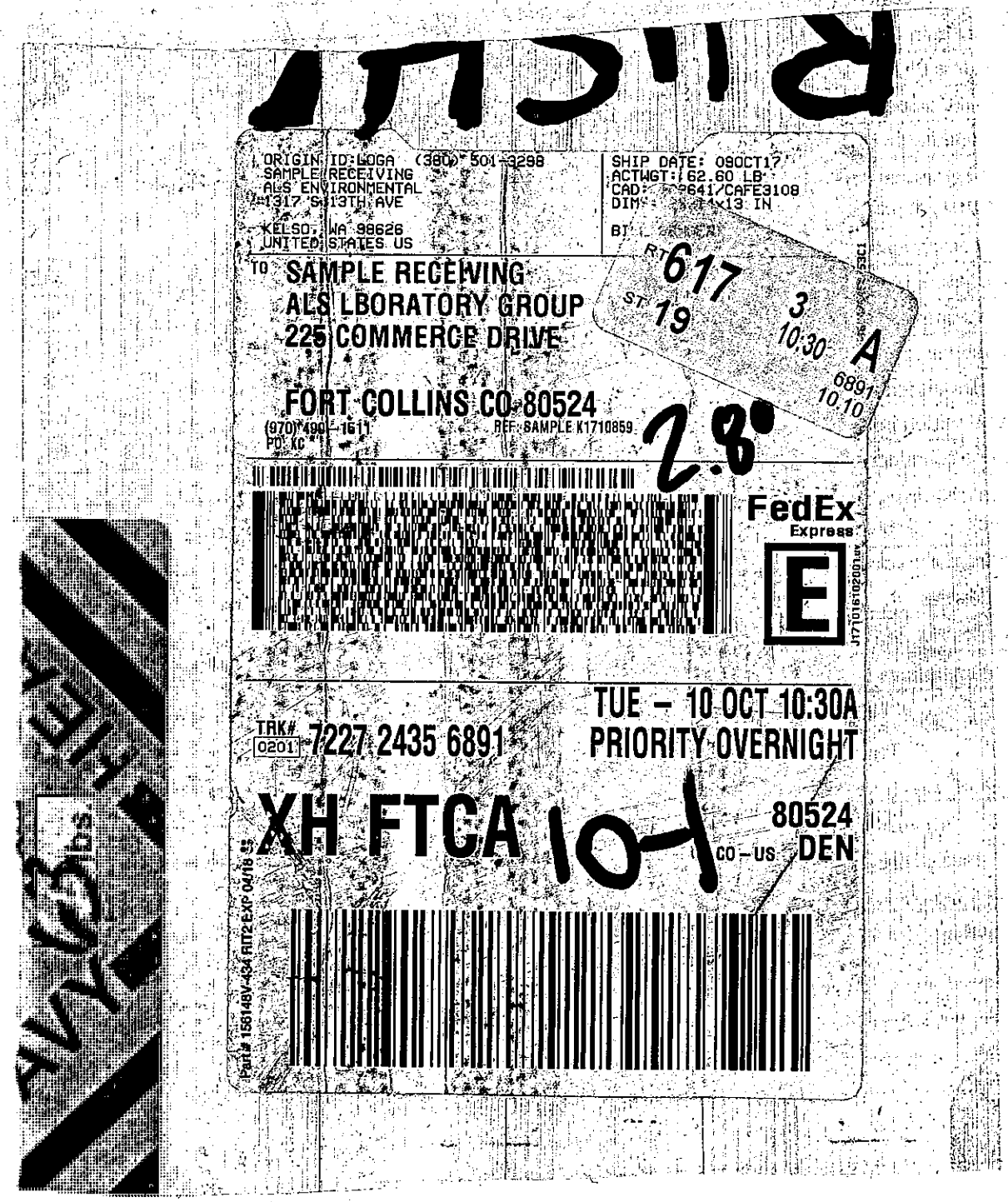
ALS Sample ID	Client Sample ID	Initial pH	Final pH	Reagent Used	Volume Added (mL)	Lot No. of Reagent	Requested Analysis	Initials / Date / Time
1710191-2-1	K1710859-002	6	<2	HNO_3	2.0	152495	RAD	JA 10-10 1100
2-2								
2-3								
2-4								
2-5								
2-6								
4-1	K1710859-004	4			0.75			

If applicable, was the client contacted? YES / NO (NA) Contact: _____ Date/Time: _____

Project Manager Signature / Date: _____ 10-10-17

Form 201r24.xls (06/04/2012)

Page ___ of ___


ORIGIN ID:LOGA (360) 501-3298
SAMPLE RECEIVING
ALS ENVIRONMENTAL
1317 S 13TH AVE
KELSO, WA 98626
UNITED STATES US
SHIP DATE: 09OCT17
ACTWGT: 62.60 LB
CAD: 2641/CAFE3108
DIM: 14x13 IN
BI
TO SAMPLE RECEIVING
ALS LBORATORY GROUP
225 COMMERCE DRIVE
FORT COLLINS CO 80524
(970) 490-1611
PO: KC
REF: SAMPLE K1710859
RT 617
ST 19
3
10:30 A
6891
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E
TUE - 10 OCT 10:30A
PRIORITY OVERNIGHT
TRK# 0201 7727 2435 6891
XH FTCA
80524
CO-US DEN
Part # 156148V-434 RIT2 EXP 04/16

Client:	ALS Environmental	**Date:**	*08-Nov-17*
Project:	K1710859	**Work Order:**	1710191
Sample ID:	100517-CCR-LPLF1	**Lab ID:**	1710191-1
Legal Location:		**Matrix:**	WATER
Collection Date:	10/5/2017 13:05	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **10/30/2017**	PrepBy: **HCJ**
Ra-226	0.38 (+/- 0.21)	LT	0.23	pCi/l	NA	11/7/2017 10:59
Carr: BARIUM	*96.1*		*40-110*	*%REC*	DL = NA	11/7/2017 10:59
Radium-228 Analysis by GFPC		**PAI 724**			Prep Date: **10/30/2017**	PrepBy: **ARS**
Ra-228	**2.39 (+/- 0.8)**	M3	**1.02**	**pCi/l**	NA	11/7/2017 09:05
Carr: BARIUM	*96.1*		*40-110*	*%REC*	DL = NA	11/7/2017 09:05

Client:	ALS Environmental	**Date:**	*08-Nov-17*
Project:	K1710859	**Work Order:**	1710191
Sample ID:	100517-CCR-LPLF2R	**Lab ID:**	1710191-2
Legal Location:		**Matrix:**	WATER
Collection Date:	10/5/2017 13:05	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **10/30/2017**	PrepBy: **HCJ**
Ra-226	0.18 (+/- 0.13)	Y1,LT	0.15	pCi/l	NA	11/7/2017 10:59
Carr: BARIUM	*100*	Y1	*40-110*	*%REC*	DL = NA	11/7/2017 10:59
Radium-228 Analysis by GFPC		**PAI 724**			Prep Date: **10/30/2017**	PrepBy: **ARS**
Ra-228	0.81 (+/- 0.38)	LT	0.64	pCi/l	NA	11/7/2017 09:05
Carr: BARIUM	*97.8*		*40-110*	*%REC*	DL = NA	11/7/2017 09:05

Client:	ALS Environmental	**Date:**	*08-Nov-17*
Project:	K1710859	**Work Order:**	1710191
Sample ID:	100517-CCR-LPLF8	**Lab ID:**	1710191-3
Legal Location:		**Matrix:**	WATER
Collection Date:	10/5/2017 13:05	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **10/30/2017**	PrepBy: **HCJ**
Ra-226	ND (+/- 0.12)	U	0.23	pCi/l	NA	11/7/2017 10:59
Carr: BARIUM	*96.7*		*40-110*	*%REC*	DL = NA	11/7/2017 10:59
Radium-228 Analysis by GFPC		**PAI 724**			Prep Date: **10/30/2017**	PrepBy: **ARS**
Ra-228	ND (+/- 0.53)	U,M	1.06	pCi/l	NA	11/7/2017 09:05
Carr: BARIUM	*93.6*		*40-110*	*%REC*	DL = NA	11/7/2017 09:05

Client:	ALS Environmental	**Date:**	*08-Nov-17*
Project:	K1710859	**Work Order:**	1710191
Sample ID:	100517-CCR-LPLF7R	**Lab ID:**	1710191-4
Legal Location:		**Matrix:**	WATER
Collection Date:	10/5/2017 13:05	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**			Prep Date: **10/30/2017**	PrepBy: **HCJ**
Ra-226	0.31 (+/- 0.17)	LT	0.17	pCi/l	NA	11/7/2017 10:59
Carr: BARIUM	*96.3*		*40-110*	*%REC*	DL = NA	11/7/2017 10:59
Radium-228 Analysis by GFPC		**PAI 724**			Prep Date: **10/30/2017**	PrepBy: **ARS**
Ra-228	0.98 (+/- 0.54)	LT	0.98	pCi/l	NA	11/7/2017 09:05
Carr: BARIUM	*97.7*		*40-110*	*%REC*	DL = NA	11/7/2017 09:05

Client:	ALS Environmental	**Date:**	*08-Nov-17*
Project:	K1710859	**Work Order:**	1710191
Sample ID:	FD	**Lab ID:**	1710191-5
Legal Location:		**Matrix:**	WATER
Collection Date:	10/5/2017 13:05	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**PAI 783**		Prep Date: **10/30/2017**		PrepBy: **HCJ**
Ra-226	0.17 (+/- 0.12)	LT	0.13	pCi/l	NA	11/7/2017 10:59
Carr: BARIUM	*96.3*		*40-110*	*%REC*	DL = NA	11/7/2017 10:59
Radium-228 Analysis by GFPC		**PAI 724**		Prep Date: **10/30/2017**		PrepBy: **ARS**
Ra-228	**1.12 (+/- 0.58)**	M3	**1.04**	**pCi/l**	NA	11/7/2017 09:05
Carr: BARIUM	*98.9*		*40-110*	*%REC*	DL = NA	11/7/2017 09:05

Client:	ALS Environmental	**Date:**	*08-Nov-17*
Project:	K1710859	**Work Order:**	1710191
Sample ID:	FD	**Lab ID:**	1710191-5
Legal Location:		**Matrix:**	WATER
Collection Date:	10/5/2017 13:05	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

QC BATCH REPORT

Batch ID: **RE171030-1-2** Instrument ID: **Alpha Scin** Method: **Radium-226 by Radon Emanation**

DUP Sample ID: **1710191-2** Units: **pCi/l** Analysis Date: **11/7/2017 10:59**

Client ID: **100517-CCR-LPLF2R** Run ID: **RE171030-1A** Prep Date: **10/30/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	0.28 (+/- 0.21)	0.27						0.18	0.4	2.1	LT
Carr: BARIUM	16350		16410		99.6	40-110		16530			

LCS Sample ID: **RE171030-1** Units: **pCi/l** Analysis Date: **11/7/2017 12:08**

Client ID: Run ID: **RE171030-1A** Prep Date: **10/30/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	46 (+/- 11)	0	46.34		98.8	67-120					P
Carr: BARIUM	16080		16410		97.9	40-110					

MB Sample ID: **RE171030-1** Units: **pCi/l** Analysis Date: **11/7/2017 12:08**

Client ID: Run ID: **RE171030-1A** Prep Date: **10/30/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	ND	0.165									U
Carr: BARIUM	15860		16410		96.7	40-110					

The following samples were analyzed in this batch:

1710191-1	1710191-2	1710191-3
1710191-4	1710191-5	

Client: ALS Environmental
Work Order: 1710191
Project: K1710859

QC BATCH REPORT

Batch ID: **RA171030-2-1** Instrument ID: **LB4100-a** Method: **Radium-228 Analysis by GFPC**

DUP Sample ID: **1710191-2** Units: **pCi/l** Analysis Date: **11/7/2017 09:05**
Client ID: **100517-CCR-LPLF2R** Run ID: **RA171030-2A** Prep Date: **10/30/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	0.97 (+/- 0.42)	0.67						0.81	0.3	2.1	LT
Carr: BARIUM	34480		35370		97.5	40-110		34600			

LCS Sample ID: **RA171030-2** Units: **pCi/l** Analysis Date: **11/7/2017 09:05**
Client ID: Run ID: **RA171030-2A** Prep Date: **10/30/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	6.7 (+/- 1.7)	0.6	6.528		103	70-130					P
Carr: BARIUM	34400		35340		97.4	40-110					

LCSD Sample ID: **RA171030-2** Units: **pCi/l** Analysis Date: **11/7/2017 09:05**
Client ID: Run ID: **RA171030-2A** Prep Date: **10/30/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	6.7 (+/- 1.6)	0.6	6.528		102	70-130		6.7	0.02	2.1	P
Carr: BARIUM	34240		35340		96.9	40-110		34400			

MB Sample ID: **RA171030-2** Units: **pCi/l** Analysis Date: **11/7/2017 09:05**
Client ID: Run ID: **RA171030-2A** Prep Date: **10/30/2017** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-228	ND	0.64									U
Carr: BARIUM	34100		35340		96.5	40-110					

The following samples were analyzed in this batch:

1710191-1	1710191-2	1710191-3
1710191-4	1710191-5	