F I N A L

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

Prepared for

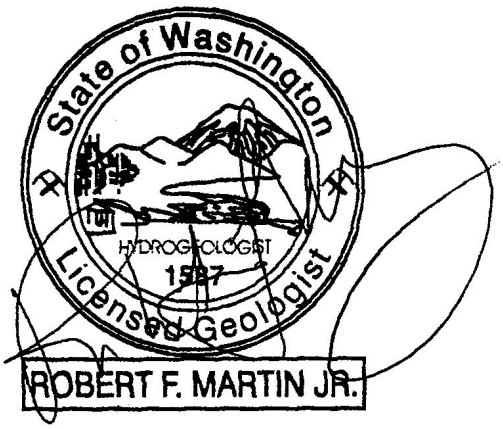
TransAlta Centralia Mining LLC

April 2018

ch2m:SM

999 W. Riverside Ave Suite 500
Spokane, WA 99201
(509) 747-2000

This addendum has been certified by a Professional Engineer and a Hydrogeologist licensed in the State of Washington and employed by Jacobs, Inc.



Pat Krych, representing:

CH2M HILL Engineers, Inc.
999 W. Riverside Ave, Suite 500
Spokane, Washington 99201
Office Phone: 509-747-2000
Email: Pat.Krych@jacobs.com

Robert Martin, representing:

CH2M HILL Engineers, Inc.
999 W. Riverside Ave, Suite 500
Spokane, Washington 99201
Office Phone: 509-747-2000
Email: Robert.Martin@jacobs.com

Contents

Acronyms and Abbreviations

°C	degrees Celsius
CCR	coal combustion residuals
CFR	Code of Federal Regulations
DQR	Double Quantification Rule
EPA	U.S. Environmental Protection Agency
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 purpose and objectives of this addendum.

1.1 Purpose and Objectives

The purpose of this addendum is to provide supplemental documentation of retesting groundwater quality results which were performed at the Limited Purpose Landfill (LPLF) at the TransAlta Centralia Mine near Centralia, Washington. Retesting was conducted in general accordance with the selected statistical method as documented in the *Coal Combustion Residual Certification of Statistical Method for the Limited Purpose Landfill at the TransAlta Centralia Mining LLC* (CH2M 2017a), and more specifically, as follow-up documentation to supplement the *2017 Annual Groundwater Monitoring Report for the Limited Purpose Landfill at the TransAlta Centralia Mine near Centralia, Washington* (CH2M 2018). This addendum is specifically intended to validate the 2017 statistical evaluation results for detection-phase monitoring, and to provide Professional Engineer (PE) certification that the site remains in the detection phase status as a demonstration of natural variation in groundwater quality in accordance with CFR Part 257.94(e)(2).

SECTION 2

Retesting Results

This section summarizes the CCR resampling event and groundwater quality results.

2.1 Retesting Sampling Event and Results

The 2017 annual report (CH2M 2018) identified and reported the following four cases which exceeded their respective background limits from the October 5, 2017 sampling event:

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

As noted in the annual report (CH2M 2018), retesting was needed for these cases and was completed on February 28, 2018 to determine if these are valid statistically-significant exceedances (SSIs), or if they were found to be 'false-positives'. Appendix A is a copy of the field sampling form, and Appendix B is a copy of the laboratory analytical data package for the retesting event. Data validation of the retesting results was completed on April 16, 2018 and confirmed that the retesting results satisfied the respective data quality objectives and met the quality control metrics.

Table 1 summarizes the statistical methods for all the wells and constituents as established from the *Coal Combustion Residual Statistical Method Certification for the Limited Purpose Landfill at the Centralia Mine near Centralia, Washington* (CH2M 2017a). As shown on this table (and as explained in the annual report), several of the constituents exhibited changing conditions (trends) during background period, and as such, the trends are accounted for in calculating background limits. For LPLF-2R, boron, calcium, and TDS background limits are calculated values which are dependent on time of sampling, whereas pH background limits are fixed.

Table 2 presents the background limits and results from the October 5, 2017 sampling event, which summarizes that the 4 cases listed above required retesting to determine if they were valid SSIs. Table 2 also shows the retesting results from the February 28, 2018 event, which confirms that pH is within the background limit, however, boron, calcium, and TDS for LPLF-2R exceed the limit and in accordance with the selected statistical method on retesting are considered to be confirmed SSIs.

2.2 Summary of Statistically Significant Exceedances

The 2017 annual report identified four constituents in LPLF-2 where the October 5, 2017 values exceeded the background limits. Retesting was completed on February 28, 2018 and the results were validated on April 16, 2018. The retesting results confirmed that pH was within the background limit, however, boron, calcium, and TDS at LPLF-2R (shown in Table 2) are confirmed SSIs. In response to these SSIs, the owner (that is, TransAlta) is providing PE certification of an alternative source demonstration in Section 3 of this addendum as an option under CFR Part 257.94(e)(2) in lieu of shifting into Assessment Monitoring.

SECTION 3

Explanation of Statistically Significant Exceedances

This section presents an alternative source demonstration in response to confirmed SSIs in accordance with 40 CFR Part 257.94(e)(2).

3.1 CCR Rule Regulatory Applicability

In accordance with 40 CFR Part 257.94(e)(2), the site owner has the option to demonstrate that a source other than the regulated unit (i.e., ash waste in the LPLF) caused the SSI exceeding background levels before automatically shifting into the assessment phase requirements. The CCR regulations cite examples of alternative sources causing SSIs such as error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

The CCR regulations require alternative source demonstrations to be certified by a PE and completed within 90 days following determination of a valid SSI. The retesting results were validated on April 16, 2018, which is interpreted as the start of the 90-day period to complete the alternative source demonstration (or the need to shift into assessment monitoring if a successful demonstration is not made, etc.). Assuming April 16, 2018 as the effective start date for alternative source demonstration, a successful demonstration must be posted to the publicly available website no later than July 14, 2018.

3.2 Alternative Source Demonstration

This section presents the technical basis and supporting documentation to support that natural variation in groundwater quality at the LPLF site is the reason for the SSIs observed for several of the constituents at LPLF-2R.

Site History

The hydrogeological setting of the LPLF is unique in that present day subsurface conditions were constructed such that surface overburden soils (mine spoils) were excavated during active mining operations in 2006 to expose coal seams within the relatively fine-grained Skookumchuck formation. As part of reclamation efforts following coal mining activities, the mine spoils were backfilled into a pit that forms the current footprint of the LPLF. Recharge via precipitation created a zone of saturation within the mine spoils immediately overlying the fine-grained Skookumchuck formation, which is the target groundwater monitoring zone 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 2017b). The mine spoils are generally characterized as light tan to brown silty loam to silty clay with sand lenses; the underlying Skookumchuck is characterized as a sequence of siltstones, claystones, coal seams, and occasional carbonaceous shales. The stratigraphic sequence beneath the center of the LPLF consists of approximately 80 feet of mine spoils, underlain by relatively thick sequence of Skookumchuck, estimated at over 500 feet thick in the area.

The mine spoils were generated by removal of coal seam interburdens, and placed back into the mined pit. The interburden was comprised of silt and claystones with stringers of sub-economical coal stringers. The backfill placement resulted in a highly heterogeneous spoil of pulverized silt and claystone as discrete and localized coal and pyritic debris mixed laterally and vertically. These gravel to cobble sized materials can be acid forming, and generate localized suppressed pH in the otherwise alkaline silt

and clay spoils, and secondary mobilization of calcium, sulfate, and other constituents increasing TDS in groundwater.

The presence of acid forming materials in the spoils can result in elevated TDS and associated dissolved constituents in groundwater with localized increases closer to the material. As groundwater fluctuates, this can either submerge previously unsaturated material, or expose saturated material to aerobic conditions in the unsaturated zone. The vertical heterogeneity of these materials results in groundwater conditions that can be highly variable for constituents susceptible to mobilization under suppressed pH conditions within localized areas, within a specific monitoring location.

Prior to the CCR regulations which were enacted in April 2015, TCM characterized the hydrogeological conditions for the LPLF as documented in Section 2 of *TransAlta Centralia Mining LLC, Limited Purpose Landfill Solid Waste Permit Application*, dated October 2008 (CH2M, 2008). To satisfy Chapter 173-350-500, *Limited Purpose Landfill*, WAC regulations, TCM initiated background monitoring prior to waste placement from 2007 to present, as described in the Ecology-approved *Groundwater Monitoring Plan for TransAlta Centralia Mining LLC Limited Purpose Landfill, Amendment 1, July 2011* (CH2M, 2011a) as approved by the Washington State Department of Ecology (Ecology) and the (LCEHD). Since 2010, TCM has prepared quarterly and annual groundwater monitoring reports and submitted these to Ecology in accordance with Chapter 173-350[5] *Groundwater Monitoring – Data Analysis, Notification, and Reporting*. To date, the WAC program remains under detection-phase monitoring status. The existing WAC data collected from 2007 to 2009 pre-date waste placement into the LPLF, and are used to document the heterogenous nature of background conditions, and are presented in the following section as part of the alternative source demonstration for the CCR program.

Background Monitoring Results

Appendix C is a copy of the *TransAlta Centralia Mining Fourth Quarter 2010 Groundwater Monitoring Report* (CH2M 2011b). This report includes descriptive statistics (via Appendix B of this report) collected during the period from 2007 to 2009, which represents site conditions of the mine spoils prior to when wastes were placed into the LPLF, effectively considered as background conditions.

Table 3 summarizes the background data obtained from 2007 to 2009 via WAC program for boron, calcium, and TDS, which are the 3 constituents which are considered SSIs under the CCR program as described in Section 2. The highlighted values (and also shown in bold font) illustrate WAC data for LPLF background data which are higher mean concentrations for boron, calcium and TDS in comparison to the CCR program values at LPLF-2R which were considered SSIs. The WAC background data demonstrate (1) substantial spatial variability and heterogeneity in these constituents of interest, and (2) that the CCR values which were identified as SSIs are actually within the demonstrated range of natural variation in groundwater quality during WAC background period.

In response to the onset of CCR Rule in April of 2015, the site owner (that is, TransAlta [TCM]) installed monitoring wells, initiated the detection monitoring program and completed the required eight background monitoring events to establish background conditions and to select an appropriate statistical method by the October 17, 2017 deadline. The duration of when the CCR Rule was effective to when initial reporting of detection monitoring results constrains the background monitoring period to approximately one full hydrological season. Although the (minimum) number of background monitoring events were satisfied per CCR Rule, it is inferred that the background monitoring period (i.e., limited to about 1 year) may not have captured the actual natural variation which might be expected to occur in a natural groundwater environment, which can vary due to changes in annual precipitation (recharge) and related geochemical changes associated with residence time within the aquifer materials. Background monitoring events conducted over several years or multiple hydrological cycles would more appropriately characterize the natural variability in groundwater, and yield more data to strengthen statistical power of detection monitoring analyses. Given these considerations, it is believed that the

background limits for the CCR program have not fully captured the natural variation in groundwater quality at the LPLF site, and future such alternative source demonstrations may be expected.

As noted in the statistical method certification (CH2M 2017a) and in accordance with Unified Guidance (EPA 2009), due to the complex behavior of groundwater and the need for sufficiently large sample sizes, it is recommended to update background conditions following four to eight sampling events. Using this principle with semi-annual sampling as prescribed under the CCR program, the background values should be reviewed and updated using statistical analysis every 2 to 4 years assuming no confirmed statistically significant increase is identified. In addition, if hydrogeologic conditions change, then background should be updated to match the latest conditions.

3.3 Summary

Key findings developed and/or confirmed from the annual groundwater report and as provided in this addendum 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.
- **Background and 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.
- **Detection Monitoring Results/Statistical Evaluation/2017 Annual Report.** The initial 2017 annual report was completed by the January 31, 2018 deadline, and posted to the publicly available website. The 2017 annual report 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 and required retesting. Retesting was completed on February 28, 2018 for boron, calcium, pH and TDS in well LPLF-2R.
- **Retesting/Addendum to the 2017 Annual Report** (as presented herein). Analysis of retesting results confirms that pH was within the background limit, however, boron, calcium, and TDS were identified as SSIs based on the CCR statistical method. Based on the results and analysis in this addendum, however, these SSIs were explained or qualified as unrelated to the LPLF waste materials, and due to natural variation in groundwater quality.
- **Status of CCR Monitoring Program.** This addendum has been certified by a PE in accordance with the alternative source demonstration per 40 CFR Part 257.94(e)(2) to document that the 2017 SSIs for boron, calcium, and TDS at LPLF-2R are due to natural variation in groundwater quality, and are not caused by potential influence from the LPLF. The LPLF remains under the detection-phase monitoring status per 40 CFR 257.94, *Detection Monitoring Program.*

SECTION 4

References

CH2M HILL Engineers, Inc. (CH2M). 2008. TransAlta Centralia Mining LLC, Limited Purpose Landfill Solid Waste Permit Application, dated October 2008.

CH2M HILL Engineers, Inc. (CH2M). 2011a. *Groundwater Monitoring Plan for TransAlta Centralia Mining LLC Limited Purpose Landfill, Amendment 1, July 2011*.

CH2M HILL Engineers, Inc. (CH2M). 2011b. *TransAlta Centralia Mining Fourth Quarter 2010 Groundwater Monitoring Report.*

CH2M HILL Engineers, Inc. (CH2M). 2017a. *Coal Combustion Residual Statistical Method Certification for the Limited Purpose Landfill at the Centralia Mine near Centralia, Washington.*

CH2M HILL Engineers, Inc. (CH2M). 2017b. *Coal Combustion Residual Groundwater Monitoring System Certification for the Limited Purpose Landfill at the Centralia Mine Site near Centralia, Washington.*

CH2M HILL Engineers, Inc. (CH2M). 2018. *2017 Annual Groundwater Monitoring Report for the Limited Purpose Landfill at the TransAlta Centralia Mine near Centralia, Washington*.

U.S. Environmental Protection Agency (EPA). 2009. *Unified Guidance: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities.*

U.S. Environmental Protection Agency (EPA). 2015. *Federal Register, 40 CFR § 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule, Vol. 80 No. 74, dated Friday, April 17, 2015*.

Washington Administrative Code (WAC). Chapter 173-350, *Solid Waste Handling Standards*.

Tables

Table 1. Statistical Method for TransAlta Limited Purpose Landfill

Addendum to the 2017 Annual Groundwater Monitoring Report – Limited Purpose Landfill at the TransAlta Centralia Mine

Well	Constituents	Units	Method	Trending Calculated UTL (if needed) = { Intercept + [Slope* Time(days)] + Residual }				K-Value	Lower Compliance Levels	Upper Compliance Levels
				Trend Removal	Intercept	Slope	Residual		LPL	UPL
LPLF-2R	Boron	mg/L	Parametric UPL	Yes	0.3617368	-0.0001758	0.0181	2.4	--	Calculated
LPLF-2R	Calcium	mg/L	Parametric UPL	Yes	495.1875	-0.2273	36.37	2.4	--	Calculated
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	--	2010
LPLF-2R	TDS	mg/L	Non-Parametric UPL	Yes	3718.1393	-0.9717	474.89	2.4	--	Calculated
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	6.58201	-0.02855	7.44	2.4	--	Calculated
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	718	3.197	170.01	2.4	--	167
LPLF-7R	TDS	mg/L	Parametric UPL	Yes	1560	4.448	278.43	2.4	--	253
LPLF-8	Boron	mg/L	Parametric UPL	No	--	--	--	2.4	--	0.988
LPLF-8	Calcium	mg/L	Parametric UPL	Yes	363.94062	0.07846	33.96	2.4	--	Calculated
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	1989.33	2.482	123.75	2.4	--	Calculated
LPLF-8	TDS	mg/L	Parametric UPL	Yes	3180.934	3.161	307.97	2.4	--	Calculated

Notes:

DQR = Double Quantification Rule (a SSI is identified from any future detection above previous non-detected values, etc)
UPL = Upper Prediction Limit
LPL = Lower Prediction Limit

Detrending time variable assumes the period (in days) from when initial background event was obtained (November 14, 2016) to when the compliance event in question was collected.

Table 2. Detection Monitoring Results and Retesting

Addendum to the 2017 Annual Groundwater Monitoring Report - Limited Purpose Landfill at the TransAlta Centralia Mine

Well	Constituents	Units	Lower Compliance Limit October 5, 2017	Upper Compliance Limit October 5, 2017	Initial Detection Monitoring Result October 5, 2017	Lower Compliance Limit February 28, 2018	Upper Compliance Limit February 28, 2018	Retest Monitoring Result February 28, 2018	Confirmed SSI (Yes/No)
LPLF-2R	Boron	mg/L	--	0.323	**0.363**	--	0.030	**0.363***	Yes
LPLF-2R	Calcium	mg/L	--	458	**546**	--	424	**471***	Yes
LPLF-2R	Chloride	mg/L	--	9.77	8.03(J)	--	--	--	No
LPLF-2R	Fluoride	mg/L	--	DQR	<1 (ND)	--	--	--	No
LPLF-2R	pH	pH units	6.08	6.86	**6.97(J)**	6.08	6.86	6.54	No
LPLF-2R	Sulfate	mg/L	--	2,010	1,910	--	--	--	No
LPLF-2R	TDS	mg/L	--	3,440	**3,650**	--	3,300	**3,440***	Yes
LPLF-7R	Boron	mg/L	--	0.427	0.377	--	--	--	No
LPLF-7R	Calcium	mg/L	--	223	210	--	--	--	No
LPLF-7R	Chloride	mg/L	--	7.44	6.29	--	--	--	No
LPLF-7R	Fluoride	mg/L	--	DQR	<1 (ND)	--	--	--	No
LPLF-7R	pH	pH units	6.06	6.98	6.78(J)	6.06	--	--	No
LPLF-7R	Sulfate	mg/L	--	1,930	1,220	--	--	--	No
LPLF-7R	TDS	mg/L	--	3,280	2,350	--	--	--	No
LPLF-8	Boron	mg/L	--	0.988	0.968	--	--	--	No
LPLF-8	Calcium	mg/L	--	423	411	--	--	--	No
LPLF-8	Chloride	mg/L	--	7.39	5.79	--	--	--	No
LPLF-8	Fluoride	mg/L	--	DQR	<1 (ND)	--	--	--	No
LPLF-8	pH	pH units	5.61	6.36	6.09(J)	5.61	--	--	No
LPLF-8	Sulfate	mg/L	--	2,920	2,410	--	--	--	No
LPLF-8	TDS	mg/L	--	4,280	3,740	--	--	--	No

Notes:

DQR = Double Quantification Rule as described in *Annual Report* (CH2M 2018).

Lower Compliance Limit = Lower Prediction Limit

Upper Compliance Limit = Upper Prediction Limit

SSI = statistically-significant exceedance

Bold-font indicate apparent SSI where 10/5/2017 results exceeded limit; retesting performed to confirm if these cases are confirmed exeedances (SSIs).

Bolt-font with '*' indicate confirmed statistically-significant exceedances (SSIs).

Table 3. WAC Program Background Data compared to CCR Program SSIs
Addendum to the 2017 Annual Groundwater Monitoring Report - Limited Purpose Landfill at the TransAlta Centralia Mine

WAC Program Background Data - 2007 to 2009							CCR Program - 2017 SSIs
Constituent Name	**Well**	**N**	**Mean**	**Min**	**Max**	**% Non-Detects**	**LPLF-2 Exceedance Retest Result**
Calcium (mg/L)	LPLF1 (bg)	15	363.3	79	444	0	471 mgl/L
Calcium (mg/L)	LPLF2	36	241.6	180	345	0	
Calcium (mg/L)	LPLF3	36	49.19	39	67	0	
Calcium (mg/L)	LPLF4	36	16.83	12	22	0	
Calcium (mg/L)	LPLF5 (bg)	15	426.2	126	**865**	0	
Calcium (mg/L)	LPLF8	25	**492.1**	419	**573**	0	
Calcium (mg/L)	UnderDrain	12	518.7	456	585	0	
Calcium (mg/L)	Leachate	5	324.8	291	379	0	
Dis. Boron (mg/L)	LPLF1 (bg)	15	**0.8199**	0.665	**0.982**	0	0.363 mg/L
Dis. Boron (mg/L)	LPLF2	36	0.1709	0.134	0.281	0	
Dis. Boron (mg/L)	LPLF3	36	0.2733	0.151	**0.87**	0	
Dis. Boron (mg/L)	LPLF4	36	0.233	0.05	0.333	0	
Dis. Boron (mg/L)	LPLF5 (bg)	15	0.2021	0.153	0.307	0	
Dis. Boron (mg/L)	LPLF8	25	**0.7169**	0.448	**1.12**	0	
Dis. Boron (mg/L)	UnderDrain	12	0.7832	0.1	1.04	0	
Dis. Boron (mg/L)	Leachate	5	2.512	2.03	3.23	0	
TDS (mg/L)	LPLF1 (bg)	15	**4207**	1400	**5000**	0	3,440 mg/L
TDS (mg/L)	LPLF2	36	1280	970	1900	0	
TDS (mg/L)	LPLF3	36	866.4	710	1100	0	
TDS (mg/L)	LPLF4	36	312.5	230	450	0	
TDS (mg/L)	LPLF5 (bg)	15	2313	830	**4000**	0	
TDS (mg/L)	LPLF8	25	**4308**	3100	**6400**	0	
TDS (mg/L)	UnderDrain	12	3400	2900	3700	0	
TDS (mg/L)	Leachate	5	2940	2400	3300	0	

Notes:
Refer to maps in Appendix C for the WAC well locations; LPLF-1 and LPLF-5 are upgradient of LPLF.
WAC data shown in bold-font and highlighted demonstrate background concentrations which exceed the retest results for LPLF-2.

Appendix A
Field Sampling Form

Groundwater Purging and Sampling Form

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

Field Team: Bill Schleer Date: 2-28-18

Weather/Temp: Rain & Cool Arrival Time to Well: 10:55

Purge Method: ☐ Bladder ☒ Peristaltic ☐ Grab ☐ Other: _____ **Initial DTW (ft btc):** (3.01)

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	(3.04)	2000	5.95	2160	4.04	8.89		2.1	
15	(3.11)	3000	5.97	2166	3.53	9.79		2.0	
20	(3.13)	4000	6.00	2152	2.96	9.60		1.7	
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: 14 022818-CCR-LPLF2R **Sample Time:** 11:15

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: _____

_____

ADDRESS 1317 South 13th Ave., Kelso, WA 98626
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:	4700075456 Line90						
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
022818-CCR-LPLF2R	GW	02/28/2018	11:15		2	X		X				X	X			MS/MSD

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		02/28/2018			2-28-18 1545

Appendix B
Laboratory Report

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

March 12, 2018

Analytical Report for Service Request No: K1801892

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 February 28, 2018
For your reference, these analyses have been assigned our service request number **K1801892.**

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

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

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
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
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.

Chain of Custody

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

K1801892

ADDRESS 1317 South 13th Ave., Kelso, WA 98626
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:	4700075456 Line90				
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
022818-CCR-LPLF2R	GW	02/28/2018	11:15		2		X		X				X	X			MS/MSD

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		02/28/2018			2-28-18 1345

PC KC

Cooler Receipt and Preservation Form

Client TRANSALTA Service Request K18 01892

Received: 2-28-18 Opened: 2-28-18 By: JSP Unloaded: 2-28-18 By: JSP

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? 1 TAB FRONT
   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
6.0	5.9	3.3	3.2	-0.1	381			

4. Packing material: *Inserts* *Baggies* *Bubble Wrap* *Gel Packs* *Wet Ice* *Dry Ice* *Sleeves* _____
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
022818-CCL-LPLF2R	3 250mL				X	HNO3	0.5mL	REI-H0-M	JSP	1600

Notes, Discrepancies, & Resolutions:

SHORT HOLD TIME

RUSH

General Chemistry

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

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Collected:**	02/28/18
Sample Matrix:	Water	**Date Received:**	02/28/18
Analysis Method:	9056A	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
022818-CCR-LPLF2R	K1801892-001	**1910**	20	200	03/07/18 14:30	
Method Blank	K1801892-MB1	ND U	0.10	1	03/07/18 10:14	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project	LPLF CCR	**Date Collected:**	02/28/18
Sample Matrix:	Water	**Date Received:**	02/28/18
		Date Analyzed:	03/07/18

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	022818-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1801892-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1801892-001DUP Result	Average	RPD	RPD Limit
Sulfate	9056A	20	1910	1850	1880	3	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:**	K1801892
Project:	LPLF CCR	**Date Collected:**	02/28/18
Sample Matrix:	Water	**Date Received:**	02/28/18
		Date Analyzed:	03/7/18
		Date Extracted:	NA

Duplicate Matrix Spike Summary
Sulfate

Sample Name:	022818-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1801892-001	**Basis:**	NA
Analysis Method:	9056A		
Prep Method:	None		

		Matrix Spike			**Duplicate Matrix Spike**					
		K1801892-001MS			K1801892-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfate	1910	2660	800	94	2720	800	101	90-110	2	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Analyzed:**	03/07/18
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Sulfate

Analysis Method:	9056A	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	582843

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1801892-LCS	5.28	5.00	106	90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Collected:**	02/28/18
Sample Matrix:	Water	**Date Received:**	02/28/18
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
022818-CCR-LPLF2R	K1801892-001	**3440**	5.0	1	03/01/18 13:32	
Method Blank	K1801892-MB1	**5.0**	5.0	1	03/01/18 13:32	
Method Blank	K1801892-MB2	ND U	5.0	1	03/01/18 13:32	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project	LPLF CCR	**Date Collected:**	02/28/18
Sample Matrix:	Water	**Date Received:**	02/28/18
Analysis Method:	SM 2540 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
Solids, Total Dissolved

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
022818-CCR-LPLF2R	K1801892-001DUP	5.0	3440	3420	3430	<1	10	03/01/18

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dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Analyzed:**	03/01/18
Sample Matrix:	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:	582180

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1801892-LCS	1670	1640	102	85-115

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Collected:**	02/28/18
Sample Matrix:	Water	**Date Received:**	02/28/18
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
022818-CCR-LPLF2R	K1801892-001	**6.54**	-	1	02/28/18 17:19	H

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project	LPLF CCR	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Analyzed:	02/28/18

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Batch QC	**Units:**	pH Units
Lab Code:	K1801852-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1801852-001DUP Result	Average	RPD	RPD Limit
pH	SM 4500-H+ B	-	7.76	7.68	7.72	1	20

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Analyzed:**	02/28/18
Sample Matrix:	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:	581969

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1801892-LCS	8.41	8.41	100	85-115

Metals

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

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Collected:**	02/28/18 11:15
Sample Matrix:	Water	**Date Received:**	02/28/18 15:45
Sample Name:	022818-CCR-LPLF2R	**Basis:**	NA
Lab Code:	K1801892-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Boron	6010C	**0.363**	mg/L	0.021	1	03/05/18 11:51	03/01/18	
Calcium	6010C	**471**	mg/L	0.021	1	03/05/18 11:51	03/01/18	

Analytical Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	KQ1802707-02		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Boron	6010C	ND U	mg/L	0.021	1	03/05/18 11:47	03/01/18	
Calcium	6010C	**0.025**	mg/L	0.021	1	03/05/18 11:47	03/01/18	

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project	LPLF CCR	**Date Collected:**	02/28/18
Sample Matrix:	Water	**Date Received:**	02/28/18
		Date Analyzed:	03/05/18

Replicate Sample Summary
Total Metals

Sample Name:	022818-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1801892-001	**Basis:**	NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1802707-03 Result	Average	RPD	RPD Limit
Boron	6010C	0.021	0.363	0.347	0.355	5	20
Calcium	6010C	0.021	471	462	467	2	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.

Printed 3/7/2018 11:54:57 AM Superset Reference:

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Transalta Centralia Mining, LLC	**Service Request:**	K1801892
Project:	LPLF CCR	**Date Collected:**	02/28/18
Sample Matrix:	Water	**Date Received:**	02/28/18
		Date Analyzed:	03/5/18
		Date Extracted:	03/1/18

Matrix Spike Summary
Total Metals

Sample Name:	022818-CCR-LPLF2R	**Units:**	mg/L
Lab Code:	K1801892-001	**Basis:**	NA
Analysis Method:	6010C		
Prep Method:	EPA CLP-METALS ILM04.0		

Matrix Spike
KQ1802707-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Boron	0.363	0.761	0.500	80	75-125
Calcium	471	469	10.0	-16 #	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 3/7/2018 11:54:57 AM Superset Reference:

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

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

Service Request: K1801892
Date Analyzed: 03/05/18

Lab Control Sample Summary
Total Metals

Units:mg/L
Basis:NA

Lab Control Sample
KQ1802707-01

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Boron	6010C	0.453	0.500	91	80-120
Calcium	6010C	12.4	12.5	99	80-120

Appendix C
WAC Program Fourth Quarter 2010 Monitoring Report

TRANSALTA
CENTRALIA MINING LLC
LIMITED PURPOSE LANDFILL

FOURTH QUARTER 2010
GROUNDWATER MONITORING REPORT

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Prepared by
CH2M Hill
And
TransAlta Centralia Mining LLC

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This report was developed by TransAlta Centralia Minining LLC,
under the supervision of a Geologist licensed in the State of Washington.

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1. Introduction

This report presents results for 4th quarter 2010 groundwater monitoring at the TransAlta Centralia Mining LLC (TCM), Limited Purpose Landfill (LPLF). This report was prepared in accordance with the reporting requirements of Chapter 173-350-500 Washington Administrative Code (WAC). This report summarizes the monitoring results from the 4th quarter 2010 sampling event conducted in December 2010.

1.1 Site Description and Landfill Operations

The LPLF is located near the excavation area for Pit 7 of the Centralia Mine. Figure 1-1 shows the general location of the LPLF. The Pit 7 area has been mined and mine spoils (native overburden removed as part of the coal mining process) backfill was placed in the mined area as mining activities progressed. Figure 1-2 shows the site features and the LPLP groundwater monitoring network.

Construction of Stage 1 of the LPLF began during the summer of 2009 and TCM was authorized to begin waste disposal operations effective October 31, 2009. On December 21, 2009 the Lewis County Environmental Health Department amended the LPLF permit to approve disposal of wastes in Stage 1 area A3a, in addition to areas A1 and A2 which were approved for disposal in the original permit. In 2009 a total of 73,160 cubic yards of waste were disposed in the landfill. Approximately 121,223 cubic yards of wastes were placed in the landfill in 2010, prior to securing the landfill with intermediate cover and drainage control for the winter.

1.2 Monitoring Program Summary

The groundwater monitoring requirements of Chapter *173-350-330(5) WAC* prompted TCM, with assistance by CH2M HILL, to conduct subsurface investigation activities at the LPLF, occurring in two successive field investigation efforts. The first site investigation and monitoring well installation effort occurred in October 2007, which resulted in the drilling of three soil borings (SB-1, SB-2, SB-2B) and installation of four monitoring wells (LPLF 1 through LPLF-4).

In August 2008, CH2M HILL returned to the site to advance four additional borings (LPLF-5 through LPLF- 8) and perform hydraulic conductivity tests in the spoils backfill and underlying native Skookumchuck formation. The additional borings were converted into groundwater monitoring wells following the hydraulic testing activities. CH2M HILL also performed hydraulic conductivity testing in all eight completed LPLF wells to measure hydrogeologic parameters in the backfill spoils. Details describing the site conditions (conceptual site model) are presented in Section 2.4 of the 2008 permit application. Based on these field investigation findings and the objectives of the monitoring and reporting requirements of Chapter 173-350-500 WAC, the target hydrostratigraphic unit for LPLF groundwater monitoring is the saturated zone in the backfill soils immediately overlying the Skookumchuck contact.

Section G of the 2009 TransAlta LPLF permit required annual reporting of the groundwater monitoring results based on the Groundwater Monitoring Plan detailed in Section 8 of the permit application (effective date of October 2008). Baseline groundwater monitoring was performed monthly from November 2007 to September 2009. The baseline monitoring period represents site conditions prior to when wastes were placed into the landfill and are used to characterize the distribution of the data for which future monitoring results may be compared to assess if there may be any potential impact from the landfill. Routine detection monitoring has been conducted monthly from October 2009 through December 2010. The site features and the LPLF groundwater monitoring well network are shown in Figure 1-2.

2. Monitoring Program Description

This section describes the monitoring network and sampling activities performed during the 4th quarter 2010 sampling event. Groundwater monitoring is performed to satisfy the requirements of Chapter 173-350-500 WAC, and in accordance with Section B.3 of the 2009 TransAlta LPLF permit application. The groundwater monitoring program is described in Section 8 of the permit application dated October 2008.

2.1 Monitoring Network

Table 2-1 provides a summary of the LPLF groundwater monitoring well network and construction details. The wells were constructed according to WAC 173-160-400, *Requirements for Resource Protection Well Construction*.

The LPLF monitoring network includes eight groundwater wells completed in the target hydrostratigraphic unit consisting of the following wells: LPLF-1, -2, -3, -4, -5, -6, -7, and LPLF-8. These groundwater monitoring locations were selected to provide adequate stratigraphic and spatial representation of shallow groundwater in the LPLF permit area. An underdrain collection system is also part of the monitoring program which was installed to maintain hydraulic separation between the landfill liner system and seasonal high groundwater. Figure 1-2 shows the locations of these monitoring wells and the sub-grade underdrain monitoring location along the southern extent of the LPLF footprint.

A groundwater flow path analysis and hydraulic designation of the LPLF network was developed in the conceptual site model report (Section 2, Siting and Location, LPLF Engineering Design Report, CH2M HILL 2008). Monitoring wells LPLF-1, -4, -5, and -6 are located upgradient of the LPLF, whereas monitoring wells LPLF-2, -3, -7, and -8 are located laterally and down gradient of the LPLF footprint. The sub-grade drain collection system is located down gradient from the LPLF footprint. The sub-grade drain provides an additional down gradient monitoring location to compliment the LPLF well network. The sub-grade drain was constructed with a vertical sampling catch basin beneath a lateral perforated drainage pipe to allow for groundwater measurement and sampling in a manner consistent with the groundwater monitoring wells.

A leachate collection system was also constructed for the LPLF and is monitored for the same parameters and frequency as the groundwater monitoring wells.

2.2 Groundwater Level Measurement and Sampling

Upon arrival at each well location, the well cap is removed and static depth to water (DTW) is measured in each monitoring well prior to purging. Water-level measurements are read to the nearest 0.01 foot, using an electronic water level indicator probe. The DTW is measured from top of casing (TOC) and compared to the expected DTW range. If the two measurements vary considerably, the water level is measured again for verification.

Each monitoring well is purged before sampling to ensure that sampled groundwater represents conditions of the water-bearing unit. Each well is purged using a “low-flow” (minimal drawdown) groundwater sampling procedure. During purging, field parameters

consisting of pH, temperature, and specific conductivity (SC), are measured at approximate five-minute intervals using a multiple parameter in-line monitoring instrument (Horiba U-22 or equivalent). When the pH and SC indicator parameters have stabilized (i.e., when pH within +/- 10 percent and SC is +/- 10 μS/cm), samples are collected in laboratory-supplied sample containers at a flow rate of approximately 0.1 liter per minute. Field measurement readings and pertinent sampling information are recorded on dedicated field sampling forms.

The underdrain collection system is monitored during each round of groundwater sampling. Since the underdrain system is gravity-fed, the sampling method includes one set of field parameters (that are not required to stabilize), and the grab sample is collected at the end of the drain pipe.

2.3 Leachate Monitoring and Sampling

Leachate monitoring and sampling for the LPLF began in June 2010. Leachate sampling has been conducted monthly from June 2010 to December 2010. TCM collects grab samples at the entrance of the leachate treatment system. Leachate is analyzed for the same parameters and methods as the groundwater monitoring well samples.

2.4 Sample Handling & Analysis

Table 2-2 shows the field and laboratory analytical parameters for the LPLF monitoring program. Groundwater samples are collected in laboratory-supplied containers. All field parameters and sample identification numbers are recorded in the field sheets and then transferred into the master database.

Sample containers are labeled at the time of collection with the unique sample number, date, and time collected. Sample numbers are recorded on the chain-of-custody (COC) along with the time the sample was collected. The COC is sealed in a clear plastic bag and placed in the cooler, either on top of the samples or taped to the inside lid of the cooler. Coolers are sealed securely with clear tape, and COC seals are attached to the lid. The samples are shipped in ice-chilled coolers overnight to Maxxam Analytics International Corporation, located in Burnaby, British Columbia, Canada. Chain-of-custody forms are signed and filled out for each cooler. The COCs are kept as part of the permanent sampling record.

2.5 Field and Laboratory Quality Control

This section describes the field and laboratory quality control that is implemented in accordance with the Groundwater Monitoring Plan (Section 8 of the LPLF Solid Waste Permit Application, dated October 2008).

Field Quality Control:

Water level indicator probes are decontaminated before and after measuring each monitoring well by spraying it with an alconox/deionized water solution, rinsing with deionized water, and then wiping with paper towels. Sampling supplies and sampling bottles are handled using clean (new) disposable nitrile or latex gloves upon arrival at each sampling location.

Wells are purged and sampled using a low-flow peristaltic pump with variable controlled flow rates and dedicated sampling tubing. A dedicated sampling line is used to avoid generating increased turbidity in the sample.

Laboratory Quality Control:

Details of the laboratory quality control are prescribed in the Groundwater Monitoring Plan and are not reiterated herein.

3. Groundwater Monitoring Results

Monitoring results for the 4th quarter (December 2010) sampling event are summarized below.

3.1 Groundwater Levels and Hydrographs

The depth to water and groundwater elevation data for the December 2010 event are summarized in Table 3-1. Groundwater elevations were calculated by subtracting the measured static depth to water from the surveyed top-of-casing elevations relative to the local vertical datum (NGVD29).

Groundwater elevation hydrographs and monthly precipitation data are presented in Figure 3-1. The site hydrograph was developed using monthly water level measurements initiated November 2007 through December 2010. As shown on the site hydrograph, monitoring wells LPLF-1 and LPLF-5 are intermittently dry, particularly during the late summer or fall months. Monitoring wells LPLF-6 and LPLF-7 have been dry since their installation in September 2008. A distinct correlation between precipitation and groundwater elevation changes is not readily apparent. However, there may be a limited correlation between the seasonal low precipitation cycle typically occurring in July through August, which may correspond to the period when some of the wells are dry (i.e., particularly LPLF-1 and -5). There do not appear to be any significant temporal trends in groundwater levels over the period of record (roughly 3 years). The most-recent groundwater elevations measured in December 2010 are consistent with previous observations.

Precipitation data is obtained from TCM's meteorological station located approximately 8,000 feet northwest of the LPLF. The data is collected on hourly intervals but for reporting purposes TCM has summarized the data as monthly totals in Figure 3-1.

3.2 Groundwater Flow Direction and Hydraulic Gradient

The December 2010 groundwater level measurements in the LPLF well network and the interpreted potentiometric surface are presented in Figure 3-2. Based on the interpreted potentiometric surface, the groundwater flow direction in the vicinity of the LPLF is to the southwest.

As illustrated in Figure 3-2, the December 2010 groundwater levels and distances between LPLF-5 and LPLF-8 were used to estimate the hydraulic gradient at 0.070 ft/ft. The southwesterly flow direction and hydraulic gradient measured during the December 2010 event are generally consistent with the hydraulic conditions as presented in Section 2 of the *LPLF Engineering Design Report, Transalta Centrailia Mining LLC* (CH2M HILL, 2008). The groundwater flow direction and hydraulic gradient will be evaluated during each quarterly sampling event.

3.3 Groundwater Flow Velocity Estimates

Groundwater flow velocity estimates can be made using the following formula (obtained from Fetter, 1994):

$$v = \frac{K_a i}{n_e} * 365$$

where: v = estimated groundwater seepage velocity (ft/year)
K_a = horizontal hydraulic conductivity (ft/day)
i = horizontal hydraulic gradient (ft/ft; dimensionless)
n_e = effective porosity (dimensionless)

Table 3-2 presents the estimated groundwater seepage velocity and hydraulic parameters for the December 2010 sampling event. The estimated groundwater seepage velocity of 11 feet/year is relatively slow and correlates well with the fine-grained backfill spoils that comprise the uppermost hydrostratigraphic unit. As described in Section 3.2 (above), the hydraulic gradient was calculated for the December 2010 event, whereas the other hydrogeologic parameters were established in Section 2 of the *LPLF Engineering Design Report, Transalta Centrailia Mining LLC* (CH2M HILL, 2008).

3.4 Groundwater Quality Results

Groundwater quality results for the December 2010 monitoring event are summarized in Table 3-3. Field sampling sheets and laboratory analytical reports are presented in Appendix A. As shown in Table 3-3, the groundwater quality results include values for the entire LPLF well network, the underdrain collection system, and leachate. Samples from LPLF-6 and -7 have not been collected since these wells have been dry since their installation in September 2008. Groundwater quality results are organized into field measurements, general chemistry, major ions, and dissolved metals. The analytical parameters and their respective analytical test method are summarized in Table 2-2.

Stiff diagrams for the December 2010 event have been generated using the *Sanitas* software and are shown in Figure 3-3. Stiff diagrams are a graphical method to facilitate interpretation and presentation of the major ions present in a water quality sample. Stiff diagrams are particularly useful to visually compare the chemical composition of water quality among the LPLF well network. Stiff diagrams present the water quality results expressed in milliequivalents per liter, and they account for the ionic charge and formula weight for primary ions. The primary cations include sodium + potassium, calcium, and magnesium; whereas the primary anions include chloride, sulfate, and bicarbonate.

As shown in Figure 3-3, the chemical composition of LPLF-2, -3, and -4 exhibit an overall lower abundance of ions, whereas LPLF-1, -5, -8, and the Underdrain collection system exhibit a relatively higher overall abundance of ions. The Stiff plots illustrate a calcium and sulfate rich groundwater chemistry that is consistent with spoils wells located elsewhere within the mine site. Higher concentrations of calcium and sulfate are observed in both upgradient wells (LPLF-1 and LPLF-1) and downgradient locations (LPLF-8 and Underdrain) in comparison to the levels observed in the leachate. The calcium and sulfate signatures are more indicative of

heterogeneous distribution of spoils materials in the backfill, which appears to be localized in the vicinity of some of the LPLF monitoring locations.

3.5 Comparison to Applicable Groundwater Quality Criteria

Groundwater quality criteria applicable to the *Solid Waste Handling Standards*, Chapter 173-350, WAC, are the maximum contaminant levels (MCL's) as specified in Chapter 173-200, WAC for groundwater in the State of Washington. These MCL criteria for groundwater are also cited in the *TransAlta Centrailia Mining LLC, Solid Waste Handling Facility Permit* (amended on December 30, 2010).

Table 3-3 provides a summary of the December 2010 results and identifies those wells-constituents which exceed the Chapter 173-200 WAC criteria (exceedances highlighted in bold font). A discussion of the December 2010 MCL exceedances for the LPLF well network and Underdrain collection system (excluding leachate) are provided below.

- Hydrogen Ion Activity (pH criteria/range 6.5-8.5): pH is below the criteria in LPLF-2, -5, LPLF-8, and the Underdrain.
- Total Dissolved Solids (criteria is 500 mg/L): exceeds criteria in all wells, except for LPLF-4.
- Iron (criteria is 0.3 mg/L): exceeds criteria in LPLF-1, -2, -8, and the Underdrain.
- Sulfate (criteria is 250 mg/L): exceeds criteria at all locations, except for LPLF-3 and LPLD-4.
- Arsenic (criteria is 0.00005 mg/L): exceeds the criteria at all locations.
- Manganese (criteria is 0.05 mg/L): exceeds the criteria at all locations.

Exceedances of the groundwater criteria would not be considered to be attributed to a potential landfill source if the following occur:

- If the criteria are exceeded during the background monitoring period (i.e., prior to waste placement into the LPLF cell), and
- If the criteria are exceeded in upgradient monitoring locations, these exceedances would also be expected in downgradient locations and would not be attributed to the landfill.

Based on this decision logic, there are no groundwater quality exceedances of the Chapter 173-200 WAC criteria that are considered to originate from the LPLF. These wells- constituents and the criteria evaluation will be tracked in future sampling events. If necessary, the leachate sampling data may also be compared to the groundwater criteria to help troubleshoot any unexpected results observed in the groundwater monitoring wells. It should be noted that leachate monitoring results compared to water quality criteria had exceedances for pH (but at greater than 8.5, opposite than detected in wells), and selenium is not detected in any of the groundwater monitoring wells. Other criteria were exceeded in the leachate, but at values within the range of and lower than the monitoring well results.

3.6 Data Quality Assessment

Data quality may be assessed by the cation-anion balance and is required under the Chapter 173-350 WAC reporting requirements. A cation-anion balance is performed by converting all the ionic concentrations to units of milliequivalents per liter. The anions and cations are summed separately, and the results are compared. Assuming the waters are generally in equilibrium, if the sum of the cations is not within 10 percent of the sum of the cations, then there may be a problem with the chemical analyses, or there may be one or more ionic species that are present in significant quantities are not being included in the chemical analyses (Fetter, 1994).

Table 3-3 presents the *ion balance* as calculated by the analytical testing laboratory (*Maxxam Analytics International Corporation*) for the December 2010 sampling event. Using the constituent values in milligrams per liter, the ion balance is calculated as follows:

Total Cations (in meq/L) =
(NA*0.04350)+(CA*0.04990)+(MG*0.08229)+(K*0.02558)+(FE*0.03581)+(MN*0.03640)+(NH4*0.07140)

Total Anions (in meq/L) =
(CL*0.02821)+(SO4*0.02082)+(CO3*0.03333)+(HCO3*0.01639)+(OH*0.05880)+(PO4*0.09594)+(F*0.05264)+(SIO2*0.02629)+(NO2NO3*0.07140)

Ion Balance =
Total Cations / Total Anions

As shown in Table 3-3, the ion balance for the December 2010 event was equal to or greater than 0.9 for all wells (equivalent to a percent difference of less than 10 percent). A threshold of 10 percent (or equal to or greater than an ion balance of 0.9) is considered acceptable in consideration that all ionic species many not be accounted for, and that there is some inherent error that may be attributed to field and/or laboratory methods.

4. Statistical Evaluation

This section provides a summary of the statistical evaluation procedures and results for the LPLF groundwater monitoring program. These statistical findings are inclusive of monitoring results collected from November 2007 to the most-recent 4th quarter sampling event concluded in December 2010.

4.1 Statistical Analysis Regulatory Requirements

The primary purpose of statistically analyzing the LPLF monitoring data is to assist with an unbiased identification of any potential impacts to groundwater that may be attributable to a potential leak from the LPLF cell. Statistical analysis of the LPLF water quality results are performed to satisfy the requirements of the limited purpose landfill Solid Waste Handling Standers, per *Chapter 173-350- 500(5) WAC, Groundwater Monitoring – Data Analysis, Notification, and Reporting.* Statistical analyses are also required as stated in the *TransAlta Centralia Mining LLC Limited Purpose Landfill Solid Waste Facility Permit* (dated December 30, 2010), noting that "the Permittee shall perform an appropriate statistical evaluation of all groundwater and sub-grade drain monitoring data capable of revealing any increases over background for parameters and constituents tested." The statistical analyses presented herein are performed to satisfy these regulatory requirements.

4.2 Statistical Analysis Procedures

The statistical analysis approach and procedures for the LPLF groundwater monitoring program were selected to satisfy the regulatory requirements (noted above), and in consideration of the LPLF site conditions as presented in Section 2 of the *LPLF Engineering Design Report, TransAlta Centralia Mining, LLC (CH2M HILL 2008)*. The statistical analyses include the following three categories:

- Descriptive Statistics:
  - Descriptive Statistics (includes baseline date range only)
  - Time-Series Concentration Plots (inclusive of all wells-constituents for the entire period of record)
- Trend Evaluation using the Sen's Slope/Mann-Kendall Method (includes all data)
- Statistical Test for Increase of Conditions over Background (pending exploratory analysis; test method and approach will be presented in the 2010 Annual Report)

A summary of the approach and assumptions for these statistical analyses is provided below. The statistical analyses presented herein have been performed using *Sanitas Statistical Software*, Version 9.1.

Descriptive statistics:

Descriptive statistics include calculated values for mean concentration, standard deviation, variance, minimum and maximum, number of observations (sampling events), and percentage non-detect. Descriptive statistics were calculated for all wells and constituents in the LPLF dataset for the baseline monitoring period (November 2007 to September 2009). This period represents "background" conditions in consideration that it precedes placement of waste into the LPLF cell, thus precluding any potential adverse influence from landfill activities (such as leakage to shallow groundwater). Thus, it is the underlying assumption that the background dataset are not influenced by landfill activities. Descriptive statistics have been calculated for the background period to assist with a comparison to future sampling results (and as required for routine detection monitoring).

In addition, time-series concentration plots are a graphical presentation of the temporal dataset. These plots provide a method to quickly view relative changes in data at a particular well-constituent through time. Time-series concentration plots are useful to display the variability in concentration over time, assist with identification of potential outliers, can be used to assess potential seasonal patterns, and may compliment or cross-check the statistical tests used for the detection or assessment monitoring program (such as trend test or increase of conditions over background, described subsequently).

Trend Evaluation:

A "trend" is the general increase or decrease in observed values of some random variable over time (in our case groundwater concentration for the parameters of interest). A trend analysis can be used to determine the significance of an apparent trend and to estimate the magnitude of that trend.

The Mann-Kendall test for temporal trend and Sen's Slope estimate were used to evaluate the correlation of constituent concentrations through time. The Mann-Kendall test is a nonparametric test, meaning that it does not depend on the assumption of a particular underlying distribution of the dataset (Gilbert, 1987). The test uses only the relative magnitude of data rather than actual values, therefore, the test is well suited for irregular data collection frequencies and/or data gaps, which is often the case in environmental monitoring programs. In addition, non-detects may be included in the analysis and are typically assigned values equal to one-half their method detection limit (Gilbert, 1987).

The Mann-Kendall test for trend procedure was performed on the LPLF dataset. At this time, the trend test approach assumes all well-constituent pairs for the entire period of monitoring from November 2007 through December 2010. Considering the relatively slow groundwater seepage velocity and expectantly slow response to see changes in groundwater quality, the entire dataset was included for the initial test for trend. As the monitoring program matures and the results are routinely evaluated, the trend procedure and applicable date range may be adjusted to include a more recent or fixed window of observations. In addition, in consideration of the site conditions (i.e., fill materials or mine spoils), the groundwater conditions may be expected to exhibit changing conditions over the life of landfill and post-closure monitoring period. Therefore, for the LPLF monitoring program, it will be important to track and consider site-wide changes (i.e., in both upgradient and downgradient locations) while evaluating if there may be a potential adverse influence from landfill activities.

Non-detects were included in the trend test if the number of detects (N) in the given well-constituent pair met a minimum detection frequency set to 10 percent; well-constituent pairs with a detection frequency less than 10 percent were not evaluated. This approach excludes cases which are predominantly non-detect and are therefore not suitable to assess temporal changes. *Sanitas* uses one-half the method detection limit for instances when non-detects are included in the evaluation. It should also be re-iterated that the well network was installed in two separate phases, therefore, at this time the number of observations for the initial phase of wells is typically 38, whereas the second phase of wells have a total of 17 sampling observations. The test for trend (via Mann-Kendall) may be influenced by the relative number of observations, therefore, the trend results performed for the LPLF dataset for the entire period of monitoring may not have a homogeneous statistical significance. As mentioned above, as the monitoring program matures, a more recent window of observations may be included in future trend analyses, which would result in a consistent number of observations and provide for a more balanced result.

Increase of Conditions over Background:

In compliance with the Chapter 173-350-500 WAC reporting requirements, a statistical procedure will be developed and presented in the 2010 Annual Report to routinely evaluate if an increase (or change) of conditions has occurred in comparison to the background dataset. The statistical test will be selected based on the outcome of an exploratory data evaluation that is currently being performed. The site conceptual model will be used along with the results from the exploratory data analysis to select a detection monitoring procedure (statistical test) that is suitable for the LPLF groundwater monitoring program.

The exploratory data analysis will include an evaluation of the distribution and characteristics of the data, test for seasonality, test for outliers, and consider any temporal or spatial site variability for the parameters of interest. Results from the exploratory data analysis will be used to support weather an inter-well or intra-well comparison is suitable, and then select the appropriate statistical test (such as Control Charts, Prediction Limits, Tolerance Limit, etc). The preferred method will be described and presented to Ecology in the 2010 Annual Report, and upon concurrence, will be included in the amended groundwater monitoring plan.

4.3 Statistical Evaluation Results

This section presents the statistical evaluation results that have been performed on the dataset through the 4th quarter December 2010 sampling event.

Descriptive Statistics:

Descriptive statistics were generated in *Sanitas* for the baseline data collection period (November 2007 to September 2009) and are included in Appendix B. These results represent monthly measurements prior to landfill activities and may be used in comparison to future sampling events to assess for potential impacts to shallow groundwater. The number of observations (N) for the initial phase of wells (LPLF-2, -3, and -4) represent 23 events, whereas the number of observations for the second phase of wells (LPLF-1, -5, and -8) is a reduced number of observations ranging from 6 to 12 events. The Underdrain and leachate collection system are not included in Appendix B since they were installed after the baseline monitoring period.

Time-series concentration plots were also generated using *Sanitas* and are also included in Appendix B (following the descriptive statistics). As noted in Section 4.2, these plots help to

visualize the range and temporal characteristics in the dataset, and may be used to support the subsequent test for trend and/or change of conditions over background (described in sections below). One of the noteworthy characteristics is that well LPLF-5 (background well) shows a significant increase in numerous constituents occurring in summer of 2009. The increase in several parameters believed to represent this well becoming fully saturated and geochemically equilibrating with the primary hydrostratigraphic unit of interest. Therefore, groundwater quality results after the summer of 2009 are believed most representative of the baseline conditions for LPLF-5.

Trend Evaluation Results:

The Mann-K trend results (tabulated results), along with the Sens-Slope estimator (graphic plots) are included in Appendix C. All cases were included for analysis, provided each well-constituent pair met the minimum number of detects set to greater than 10 percent (to exclude cases which were predominantly non-detect). The trend test was performed with a confidence level set to 95 percent (or an alpha of 5 percent), which means that there is a 5 percent chance that the statistical test result is incorrectly assigned.

A summary of the significant trend results (either increasing or decreasing trend) has been compiled in Table 4-1. Of all the cases tested, a total of 78 cases are statistically significant; 30 of which are increasing, and 48 are decreasing at 95 percent confidence level. Of the increasing trends, the majority are from upgradient wells such as LPLF-1, -4, and -5.

Given the relatively recent hydrogeologic depositional setting (spoils backfill) and recent cell construction activities, it is to be expected that trends are occurring site-wide during the active life and post-closure monitoring period. In addition, the trend procedure included data which spans the baseline monitoring period, LPLF construction, and into the initial period of waste placement activities, thus, any trends identified would not be wholly indicative of a potential influence from landfill source materials. Given the relatively early stages of monitoring, combined with relatively slow groundwater seepage velocity, the trend results may be used to compliment the comparison to groundwater criteria (per Section 3.4) and if there may be a potential increase of conditions over background (as described below). Trend results alone, however, should not solely be used to assess potential adverse influences from the landfill.

Increase of Conditions over Background:

As mentioned above, this section is currently a placeholder for future reporting efforts. The statistical procedure to test for an increase of conditions over background will be developed and included in the forthcoming 2010 Annual Report.

5. Summary

Key findings developed from the 4th quarter (December 2010) monitoring results are summarized below.

- Groundwater in the uppermost hydrostratigraphic unit beneath the LPLF landfill generally flows to the southwest. This general flow direction is consistent with previous observations as presented in the 2008 permit application.

- Groundwater quality exceedances of the Chapter 173-200 WAC criteria were observed for the following constituents and locations:

  – Hydrogen Ion Activity (pH criteria/range 6.5-8.5): pH is below the criteria in LPLF-2, -5, LPLF-8, and the Underdrain.

  – Total Dissolved Solids (criteria is 500 mg/L): exceeds criteria in all wells, except for LPLF-4.

  – Iron (criteria is 0.3 mg/L): exceeds criteria in LPLF-1, -2, -8, and the Underdrain.

  – Sulfate (criteria is 250 mg/L): exceeds criteria at all locations, except for LPLF-3 and LPLD-4.

  – Arsenic (criteria is 0.00005 mg/L): exceeds the criteria at all locations.

  – Manganese (criteria is 0.05 mg/L): exceeds the criteria at all locations.

  None of these exceedances are attributed to a landfill-related source given they occurred during the background monitoring period and/or in upgradient monitoring wells. These constituents and their concentrations will be tracked in future reporting efforts.

- Trend results from the Mann-Kendall method revealed a number of significant cases, both increasing and decreasing, for the period tested. Trend analyses will be performed on a quarterly basis to compliment other analyses (such as comparison to MCL's, and to support the detection monitoring program).

- An exploratory data analysis is currently in process to assist with selection of a suitable statistical test to evaluate if there has been a change of condition over background. Results from the exploratory analysis will be presented in the 2010 Annual Report. Upon agency concurrence, the recommended statistical approach and methods will be incorporated into the routine LPLF monitoring and reporting program, and documented in the amended groundwater monitoring plan to be submitted by July 1, 2011.

6. References

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Sanitas™ Version 9.1. Statistical software used to evaluate groundwater data for RCRA Subtitle C and D facilities.

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TransAlta Centralia Mining LLC, Limited Purpose Landfill Solid Waste Permit Application, dated October 2008.

TransAlta Centralia Mining, LLC, Solid Waste Handling Facility Permit, amended on December 30, 2010.

Water Quality Standards for Ground Waters in the State of Washington, Chapter 173-200 Washington Administrative Code.

Tables

TABLE 2-1
Groundwater Monitoring Well Construction Summary

Well	Northing[1]	Easting[1]	Top of Casing	Reference Point Top of Ground Elevation[2]	Well Screen Elevation		Sand Pack Elevation		Well Depth[3]
					Top	Bottom	Top	Bottom	
LPLF-1	520,881.45	1,420,272.06	347.80	344.58	305.58	285.58	309.58	282.58	59
LPLF-2	521,560.80	1,418,888.82	302.26	298.32	283.32	263.32	288.32	260.32	35
LPLF-3	521,923.64	1,419,157.72	295.64	291.69	281.69	261.69	283.69	258.69	30
LPLF-4	522,146.70	1,419,339.00	303.12	299.60	287.6	282.6	290.6	279.6	17
LPLF-5	521,931.70	1,419,921.73	359.90	357.88	349.88	344.88	351.38	343.38	13
LPLF-6	521,408.14	1,420,291.02	358.60	356.39	339.39	334.39	341.39	331.39	22
LPLF-7	521,032.26	1,419,527.54	303.84	301.28	289.28	284.28	291.28	281.28	17
LPLF-8	521,235.37	1,419,233.53	298.75	296.93	279.93	274.93	282.93	273.93	22

Notes:
[1] Washington State Plane Coordinates (NAD27)
[2] Reference point elevation is top ground; all elevations in feet above mean sea level (NGVD29)
[3] Well depth is feet below ground surface

TABLE 2-2
Groundwater Analytes, Detection Limits, and Analytical Methods
December 2010

Analytes[1]	Detection Limits	Analytical Method
Field Determinations		
Temperature	0.1 °C	Electronic Field Probe
pH	0.01 units	SM4500-H+
Specific Conductance	1 μmhos/cm	SM2510B Field Probe
Laboratory Determinations		
Total Dissolved Solids	10 mg/l	2540C
Carbonate Alkalinity	2 mg/l	SM2320B
Bicarbonate Alkalinity	2 mg/l	SM2320B
Ammonia	0.1 mg/l	E350.3
Boron	100 µg/l	SW6010
Chloride	0.5 mg/l	300
Fluoride	1.0 mg/l (distilled) or 0.1 mg/l (undistilled)	340.2
Dissolved Sulfate (SO_4)	0.5 mg/l	300.1
Dissolved Sulfite (SO_3)	2 mg/l	377.1
Nitrate (NO_3)	0.1 mg/l	E353.2
Total and Dissolved Arsenic	0.001 mg/l	6020A
Total and Dissolved Barium	0.001 mg/l	6010B
Total and Dissolved Cadmium	0.005 mg/l	6020A
Total and Dissolved Chromium	0.001 mg/l	6010B
Total and Dissolved Calcium	0.05 mg/l	6010B
Total and Dissolved Iron	0.005 mg/l	6010B
Total and Dissolved Lead	0.0005 mg/l	6020A
Total and Dissolved Magnesium	0.05 mg/l	6010B
Total and Dissolved Mercury	0.00005 mg/l	7471A
Total and Dissolved Manganese	0.001 mg/l	6010B
Total and Dissolved Potassium	1 mg/l	6010B
Total and Dissolved Selenium	0.001 mg/l	6020A
Total and Dissolved Silver	0.0001 mg/l	6020A
Total and Dissolved Sodium	0.05 mg/l	6010B
Total and Dissolved Zinc	0.005 mg/l	6010B
Cation/Anion Balance	NA	Calculated

Notes:

1. The list of analytes are site-specific for the LPLF as presented in the Groundwater Monitoring Plan (Section 8 of the LPLF Solid Waste Permit Application) and includes the parameters as required under Chapter 173-350-500, Washington Administrative Code (WAC).

Table 3-1
Groundwater Levels and Field Parameters
December 2010

Well	Date Sampled	Reference Point (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Temp (°C)	pH	Conductivity (uS/cm)	Comments
LPLF-1	13 Dec 2010	344.58	55.39	289.19	12.90	6.50	4553	
LPLF-2	13 Dec 2010	298.32	6.11	292.21	11.9	6.4	1212	
LPLF-3	13 Dec 2010	291.69	1.49	290.20	11.9	6.8	1089	
LPLF-4	13 Dec 2010	299.66	2.00	297.66	11.60	7.10	396	
LPLF-5	13 Dec 2010	357.88	10.61	347.27	13.8	6.4	2814	
LPLF-6	13 Dec 2010	356.39	22.00	< 334.39	-	-	-	Dry at time of measurement; value represents well bottom
LPLF-7	13 Dec 2010	301.28	17.00	< 284.28	-	-	-	Dry at time of measurement; value represents well bottom
LPLF-8	13 Dec 2010	296.93	15.69	281.24	13.1	5.2	3351	
Leachate	13 Dec 2010	NA	NA	NA	12.3	9.3	1804	
Underdrain	13 Dec 2010	NA	NA	NA	10.0	6.1	2184	

Notes:
Reference point elevation is top of ground.
All elevations in feet above mean sea level (NGVD29).

TABLE 3-2
Groundwater Flow Velocity Estimates
December 2010

Description:	Hydraulic Parameter for LPLF-5 & LPLF-8
Groundwater Elevation (ft) (upgradient well)	347.27
Groundwater Elevation (ft) (downgradient well)	278.43
Distance between wells (ft)	982
Hydraulic Gradient (i)	0.0701
Mean Hydraulic Conductivity (K) (ft/day)	0.111
Groundwater Flow Velocity Est. (ft/year)	**11**

Groundwater Velocity Equation (Fetter, 1994):

$$v = \frac{K_a i}{n_e} * 365$$

v - velocity (ft/year)
K_a - mean hydraulic conductivity of LPLF-5 & LPLF-8 (reference Section 2.4.5 of the October 2008 permit application).
i - gradient (ft/ft)
n_e - effective porosity (25% - assumed value)

TABLE 3-3
Analytical Results and Criteria Comparison
December 2010

Chemical Group	Analyte	Unit	Monitoring Wells								Other Monitoring Locations		WAC
			LPLF-1 (UG)	LPLF-2 (DG)	LPLF-3 (DG)	LPLF-4 (UG)	LPLF-5 (UG)	LPLF-6 (UG)	LPLF-7 (DG)	LPLF-8 (DG)	Leachate (DG)	Underdrain (DG)	173-200 Criteria
Field	Temperature	°C	12.9	11.9	11.9	11.6	13.8	na	na	13.1	12.3	10.0	-
Field	Conductivity	uS/cm	4553	1212	1089	396	2814	na	na	3351	1804	2184	-
Field	pH	unit	6.5	**6.4**	6.8	7.1	**6.4**	na	na	**5.2**	**9.3**	**6.1**	6.5-8.5
Gen. Chem.	Bicarbonate	mg/L	1300	400	720	300	540	na	na	120	45	230	-
Gen. Chem.	Carbonate	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	na	na	<0.5	10	<0.5	-
Gen. Chem.	Ammonia (as N)	mg/L	0.42	0.77	0.8	0.1	0.27	na	na	5.3	0.68	1.1	-
Gen. Chem.	Total Dissolved Solids	mg/L	**4200**	**1200**	**880**	310	**3400**	na	na	**3900**	**1900**	**2800**	500
Gen. Chem.	Total Organic Carbon	mg/L	4.5	<0.5	2	1.6	1.1	na	na	3.3	13.6	3.8	-
Gen. Chem.	Flouride	mg/L	0.12	0.05	0.09	0.24	0.21	na	na	0.12	0.84	0.15	4
Gen. Chem.	Ion Balance		0.9	0.92	1	0.96	1.1	an	na	0.98	1	1.1	-
Major Ion	Calcium	mg/L	352	206	55	13	623	na	na	448	249	383	-
Major Ion	Chloride	mg/L	7.4	4	6.3	3.9	7.4	na	na	11	18	9.7	250
Major Ion	Iron	mg/L	**4.374**	**3.17**	0.197	0.037	0.28	na	na	**487**	0.14	**12.8**	0.3
Major Ion	Magnesium	mg/L	102	13.1	15.5	5.7	163	na	na	169	20.4	149	-
Major Ion	Nitrate (as N)	mg/L	3.46	<0.02	<0.02	0.2	0.04	na	na	<0.02	1.29	<0.02	10
Major Ion	Potassium	mg/L	17.8	5.1	4.8	1.8	8.1	na	na	12.7	45.5	13.7	-
Major Ion	Sodium	mg/L	1090	96	261	97	124	na	na	181	246	170	-
Major Ion	Sulfate	mg/L	**2900**	**660**	180	26	**1800**	na	na	**3000**	**1200**	**1600**	250
Major Ion	Nitrite	mg/L	0.055	<0.005	<0.005	<0.005	<0.005	na	na	0.033	0.12	<0.005	-
Major Ion	Nitrate/Nitrite	mg/L	3.51	<0.02	<0.02	0.2	0.04	na	na	0.05	1.41	<0.02	-
Trace Metal	Arsenic	mg/L	**0.0004**	**0.0002**	**0.0002**	**0.0003**	**0.0003**	na	na	**0.0092**	**0.0021**	**0.0006**	0.00005
Trace Metal	Barium	mg/L	0.02	0.043	0.117	0.076	0.028	na	na	0.015	0.132	0.025	1
Trace Metal	Boron	mg/L	0.822	0.157	0.264	0.298	0.194	na	na	0.928	2.54	0.742	-
Trace Metal	Cadmium	mg/L	0.00038	0.00004	0.00006	0.00002	0.0005	na	na	0.00022	0.00015	0.00053	0.01
Trace Metal	Chromium	mg/L	<0.004	<0.001	<0.001	<0.001	<0.002	na	na	<0.002	0.029	<0.001	0.05
Trace Metal	Lead	mg/L	<0.0008	<0.0002	<0.0002	<0.0002	<0.0004	na	na	<0.0004	<0.0002	<0.0002	0.05
Trace Metal	Manganese	mg/L	**0.451**	**1.01**	**0.864**	**0.052**	**5.09**	na	na	**10.1**	**0.22**	**9.64**	0.05
Trace Metal	Mercury	mg/L	<0.00008	<0.00002	<0.00002	<0.00002	<0.00004	na	na	<0.00004	<0.00002	<0.00002	0.002
Trace Metal	Selenium	mg/L	<0.0004	<0.0001	<0.0001	<0.0001	<0.0001	na	na	<0.0004	**0.0184**	0.0001	0.01
Trace Metal	Silver	mg/L	<0.00008	<0.00002	<0.00002	<0.00002	<0.00004	na	na	<0.00004	<0.00002	<0.00002	0.05
Trace Metal	Zinc	mg/L	0.037	0.006	<0.005	<0.005	0.098	na	na	0.57	<0.005	0.204	5

Notes:
Groundwater samples collected December 13, 2010
LPLF-6 & LPLF-7: Dry Wells
All metals results are dissolved concentrations. Although sample water was field filtered, the laboratory reported iron as total iron.
"UG" = upgradient well; "DG" = downgradient well; (relative to respective landfill area).
Non-detect values preceded with "<" symbol; non-detect value is laboratory reporting limit. "J" = estimated concentration below laboratory reporting limit.
Bold values indicate concentrations at or above established WAC 173-200 criteria.
Ion Balance is calculated by testing laboratory as described in Section 3.6

TABLE 4-1
Significant Trend Summary - December 2010

Constituent Name	Well	Slope	Mann-Kendall	Critical Value	Trend	N	Alpha
Sulfate (mg/L)	LPLF1 (bg)	327.7	95	49	Yes	17	0.05
Specific Conductance (uS/cm)	LPLF1 (bg)	312.5	74	49	Yes	17	0.05
Bicarbonate (mg/L)	LPLF3	47.1	454	158	Yes	38	0.05
Specific Conductance (uS/cm)	LPLF4 (bg)	41.54	283	158	Yes	38	0.05
Magnesium (mg/L)	Leachate	33.88	18	15	Yes	7	0.05
Bicarbonate (mg/L)	LPLF2	29.8	230	158	Yes	38	0.05
Bicarbonate (mg/L)	LPLF4 (bg)	22.08	307	158	Yes	38	0.05
TDS (mg/L)	LPLF4 (bg)	16.98	182	158	Yes	38	0.05
Dis. Hardness (mg/L)	LPLF3	15.99	262	158	Yes	38	0.05
Magnesium (mg/L)	LPLF1 (bg)	10.58	100	49	Yes	17	0.05
Sodium (mg/L)	LPLF4 (bg)	9.635	322	158	Yes	38	0.05
Potassium (mg/L)	UnderDrain	4.368	46	37	Yes	14	0.05
Calcium (mg/L)	LPLF3	3.185	210	158	Yes	38	0.05
Sulfate (mg/L)	LPLF4 (bg)	2.92	170	158	Yes	38	0.05
Potassium (mg/L)	LPLF5 (bg)	1.984	72	45	Yes	16	0.05
Magnesium (mg/L)	LPLF3	1.867	382	158	Yes	38	0.05
Iron (mg/L)	LPLF1 (bg)	1.726	78	49	Yes	17	0.05
Nitrate (mg/L)	LPLF1 (bg)	0.9106	76	49	Yes	17	0.05
Nitrate-Nitrite (mg/L)	LPLF1 (bg)	0.8838	76	49	Yes	17	0.05
Temperature (Deg C)	LPLF2	0.4184	179	158	Yes	38	0.05
Temperature (Deg C)	LPLF3	0.4011	199	158	Yes	38	0.05
Manganese (mg/L)	LPLF2	0.1938	187	158	Yes	38	0.05
pH (SIU)	LPLF4 (bg)	0.1629	207	158	Yes	38	0.05
Iron (mg/L)	LPLF2	0.118	258	158	Yes	38	0.05
Ammonia (mg/L)	LPLF2	0.1116	206	158	Yes	38	0.05
Nitrate-Nitrite (mg/L)	LPLF4 (bg)	0.05	340	158	Yes	38	0.05
Nitrate (mg/L)	LPLF4 (bg)	0.04932	333	158	Yes	38	0.05
Dis. Boron (mg/L)	LPLF4 (bg)	0.0395	431	158	Yes	38	0.05
Zinc (mg/L)	LPLF1 (bg)	0.008115	40	34	Yes	13	0.05
Cadmium (mg/L)	LPLF5 (bg)	0.0001438	46	45	Yes	16	0.05
Nitrite (mg/L)	LPLF3	0	-202	-158	Yes	38	0.05
Dis. Arsenic (mg/L)	LPLF4 (bg)	-0.00003373	-201	-158	Yes	38	0.05
Cadmium (mg/L)	LPLF2	-0.00006919	-378	-158	Yes	38	0.05
Dis. Arsenic (mg/L)	LPLF2	-0.00008346	-251	-158	Yes	38	0.05
Dis. Arsenic (mg/L)	LPLF3	-0.0001409	-392	-158	Yes	38	0.05
Dis. Arsenic (mg/L)	LPLF1 (bg)	-0.0002761	-85	-49	Yes	17	0.05
Dis. Arsenic (mg/L)	LPLF5 (bg)	-0.0009233	-89	-45	Yes	16	0.05
Cadmium (mg/L)	UnderDrain	-0.001239	-57	-37	Yes	14	0.05
Dis. Barium (mg/L)	LPLF8	-0.004571	-245	-96	Yes	27	0.05
Iron (mg/L)	LPLF3	-0.006581	-166	-158	Yes	38	0.05
Dis. Barium (mg/L)	LPLF2	-0.006677	-200	-158	Yes	38	0.05
Dis. Barium (mg/L)	LPLF1 (bg)	-0.006871	-79	-49	Yes	17	0.05
Fluoride (mg/L)	LPLF2	-0.009432	-256	-158	Yes	38	0.05
Fluoride (mg/L)	LPLF3	-0.0154	-297	-158	Yes	38	0.05
Fluoride (mg/L)	LPLF4 (bg)	-0.0167	-203	-158	Yes	38	0.05
Dis. Barium (mg/L)	LPLF5 (bg)	-0.02484	-101	-45	Yes	16	0.05
Manganese (mg/L)	LPLF4 (bg)	-0.03068	-242	-158	Yes	38	0.05
Fluoride (mg/L)	LPLF1 (bg)	-0.03911	-76	-49	Yes	17	0.05
Nitrate-Nitrite (mg/L)	LPLF8	-0.04363	-103	-96	Yes	27	0.05
Ammonia (mg/L)	LPLF4 (bg)	-0.04807	-236	-158	Yes	38	0.05
Fluoride (mg/L)	LPLF8	-0.05328	-173	-96	Yes	27	0.05

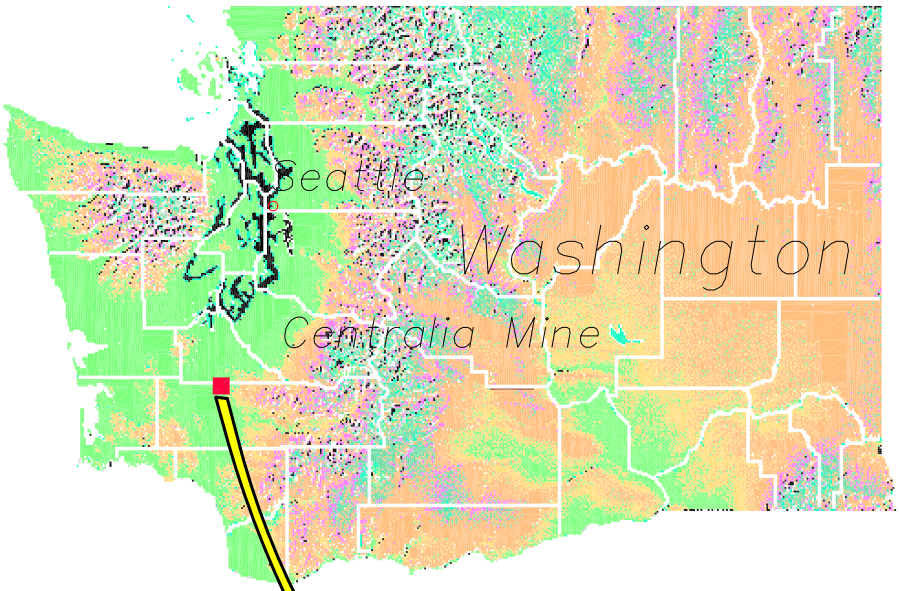
TABLE 4-1
Significant Trend Summary - December 2010

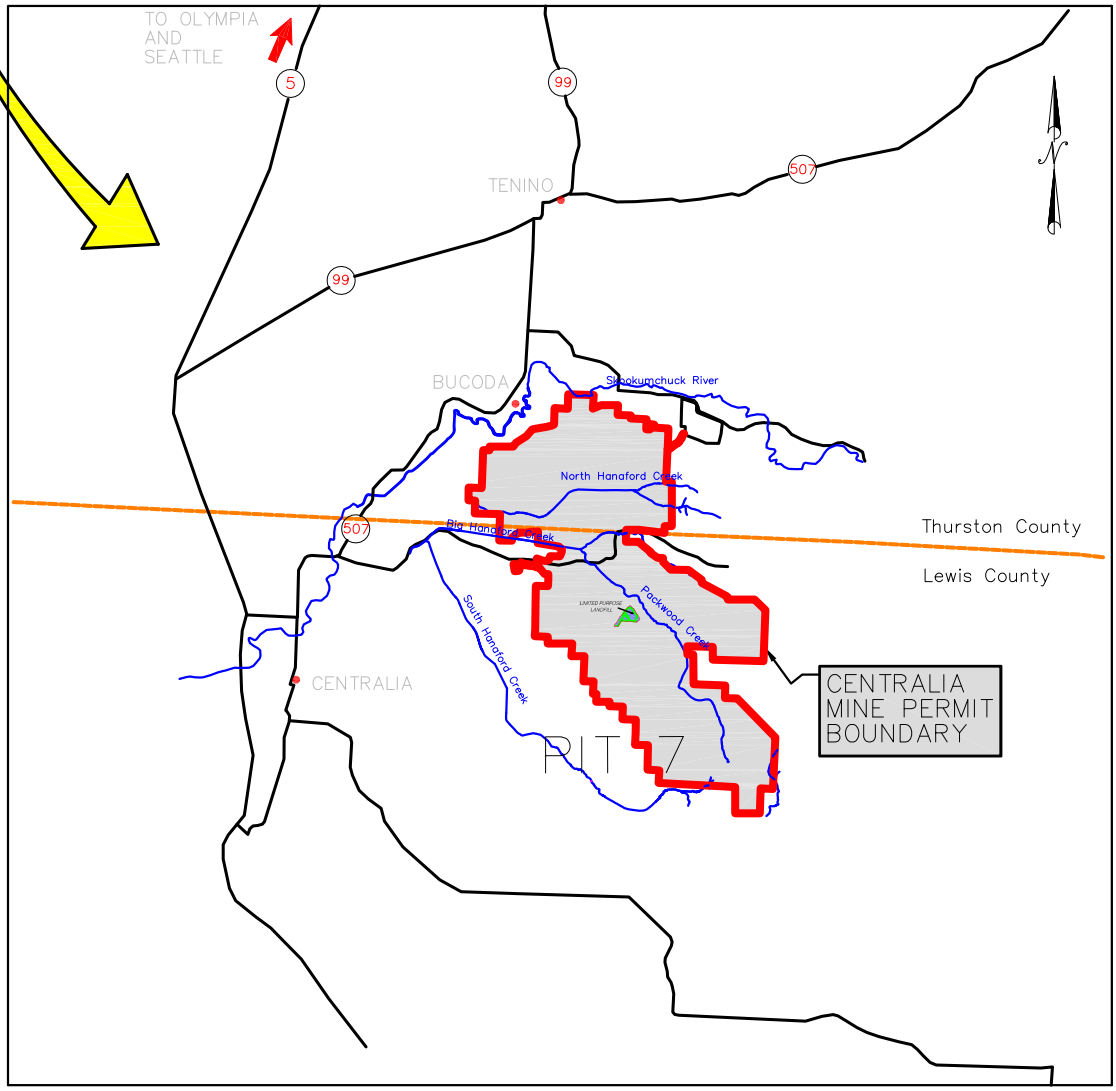
Constituent Name	Well	Slope	Mann-Kendall	Critical Value	Trend	N	Alpha
Iron (mg/L)	LPLF4 (bg)	-0.06011	-417	-158	Yes	38	0.05
pH (SIU)	LPLF3	-0.07249	-159	-158	Yes	38	0.05
Nitrate (mg/L)	LPLF2	-0.09656	-320	-158	Yes	38	0.05
Nitrate-Nitrite (mg/L)	LPLF2	-0.1007	-330	-158	Yes	38	0.05
pH (SIU)	LPLF1 (bg)	-0.1243	-70	-49	Yes	17	0.05
Nitrate (mg/L)	UnderDrain	-0.1792	-43	-37	Yes	14	0.05
Nitrate-Nitrite (mg/L)	UnderDrain	-0.1792	-43	-37	Yes	14	0.05
Nitrate (mg/L)	LPLF3	-0.2129	-290	-158	Yes	38	0.05
TOC (mg/L)	LPLF2	-0.231	-177	-158	Yes	38	0.05
Nitrate-Nitrite (mg/L)	LPLF3	-0.2333	-299	-158	Yes	38	0.05
pH (SIU)	LPLF8	-0.2913	-211	-96	Yes	27	0.05
Zinc (mg/L)	UnderDrain	-0.3333	-48	-37	Yes	14	0.05
Potassium (mg/L)	LPLF2	-0.6278	-313	-158	Yes	38	0.05
Chloride (mg/L)	LPLF1 (bg)	-1.304	-92	-49	Yes	17	0.05
Calcium (mg/L)	LPLF4 (bg)	-1.412	-275	-158	Yes	38	0.05
Chloride (mg/L)	LPLF8	-1.712	-121	-96	Yes	27	0.05
Manganese (mg/L)	LPLF8	-1.77	-126	-96	Yes	27	0.05
TOC (mg/L)	LPLF8	-2.802	-192	-96	Yes	27	0.05
Dis. Hardness (mg/L)	LPLF4 (bg)	-3.206	-237	-158	Yes	38	0.05
Sulfate (mg/L)	LPLF3	-14.78	-164	-158	Yes	38	0.05
Calcium (mg/L)	LPLF2	-19.37	-222	-158	Yes	38	0.05
Calcium (mg/L)	LPLF8	-32.9	-123	-96	Yes	27	0.05
Bicarbonate (mg/L)	LPLF5 (bg)	-96.35	-51	-45	Yes	16	0.05
Dis. Hardness (mg/L)	LPLF8	-116.3	-134	-96	Yes	27	0.05
Iron (mg/L)	LPLF8	-170.5	-186	-96	Yes	27	0.05
Sulfate (mg/L)	LPLF8	-262.6	-102	-96	Yes	27	0.05
Specific Conductance (uS/cm)	LPLF8	-352.3	-112	-96	Yes	27	0.05

NOTE:

Table 4-1 are the significant cases from Mann-Kendall trend test in Appendix C. Positive slope value indicates "increasing trend"; negative slope value indicates "decreasing trend".

Figures





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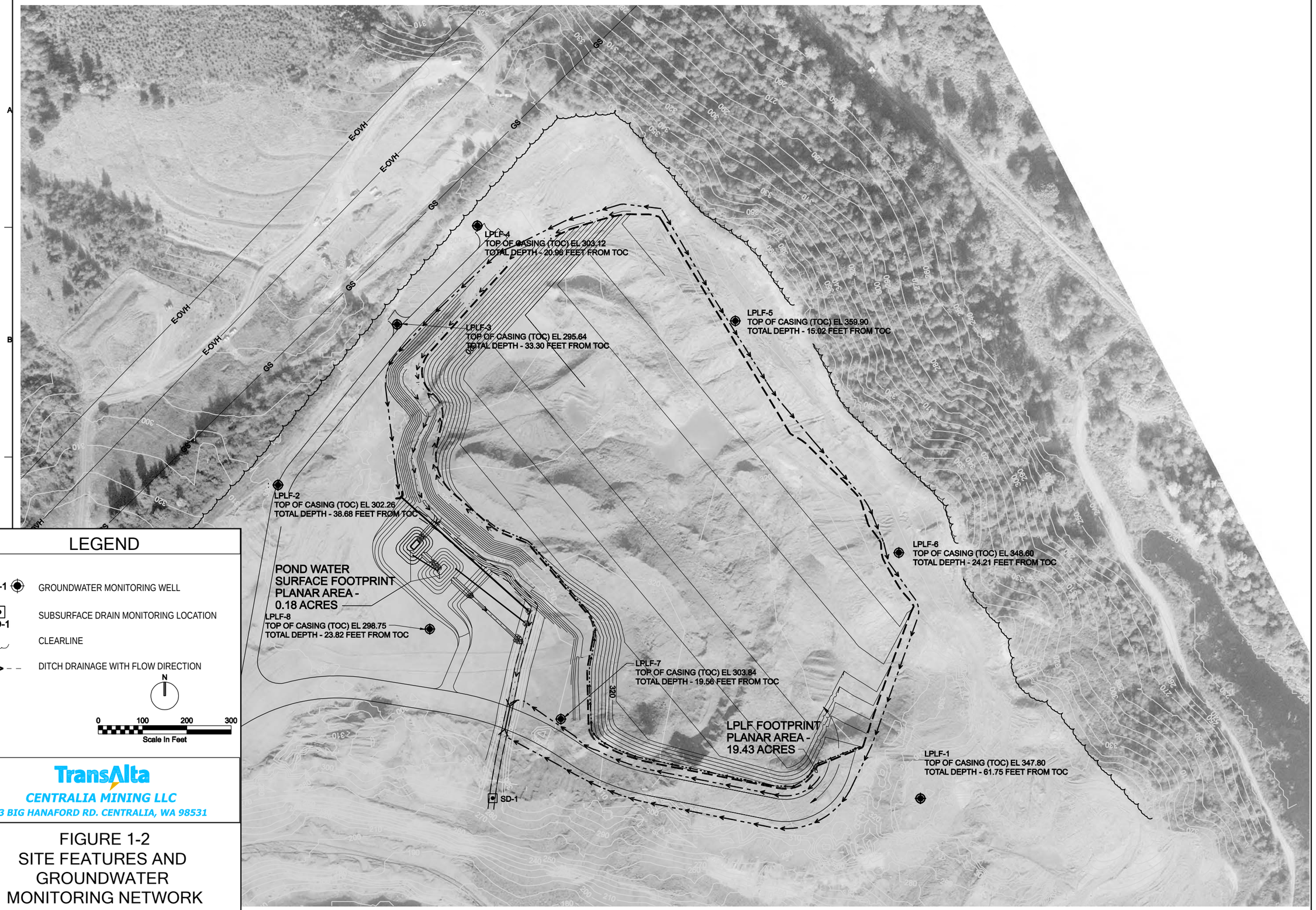
GENERAL LOCATION MAP

DATE: Jan 25, 2011	Fig 1-1 General Location Map.dwg	DRAWN BY: D.M.	REVISION
SCALE: NTS	FIGURE 1-1		



LEGEND

- LPLF-1 — GROUNDWATER MONITORING WELL
- SD-1 — SUBSURFACE DRAIN MONITORING LOCATION
- CLEARLINE
- DITCH DRAINAGE WITH FLOW DIRECTION

N

0 100 200 300

Scale In Feet

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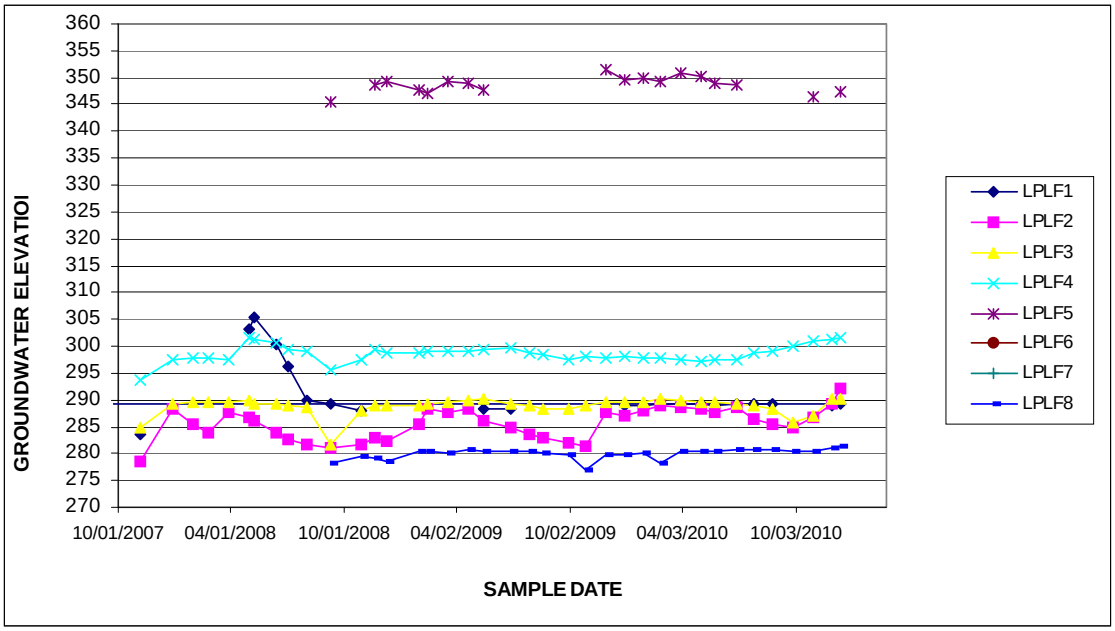
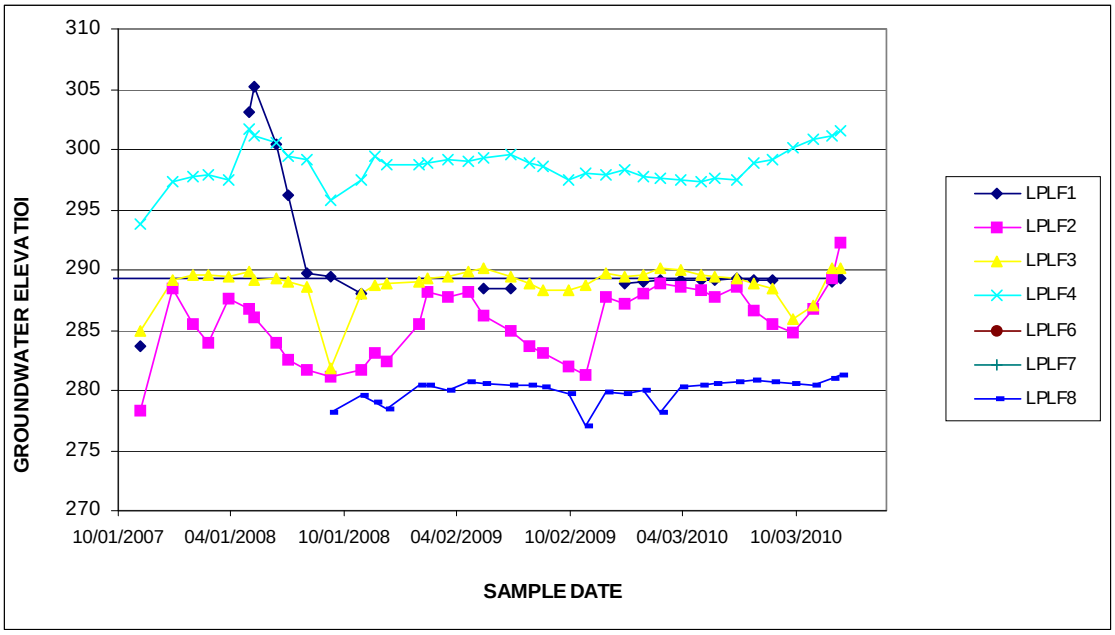
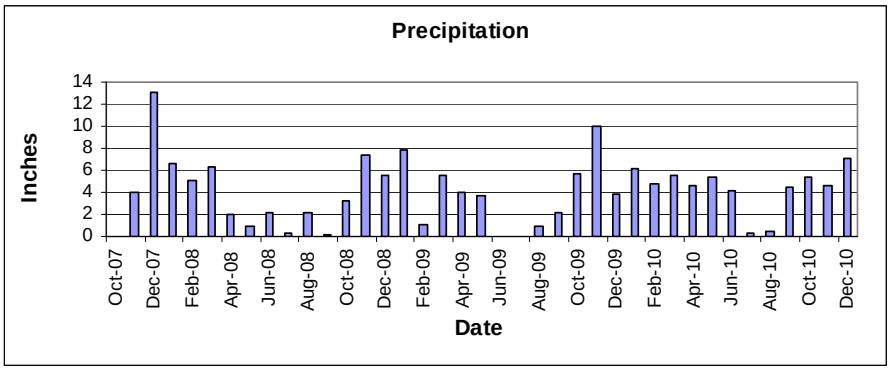
FIGURE 1-2
SITE FEATURES AND GROUNDWATER MONITORING NETWORK

DATE: February 4, 2011







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GROUNDWATER HYDROGRAPH
& PRECIPITATION

Date: February 10, 2011	fig3-1_10Feb11.dwg	Drawn By: DNM	REVISION
SCALE: As Shown	Figure 3-1		

E 1,418,500
N 522,000

E 1,420,500
N 522,000

301 ⊗ 60
LPLF 4

290 ⊗ 20
LPLF 3

347 ⊗ 27
LPLF 5

292 ⊗ 21
LPLF 2

<334 ⊗ 39
LPLF 6

278 ⊗ 43
LPLF 8

<284 ⊗ 28
LPLF 7

289 ⊗ 02
LPLF 1

340

320

300

280

0.070 ft/ft

E 1,418,500
N 521,000

NOTE: Phreatic surface based on Alluvial Wells.

LEGEND

INFERRED GROUNDWATER FLOW DIRECTION FOR UPPERMOST HYDROSTATIC GRAPHIC UNIT

320 INFERRED GROUNDWATER ELEVATION CONTOUR

NOTES:
1) CONTOUR INTERVAL 5'
2) DEPTH TO GROUNDWATER MEASURED ON 12/13/2010
3) WELLS LPLF 6 AND LPLF 7 WERE DRY AT THE TIME OF MEASUREMENT; VALUES REPRESENT LESS THAN WELL BOTTOM

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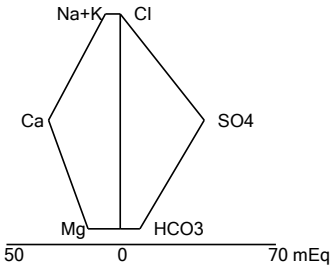
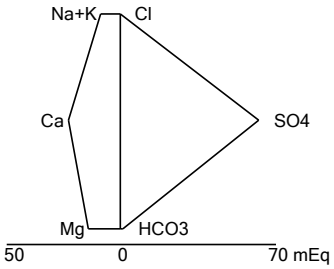
FIGURE 3-2
GROUNDWATER FLOW DIRECTION
DECEMBER 2010

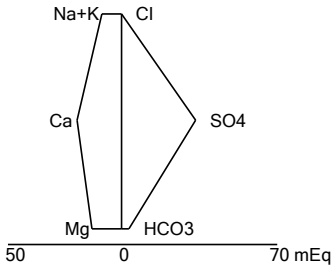
DATE: February 4, 2011	Fig 3-2 Q4 2010 groundwater flow.dwg	DRAWN BY: S.D.
SCALE: 1:150	FIGURE 3-2	



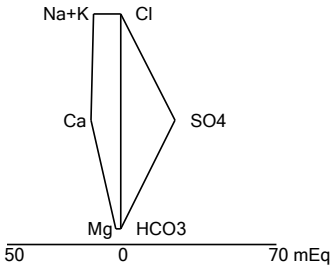
LPLF5 (bg)



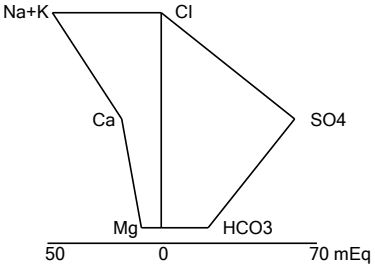
LPLF8



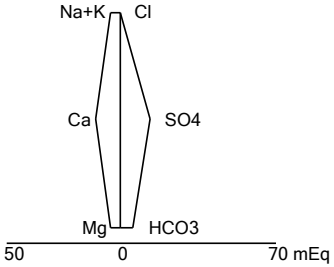
UnderDrain



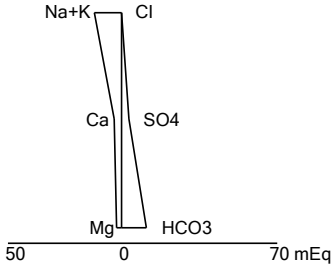
Leachate



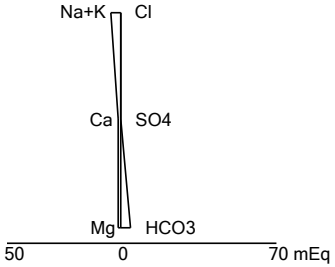
LPLF1 (bg)



LPLF2



LPLF3



LPLF4 (bg)

December 2010 Sampling Results

Source: Stiff diagrams generated in Sanitas.

TransAlta

CENTRALIA MINING LLC

913 BIG HANAFORD RD. CENTRALIA, WA 98531

FIGURE 3-3
STIFF DIAGRAM

DATE: February 4, 2011

Appendices

Appendix A

Field Data Sheets and Laboratory Analytical Data Packages

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: CPLE
2. TCM Site No: CPLF1
3. Site Type (GW.DW.SM.SW): GW
4. Data Type: Fld
5. Date: 12/13/10
6. Time (mil): 12.20
7. Collected By (Initials): MSR
8. Confidence: Good
9. Temperature (°C): 12.9
10. pH (units): 6.52
11. Cond. Field (mhos/cm): 4553
    @25°C:
12. DO (mg/l):
13.
14.
15. Chlorine (mg/l): free ___ total ___
16. General Comments: Bailed nearly dry @ 8:25
17. Weather Conditions: Sunbreak - breezy
18. Flow Conditions: None

13.2
6.56
4580

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Bailer 4.5 bails
20. Sample Source: well
21. Quantity Removed Before Sampling: _____ (gal.)
22. Static Water Level or ~~Discharge Rate~~: 55.39 (cfs) (ft.)
23. Stage: N/A (ft.)
24. Field Instruments:
25. Sample Treatment: CPLF10

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
2 White	None	250/125	P/S.
1 White	Filter, HNO3	120	
1 White	Unfilter, HNO3		
1 White	Unfiltered, H2SO4		
__ White	Filtered, Raw		
__ White	Amber/HCL		
__ Fecal Coliform	Sodium Thiosulfate		

26. Remarks:

TCG LAB ANALYSIS

WDOE ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): _____

	Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
DATE RECEIVED: ___/___/___	☐	TSS (mg/l)	___/___/___	___:___		
TIME RECEIVED: ___:___	☐	Turbidity (NTU)	___/___/___	___:___		
RECEIVED BY:	☐		___/___/___	___:___		
DATE REVIEWED: ___/___/___	☐		___/___/___	___:___		
TIME REVIEWED: ___:___	☐		___/___/___	___:___		
RECEIVED BY:	☐		___/___/___	___:___		

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: LPLF2
3. Site Type (GW.DW.SM.SW): GW
4. Data Type: Fld
5. Date: 12/13/10
6. Time (mil): 10:10
7. Collected By (Initials): MSK
8. Confidence: good
9. Temperature (°C): 11.9
10. pH (units): 6.44
11. Cond. Field (mhos/cm): 1212
    @25°C: _____
12. DO (mg/l): _____
13. _____
14. _____
15. Chlorine (mg/l): free _____ total _____
16. General Comments: _____
17. Weather Conditions: cloudy – Lt. breeze
18. Flow Conditions: None

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Low flow peristaltic (275 ml (2 min))
20. Sample Source: well
21. Quantity Removed Before Sampling: _____ (gal.)
22. Static Water Level or Discharge Rate: -6.11 (cfs) (ft.)
23. Stage: n/a (ft.)
24. Field Instruments:
25. Sample Treatment: LPLF10

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis. Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
2 White	None	250/120	P/ST.
1 White	Filter, HNO3	120	
1 White	Unfilter, HNO3		
1 White	Unfiltered, H2SO4		
__ White	Filtered, Raw		
__ White	Amber/HCL		
__ Fecal Coliform	Sodium Thiosulfate		

26. Remarks: _____

TCG
LAB ANALYSIS

WDOE
ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): _____	Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
DATE RECEIVED: ___/___/___	☐	TSS (mg/l) _____	12/15/10	11:9	6.71	1209
TIME RECEIVED: ___:___	☐	Turbidity (NTU) _____	12/10/10	11:9	6.46	1211
RECEIVED BY: _____	☐	_____	12/15/10	11.9	6.44	1212
DATE REVIEWED: ___/___/___	☐	_____	__/__/__	__:__	___	___
TIME REVIEWED: ___:___	☐	_____	__/__/__	__:__	___	___
REVEIWED BY: _____	☐	_____	__/__/__	__:__	___	___

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: LPLF3
3. Site Type (GW.DW.SM.SW): GW
4. Data Type: Field
5. Date: 12/13/10
6. Time (mil): 9:45
7. Collected By (Initials): MSR
8. Confidence: Good
9. Temperature (°C): 11.9
10. pH (units): 6.76
11. Cond. Field (mhos/cm): 1089
    @25°C:
12. DO (mg/l):
13.
14.
15. Chlorine (mg/l): free total
16. General Comments:
17. Weather Conditions: cloudy, w/brief snowflakes
18. Flow Conditions: None

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: cow flow - peristaltic
20. Sample Source: well
21. Quantity Removed Before Sampling: (gal.)
22. Static Water Level or Discharge Rate: 300 ml/2min/16 = 1.49 (cfs) (ft.)
23. Stage: N/A (ft.)
24. Field Instruments:
25. Sample Treatment: LPLF10

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
2 White	None	250/125	Plst.
1 White	Filter, HNO3	125	
1 White	Unfilter, HNO3		
1 White	Unfiltered, H2SO4		
__ White	Filtered, Raw		
__ White	Amber/HCL		
__ Fecal Coliform	Sodium Thiosulfate		

26. Remarks:

TCG LAB ANALYSIS

WDOE ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): ____

DATE RECEIVED: ____/____/____

TIME RECEIVED: 6.77 .01

RECEIVED BY: .677

DATE REVIEWED: ____/____/____

TIME REVIEWED: ____:____

REVEIWED BY: ____

Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
☐	TSS (mg/l) ____	12/15/10	11:9	6.77	1086
☐	Turbidity (NTU) ____	12/10/10	11:9	6.82	1099
☐	____	12/15/10	11:9	6.77	1092
☐	____	__/__/__	__:__	____	____
☐	____	__/__/__	__:__	____	____
☐	____	__/__/__	__:__	____	____

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: LPLF4
3. Site Type (GW.DW.SM.SW): GW
4. Data Type: Fld
5. Date: 12/13/10
6. Time (mil): 9:15
7. Collected By (Initials): MSH
8. Confidence: Good
9. Temperature (°C): 11.6
10. pH (units): 7.14
11. Cond. Field (mhos/cm): 396
    @25°C: ____
12. DO (mg/l): ____
13. ____
14. ____
15. Chlorine (mg/l): free ____ total ____
16. General Comments: ____
17. Weather Conditions: cloudy - sl. breeze Flow Conditions: None

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Low flow peristaltic Sample Source: well
21. Quantity Removed Before Sampling: ____ (gal.)
22. ~~225 mL/1.25~~ (300 mL/2 min) 21 Static Water Level or ~~Discharge Rate~~: 2.0 (cfs) (ft.) 23. Stage: n/a (ft.)
24. Field Instruments:
25. Sample Treatment: LPLF10

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH ✓	SM 4500-H+B	YSI MPS Model 556	4/10	7.0	6.90
Cond. ✓	SM 2510 B	YSI MPS Model 556	1442	1447	1447
Dis Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
2 White	None	250/120	P/ST.
1 White	Filter, HNO3	120	P
1 White	Unfilter, HNO3		
1 White	Unfiltered, H2SO4		
__ White	Filtered, Raw		
__ White	Amber/HCL		
__ Fecal Coliform	Sodium Thiosulfate		

26. Remarks: ____

TCG LAB ANALYSIS

WDOE ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): ____

DATE RECEIVED: ____/____/____

TIME RECEIVED: ____:____

RECEIVED BY: ____

DATE REVIEWED: 11.5 04 /____/____

TIME REVIEWED: 1153 :____

REVEIWED BY: ____

Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
☐	TSS (mg/l) ____	__/5/__	11:3	7.86	394
☐	Turbidity (NTU) ____	__/10/__	11:3	7.30	395
☐	____	__/15/__	11:5	7.20	396
☐	____	__/20/__	11:6	7.15	396
☐	____	__/__/__	__:__	___	____
☐	____	__/__/__	__:__	___	____

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: LPLFS
3. Site Type (GW.DW.SM.SW): GW
4. Data Type: Fld
5. Date: 12/13/10
6. Time (mil): 12:45
7. Collected By (Initials): MSC
8. Confidence: good
9. Temperature (°C): 13.8
10. pH (units): 6.42
11. Cond. Field (mhos/cm): 2814
    @25°C: _____
12. DO (mg/l): _____
13. _____
14. _____
15. Chlorine (mg/l): free _____ total _____
16. General Comments: Reset tube to Bow
17. Weather Conditions: scattered clouds · calm
18. Flow Conditions: none

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Low flow Peristaltic
20. Sample Source: well
21. Quantity Removed Before Sampling: (175 mL/min) 16 (gal.)
22. Static Water Level or Discharge Rate: 16.41 (cfs) (ft.)
23. Stage: N/A (ft.)
24. Field Instruments:
25. Sample Treatment: LPLF10

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
2 White	None	250/120	P/GA
1 White	Filter, HNO3	60	
1 White	Unfilter, HNO3		
1 White	Unfiltered, H2SO4		
__ White	Filtered, Raw		
__ White	Amber/HCL		
__ Fecal Coliform	Sodium Thiosulfate		

26. Remarks:

TCG
LAB ANALYSIS

WDOE
ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): _____

DATE RECEIVED: ____/____/____

TIME RECEIVED: ____:____

RECEIVED BY: _____

DATE REVIEWED: ____/____/____

TIME REVIEWED: ____:____

REVEIWED BY: _____

Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
☐	TSS (mg/l) _____	__/5/__	13.7	6.47	2826
☐	Turbidity (NTU) _____	__/10/__	13 8	6.46	2829
☐	_____	__/15/__	13 8	6.42	2816
☐	_____	__/__/__	__:__	____	____
☐	_____	__/__/__	__:__	____	____
☐	_____	__/__/__	__:__	____	____

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: LPLF5
3. Site Type (GW.DW.SM.SW): SW
4. Data Type: Field
5. Date: 12/13/10
6. Time (mil): 8:45
7. Collected By (Initials): MSR
8. Confidence: good
9. Temperature (°C): __.__
10. pH (units): __.__
11. Cond. Field (mhos/cm): _____
    @25°C: _____.__
12. DO (mg/l): __.__
13. _____
14. __.__
15. Chlorine (mg/l): free __.__ total __.__
16. General Comments: Need to re-vamp suction tube when parts come in
17. Weather Conditions: cloudy - light breeze
18. Flow Conditions: none

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Visual - Sounder
20. Sample Source: well
21. Quantity Removed Before Sampling: 0 (gal.)
22. Static Water Level or ~~Discharge Rate~~: 10.61 (cfs) (ft.)
23. Stage: n/A (ft.)
24. Field Instruments:
25. Sample Treatment: n/A

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis. Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
White	None		
White	Filter, HNO3		
White	Unfilter, HNO3		
White	Unfiltered, H2SO4		
White	Filtered, Raw		
White	Amber/HCL		
Fecal Coliform	Sodium Thiosulfate		

26. Remarks: measured depth @ 8.79 - Suspect water level 3 below end of tube,

TCG LAB ANALYSIS

WDOE ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): _____

	Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
DATE RECEIVED: __/__/__	☐	TSS (mg/l)	__/__/__	__:__		
TIME RECEIVED: __:__	☐	Turbidity (NTU)	__/__/__	__:__		
RECEIVED BY:	☐		__/__/__	__:__		
DATE REVIEWED: __/__/__	☐		__/__/__	__:__		
TIME REVIEWED: __:__	☐		__/__/__	__:__		
REVEIWED BY:	☐		__/__/__	__:__		

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: LPLF6
3. Site Type (GW.DW.SM.SW): GW
4. Data Type: Fld
5. Date: 12/13/19
6. Time (mil): 8:35
7. Collected By (Initials): MSIL
8. Confidence: good
9. Temperature (°C): ___.__
10. pH (units): ___.___
11. Cond. Field (mhos/cm): _____
    @25°C: _____.__
12. DO (mg/l): ___.___
13. _____
14. ___.___
15. Chlorine (mg/l): free ___.___ total ___.___
16. General Comments: Dry well.
17. Weather Conditions: cloudy - lt breeze
18. Flow Conditions: None

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Bucket sounder
20. Sample Source: well
21. Quantity Removed Before Sampling: 0 (gal.)
22. Static Water Level or Discharge Rate: 22.70 (cfs) (ft.)
23. Stage: N/A (ft.)
24. Field Instruments:
25. Sample Treatment: N/A

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis. Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
White	None		
White	Filter, HNO3		
White	Unfilter, HNO3		
White	Unfiltered, H2SO4		
White	Filtered, Raw		
White	Amber/HCL		
Fecal Coliform	Sodium Thiosulfate		

26. Remarks:

TCG LAB ANALYSIS

WDOE ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): _____

	Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
DATE RECEIVED: ___/___/___	☐	TSS (mg/l)	___/___/___	___:___	___	___
TIME RECEIVED: ___:___	☐	Turbidity (NTU)	___/___/___	___:___	___	___
RECEIVED BY: ___	☐	___	___/___/___	___:___	___	___
DATE REVIEWED: ___/___/___	☐	___	___/___/___	___:___	___	___
TIME REVIEWED: ___:___	☐	___	___/___/___	___:___	___	___
REVEIWED BY: ___	☐	___	___/___/___	___:___	___	___

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: LPLF7
3. Site Type (GW.DW.SM.SW): GW
4. Data Type: Qual
5. Date: 12/13/10
6. Time (mil): 10:15
7. Collected By (Initials): MGH
8. Confidence: Good
9. Temperature (°C): ___.__
10. pH (units): ___.___
11. Cond. Field (mhos/cm): _____
    @25°C: _____.__
12. DO (mg/l): ___.___
13. _____
14. ___.___
15. Chlorine (mg/l): free ___.___ total ___.___
16. General Comments: Dry Well
17. Weather Conditions: cloudy - calm
18. Flow Conditions: None

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Bucket - sander
20. Sample Source: well
21. Quantity Removed Before Sampling: 0 (gal.)
22. Static Water Level or Discharge Rate: -16.76 (cfs) (ft.)
23. Stage: N/A (ft.)
24. Field Instruments:
25. Sample Treatment: N/A

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis. Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
__ White	None		
__ White	Filter, HNO3		
__ White	Unfilter, HNO3		
__ White	Unfiltered, H2SO4		
__ White	Filtered, Raw		
__ White	Amber/HCL		
__ Fecal Coliform	Sodium Thiosulfate		
_____	_____		

26. Remarks:

TCG LAB ANALYSIS

WDOE ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): _____

DATE RECEIVED: ___/___/___

TIME RECEIVED: ___:___

RECEIVED BY: _____

DATE REVIEWED: ___/___/___

TIME REVIEWED: ___:___

REVEIWED BY: _____

Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
☐	TSS (mg/l) _____	___/___/___	___:___	___	_____
☐	Turbidity (NTU) _____	___/___/___	___:___	___	_____
☐	_____ ___	___/___/___	___:___	___	_____
☐	_____ ___	___/___/___	___:___	___	_____
☐	_____ ___	___/___/___	___:___	___	_____
☐	_____ ___	___/___/___	___:___	___	_____

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: LPLF8
3. Site Type (GW.DW.SM.SW): GW
4. Data Type: Fed
5. Date: 12/13/10
6. Time (mil): 12:00
7. Collected By (Initials): MYL
8. Confidence: Good
9. Temperature (°C): 13.1
10. pH (units): 5.16
11. Cond. Field (mhos/cm): 3351
    @25°C: _____
12. DO (mg/l): ___.__
13. _____
14. ___.___
15. Chlorine (mg/l): free ___.__ total ___.__
16. General Comments: _____
17. Weather Conditions: Sunbreak - Lt. drizzle
18. Flow Conditions: None

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Low flow - peristaltic
20. Sample Source: Well
21. Quantity Removed Before Sampling: (125mL/min) lb (gal.)
22. Static Water Level or ~~Discharge Rate~~: 15.69 ~~(cfs)~~ (ft.)
23. Stage: N/A (ft.)
24. Field Instruments:
25. Sample Treatment: LPLF 10
26. Remarks: _____

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
2 White	None	250/120	pl st.
1 White	Filter, HNO3	120	↓
1 White	Unfilter, HNO3	↓	
1 White	Unfiltered, H2SO4		
__ White	Filtered, Raw		
__ White	Amber/HCL		
__ Fecal Coliform	Sodium Thiosulfate		
_____	_____		

TCG
LAB ANALYSIS

WDOE
ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): _____

DATE RECEIVED: ____/____/____

TIME RECEIVED: ____:____

RECEIVED BY: _____

DATE REVIEWED: ____/____/____

TIME REVIEWED: ____:____

REVEIWED BY: _____

Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
☐	TSS (mg/l) _____	12/15/10	13:2	5.45	3333
☐	Turbidity (NTU) _____	12/15/10	13:1	5.29	3346
☐	_____	12/15/10	13:1	5.16	3351
☐	_____	__/__/__	__:__	_____	_____
☐	_____	__/__/__	__:__	_____	_____
☐	_____	__/__/__	__:__	_____	_____

TA#59 REV 6/04 WHITE - FILE CANARY - LAB

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: Leachate
3. Site Type (GW.DW.SM.SW): SW
4. Data Type: Fld
5. Date: 12/13/10
6. Time (mil): 10:40
7. Collected By (Initials): MSR
8. Confidence: good
9. Temperature (°C): 12.3
10. pH (units): 9.26
11. Cond. Field (mhos/cm): 1804
    @25°C: ___
12. DO (mg/l): ___
13. ___
14. CR6 0.50 / 0.40
15. Chlorine (mg/l): free ___ total ___
16. General Comments: ___
17. Weather Conditions: Sun break - Lt. breeze
18. Flow Conditions: mod & smooth

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: grab
20. Sample Source: ditch
21. Quantity Removed Before Sampling: Ø (gal.)
22. Static Water Level or Discharge Rate: 35.25 gpm (meter) / 31.668 (bock) (~~cfs (ft.)~~)
23. Stage: 0.31 (ft.)
24. Field Instruments:
25. Sample Treatment: LPLF10

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Dis. Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
2 White	None	250/120	plst.
1 White	Filter, HNO3	120	↓
1 White	Unfilter, HNO3	↓	
1 White	Unfiltered, H2SO4		
_ White	Filtered, Raw		
_ White	Amber/HCL		
_ Fecal Coliform	Sodium Thiosulfate		

26. Remarks: ___

TCG LAB ANALYSIS

7.44
.01
7.44

WDOE ACCREDITATION NO. 1025

	Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
FREQUENCY (D, W, Q, C, M, P):						
DATE RECEIVED: __/__/__	☐ TSS (mg/l)		__/__/__	__:__		
TIME RECEIVED: 7.44 / 8.4 @ LPLF ✓	☐ Turbidity (NTU)		__/__/__	__:__		
RECEIVED BY: .7 / 8.14	☐		__/__/__	__:__		
DATE REVIEWED: 8.44 8.44 @ B1	☐ dh		__/__/__	__:__		
TIME REVIEWED: __:__	☐		__/__/__	__:__		
REVEIWED BY: 8.14	☐		__/__/__	__:__		

TA#59 REV 6/04 01 WHITE - FILE CANARY - LAB

TransAlta

FIELD WATER QUALITY SAMPLING AND ANALYSIS

SITE DATA/FIELD DETERMINATIONS

1. Project: LPLF
2. TCM Site No: UD
3. Site Type (GW.DW.SM.SW): SW
4. Data Type: Fld
5. Date: 12/13/10
6. Time (mil): 10:30
7. Collected By (Initials): MS/4
8. Confidence: good
9. Temperature (°C): 10.0
10. pH (units): 6.08
11. Cond. Field (mhos/cm): 2164
    @25°C: ____.__
12. DO (mg/l): __.__
13. ____.__
14. __.__
15. Chlorine (mg/l): free __.__ total __.__
16. General Comments: _____
17. Weather Conditions: Sunbreak - Ltbreeze 18. Flow Conditions: low to mod smooth

SITE CONDITIONS / SAMPLE HANDLING

19. Sampling Method: Grab
20. Sample Source: drain
21. Quantity Removed Before Sampling: 0 (gal.)
22. Static Water Level or Discharge Rate: N/A (cfs) (ft.)
23. Stage: N/A (ft.)
24. Field Instruments:
25. Sample Treatment: LPLF10

FIELD TEST	METHOD NUMBER	INSTRUMENT	CALIBRATION	STANDARD actual	STANDARD as measured
Temp.	SM 2550	YSI MPS Model 556			
pH	SM 4500-H+B	YSI MPS Model 556			
Cond.	SM 2510 B	YSI MPS Model 556			
Ds Ox.	SM 4500-O-G	YSI MPS Model 556			
Alkalinity	SM 2320 B	HACH Digital Titrator	N/A		
Salinity	SM2520 B	YSI MPS Model 556			
Chlorine	SM 4500-CL G	HACH DPD	N/A		

TYPE	TREATMENT	QUANTITY	CONTAINER TYPE
2 White	None	250/120	P/T.
1 White	Filter, HNO3	120	P
1 White	Unfilter, HNO3	"	"
1 White	Unfiltered, H2SO4	"	"
__ White	Filtered, Raw		
__ White	Amber/HCL		
__ Fecal Coliform	Sodium Thiosulfate		

26. Remarks: _____

TCG LAB ANALYSIS

WDOE ACCREDITATION NO. 1025

FREQUENCY (D, W, Q, C, M, P): ____

	Analysis to be performed	Results	Date Analyzed	Time Analyzed	Analyzed By	Duplicate Valves
DATE RECEIVED: __/__/__	☐	TSS (mg/l)	__/__/__	__:__		
TIME RECEIVED: __:__	☐	Turbidity (NTU)	__/__/__	__:__		
RECEIVED BY:	☐		__/__/__	__:__		
DATE REVIEWED: __/__/__	☐		__/__/__	__:__		
TIME REVIEWED: __:__	☐		__/__/__	__:__		
REVEIWED BY:	☐		__/__/__	__:__		

Maxxam

Success Through Science®

Your P.O. #: 4700030233 LINE50
Your Project #: LPLF 10 LF1210
Site: TCM
Your C.O.C. #: 11886801, 118868-01-01

Attention: Scott Keating
TRANSALTA CENTRALIA MINING LLC
TRANSALT-CEN
913 BIG HANAFORD ROAD
Centralia, WA
USA 98531

Report Date: 2010/12/22

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B0C1615
Received: 2010/12/15, 10:55

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity - Water	8	2010/12/15	2010/12/16	BBY6SOP-00026	Based on SM2320B
Chloride by Automated Colourimetry	8	N/A	2010/12/16	BBY6SOP-00011	Based on EPA 325.2
Fluoride - Mining Clients	8	N/A	2010/12/16	BBY6SOP-00038	Based SM - 4500 F C
Hardness Total (calculated as CaCO3)	2	N/A	2010/12/21		
Hardness Total (calculated as CaCO3)	6	N/A	2010/12/22		
Hardness (calculated as CaCO3)	8	N/A	2010/12/20		
Mercury (Total) by CVAF	2	2010/12/22	2010/12/22	65-A-002-10	EPA 245.7
Ion Balance	8	N/A	2010/12/20	Calc	
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	8	N/A	2010/12/20	BBY7SOP-00002	Based on EPA 200.8
Elements by CRC ICPMS (dissolved)	8	N/A	2010/12/17	BBY7SOP-00002	Based on EPA 200.8
Na, K, Ca, Mg, S by CRC ICPMS (total)	2	2010/12/15	2010/12/21	BBY7SOP-00002	Based on EPA 200.8
Na, K, Ca, Mg, S by CRC ICPMS (total)	6	2010/12/15	2010/12/22	BBY7SOP-00002	Based on EPA 200.8
Elements by CRC ICPMS (total)	8	2010/12/18	2010/12/21	BBY7SOP-00002	Based on EPA 200.8
Ammonia-N	7	N/A	2010/12/16	BBY6SOP-00044	Based on EPA 350.1
Ammonia-N	1	N/A	2010/12/17	BBY6SOP-00044	Based on EPA 350.1
Nitrate + Nitrite (N)	7	N/A	2010/12/16	BBY6SOP-00010	Based on USEPA 353.2
Nitrate + Nitrite (N)	1	N/A	2010/12/17	BBY6SOP-00010	Based on USEPA 353.2
Nitrite (N) by CFA	8	N/A	2010/12/16	BBY6SOP-00010	EPA 353.2
Nitrogen - Nitrate (as N)	7	N/A	2010/12/17	BBY6SOP-00010	Based on EPA 353.2
Nitrogen - Nitrate (as N)	1	N/A	2010/12/20	BBY6SOP-00010	Based on EPA 353.2
Filter and HNO3 Preserve for Metals	8	N/A	2010/12/15	BRN WI-00006 R1.0	Based on EPA 200.2
Sulphite by IC (1)	1	N/A	2010/12/16	CAL SOP-00071	SM 4110-B
Sulphite by IC (1)	7	N/A	2010/12/17	CAL SOP-00071	SM 4110-B
Sulphate by Automated Colourimetry	4	N/A	2010/12/16	BBY6SOP-00017	Based on EPA 375.4
Sulphate by Automated Colourimetry	3	N/A	2010/12/17	BBY6SOP-00017	Based on EPA 375.4
Sulphate by Automated Colourimetry	1	N/A	2010/12/22	BBY6SOP-00017	Based on EPA 375.4
Total Dissolved Solids (Filt. Residue)	8	N/A	2010/12/16	BBY6SOP-00033	SM 2540C
Carbon (Total Organic)	8	N/A	2010/12/16	BBY6SOP-00003	Based on SM-5310C
Field pH	8	N/A	2010/12/16		
Field Temperature	8	N/A	2010/12/15		
Field Conductivity	8	N/A	2010/12/16		

* Results relate only to the items tested.

(1) This test was performed by Maxxam Calgary Environmental

../2

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

NAMITA SAHNI, BBY Customer Service
Email: NSahni@maxxam.ca
Phone# (604) 639-2614

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		Z05009			Z05010		Z05011			Z05012		
Sampling Date		2010/12/13 12:20			2010/12/13 10:10		2010/12/13 09:45			2010/12/13 09:15		
	Units	**LPLF1**	**RDL**	**QC Batch**	**LPLF2**	**RDL**	**LPLF3**	**RDL**	**QC Batch**	**LPLF4**	**RDL**	**QC Batch**
Misc. Inorganics												
Fluoride (F)	mg/L	0.12	0.01	4509400	0.05	0.01	0.09	0.01	4509400	0.24	0.01	4509400
Field-Vancouver												
Field Conductivity	uS/cm	4600	0.1	ONSITE	1200	0.1	1100	0.1	ONSITE	400	0.1	ONSITE
Field pH	pH Units	6.5	0.1	ONSITE	6.4	0.1	6.8	0.1	ONSITE	7.1	0.1	ONSITE
Field Temperature	°C	12.9	N/A	ONSITE	11.9	N/A	11.9	N/A	ONSITE	11.6	N/A	ONSITE
ANIONS												
Nitrite (N)	mg/L	0.055	0.005	4512347	<0.005	0.005	<0.005	0.005	4512347	<0.005	0.005	4512347
Calculated Parameters												
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE	FIELD	N/A	FIELD	N/A	ONSITE	FIELD	N/A	ONSITE
Total Hardness (CaCO3)	mg/L	1300	0.5	4505547	722	0.5	202	0.5	4505547	59.5	0.5	4505547
Ion Balance	N/A	0.90	0.01	4507665	0.92	0.01	1.0	0.01	4507665	0.96	0.01	4507665
Nitrate (N)	mg/L	3.46	0.04	4505971	<0.02	0.02	<0.02	0.02	4505971	0.20	0.02	4505971
Misc. Inorganics												
Dissolved Hardness (CaCO3)	mg/L	1300	0.5	4505239	714	0.5	201	0.5	4505239	56.3	0.5	4505239
Total Organic Carbon (C)	mg/L	4.5	0.5	4512104	<0.5	0.5	2.0	0.5	4512104	1.6	0.5	4512104
Bicarbonate (HCO3)	mg/L	1300	0.5	4508843	400	0.5	720	0.5	4508843	300	0.5	4508843
Carbonate (CO3)	mg/L	<0.5	0.5	4508843	<0.5	0.5	<0.5	0.5	4508843	<0.5	0.5	4508843
Anions												
Dissolved Sulphate (SO4)	mg/L	2900	50	4516557	660	5	180	0.5	4516557	26	0.5	4512601
Dissolved Sulphite (SO3)	mg/L	<30(1)	30	4513355	<5(1)	5	<3(1)	3	4513355	<0.5(2)	0.5	4513355
Dissolved Chloride (Cl)	mg/L	7.4	0.5	4512599	4.0	0.5	6.3	0.5	4512599	3.9	0.5	4512599
Nutrients												
Ammonia (N)	mg/L	0.42	0.005	4509619	0.77	0.01	0.80	0.01	4509619	0.10	0.005	4509619
Nitrate plus Nitrite (N)	mg/L	3.51	0.04	4514743	<0.02	0.02	<0.02	0.02	4512300	0.20	0.02	4512300
Physical Properties												
Total Dissolved Solids	mg/L	4200	10	4510064	1200	10	880	10	4510064	310	10	4510064

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Sample was precreened by ion chromatography. Sulfite was not detected.
Sample was past hold time when received.
Detection limits raised due to matrix interference.
(2) - Sample was precreened by ion chromatography. Sulfite was not detected.
Sample was past hold time when received.

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		Z05013			Z05014			Z05015		Z05016		
Sampling Date		2010/12/13 12:45			2010/12/13 12:00			2010/12/13 10:40		2010/12/13 10:30		
	Units	**LPLF5**	**RDL**	**QC Batch**	**LPLF8**	**RDL**	**QC Batch**	**LEACHATE**	**RDL**	**UD**	**RDL**	**QC Batch**
Misc. Inorganics												
Fluoride (F)	mg/L	0.21	0.01	4509400	0.12	0.05	4509400	0.84	0.01	0.15	0.01	4509400
Field-Vancouver												
Field Conductivity	uS/cm	2800	0.1	ONSITE	3400	0.1	ONSITE	1800	0.1	2200	0.1	ONSITE
Field pH	pH Units	6.4	0.1	ONSITE	5.2	0.1	ONSITE	9.3	0.1	6.1	0.1	ONSITE
Field Temperature	°C	13.8	N/A	ONSITE	13.1	N/A	ONSITE	12.3	N/A	10.0	N/A	ONSITE
ANIONS												
Nitrite (N)	mg/L	<0.005	0.005	4512347	0.033	0.005	4512347	0.120	0.005	<0.005	0.005	4512347
Calculated Parameters												
Filter and HNO3 Preservation	N/A	FIELD	N/A	ONSITE	FIELD	N/A	ONSITE	FIELD	N/A	FIELD	N/A	ONSITE
Total Hardness (CaCO3)	mg/L	2250	0.5	4505547	1950	0.5	4505547	770	0.5	1670	0.5	4505547
Ion Balance	N/A	1.1	0.01	4507665	0.98	0.01	4507665	1.0	0.01	1.1	0.01	4507665
Nitrate (N)	mg/L	0.04	0.02	4505971	<0.02	0.02	4505971	1.29	0.02	<0.02	0.02	4505971
Misc. Inorganics												
Dissolved Hardness (CaCO3)	mg/L	2230	0.5	4505239	1810	0.5	4505239	707	0.5	1570	0.5	4505239
Total Organic Carbon (C)	mg/L	1.1	0.5	4512104	3.3	0.5	4512104	13.6	0.5	3.8	0.5	4512104
Bicarbonate (HCO3)	mg/L	540	0.5	4508843	120	0.5	4508843	45	0.5	230	0.5	4508843
Carbonate (CO3)	mg/L	<0.5	0.5	4508843	<0.5	0.5	4508843	10	0.5	<0.5	0.5	4508843
Anions												
Dissolved Sulphate (SO4)	mg/L	1800	5	4512601	3000	50	4527046	1200	5	1600	5	4512601
Dissolved Sulphite (SO3)	mg/L	<30(1)	30	4513355	<30(1)	30	4513355	<10(1)	10	<30(1)	30	4513355
Dissolved Chloride (Cl)	mg/L	7.4	0.5	4512599	11	0.5	4512599	18	0.5	9.7	0.5	4512599
Nutrients												
Ammonia (N)	mg/L	0.27	0.005	4509619	5.3	0.1	4513468	0.68(2)	0.05	1.1	0.03	4509619
Nitrate plus Nitrite (N)	mg/L	0.04	0.02	4512300	0.05	0.02	4512300	1.41	0.02	<0.02	0.02	4512300
Physical Properties												
Total Dissolved Solids	mg/L	3400	10	4510064	3900	10	4510064	1900	10	2800	10	4510064

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Sample was precreened by ion chromatography. Sulfite was not detected.
Sample was past hold time when received.
Detection limits raised due to matrix interference.
(2) - RDL raised due to sample matrix interference.

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		Z05009		Z05010		Z05011		Z05012			Z05013		
Sampling Date		2010/12/13 12:20		2010/12/13 10:10		2010/12/13 09:45		2010/12/13 09:15			2010/12/13 12:45		
	Units	**LPLF1**	**RDL**	**LPLF2**	**QC Batch**	**LPLF3**	**QC Batch**	**LPLF4**	**RDL**	**QC Batch**	**LPLF5**	**RDL**	**QC Batch**
Elements													
Total Mercury (Hg)	ug/L	<0.08	0.08	<0.02	4516786	0.03	4516790	<0.02	0.02	4526222	0.06	0.04	4516790
Dissolved Metals by ICPMS													
Dissolved Arsenic (As)	ug/L	<0.4	0.4	0.2	4511238	0.2	4511238	0.3	0.1	4511238	0.3	0.2	4511238
Dissolved Barium (Ba)	ug/L	20	4	43	4511238	117	4511238	76	1	4511238	28	2	4511238
Dissolved Boron (B)	ug/L	822	200	157	4511238	264	4511238	298	50	4511238	194	100	4511238
Dissolved Cadmium (Cd)	ug/L	0.38	0.04	0.04	4511238	0.06	4511238	0.02	0.01	4511238	0.50	0.02	4511238
Dissolved Chromium (Cr)	ug/L	<4	4	<1	4511238	<1	4511238	<1	1	4511238	<2	2	4511238
Dissolved Iron (Fe)	ug/L	4370	20	3170	4511238	197	4511238	37	5	4511238	280	10	4511238
Dissolved Lead (Pb)	ug/L	<0.8	0.8	<0.2	4511238	<0.2	4511238	<0.2	0.2	4511238	<0.4	0.4	4511238
Dissolved Manganese (Mn)	ug/L	451	4	1010	4511238	864	4511238	52	1	4511238	5090	2	4511238
Dissolved Mercury (Hg)	ug/L	<0.08	0.08	<0.02	4511238	<0.02	4511238	<0.02	0.02	4511238	<0.04	0.04	4511238
Dissolved Selenium (Se)	ug/L	<0.4	0.4	<0.1	4511238	<0.1	4511238	<0.1	0.1	4511238	<0.2	0.2	4511238
Dissolved Silver (Ag)	ug/L	<0.08	0.08	<0.02	4511238	<0.02	4511238	<0.02	0.02	4511238	<0.04	0.04	4511238
Dissolved Zinc (Zn)	ug/L	37	20	6	4511238	<5	4511238	<5	5	4511238	98	10	4511238
Dissolved Calcium (Ca)	mg/L	352	0.2	206	4505240	54.8	4505240	13.2	0.05	4505240	623	0.1	4505240
Dissolved Magnesium (Mg)	mg/L	102	0.2	48.3	4505240	15.5	4505240	5.68	0.05	4505240	163	0.1	4505240
Dissolved Potassium (K)	mg/L	17.8	0.2	5.12	4505240	4.79	4505240	1.75	0.05	4505240	8.1	0.1	4505240
Dissolved Sodium (Na)	mg/L	1090	0.2	96.0	4505240	261	4505240	96.9	0.05	4505240	124	0.1	4505240

RDL = Reportable Detection Limit

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		Z05009		Z05010		Z05011		Z05012			Z05013		
Sampling Date		2010/12/13 12:20		2010/12/13 10:10		2010/12/13 09:45		2010/12/13 09:15			2010/12/13 12:45		
	Units	**LPLF1**	**RDL**	**LPLF2**	**QC Batch**	**LPLF3**	**QC Batch**	**LPLF4**	**RDL**	**QC Batch**	**LPLF5**	**RDL**	**QC Batch**
Total Metals by ICPMS													
Total Arsenic (As)	ug/L	2.8	0.4	0.2	4516786	<0.1	4516790	<0.1	0.1	4516790	<0.2	0.2	4516790
Total Barium (Ba)	ug/L	90	4	42	4516786	116	4516790	76	1	4516790	29	2	4516790
Total Boron (B)	ug/L	727	200	149	4516786	266	4516790	306	50	4516790	214	100	4516790
Total Cadmium (Cd)	ug/L	0.48	0.04	0.03	4516786	0.07(1)	4516790	0.05	0.01	4516790	0.61	0.02	4516790
Total Chromium (Cr)	ug/L	42	4	<1	4516786	<1	4516790	<1	1	4516790	<2	2	4516790
Total Iron (Fe)	ug/L	14100	20	3220	4516786	206	4516790	63	5	4516790	556	10	4516790
Total Lead (Pb)	ug/L	5.6	0.8	<0.2	4516786	<0.2	4516790	<0.2	0.2	4516790	<0.4	0.4	4516790
Total Manganese (Mn)	ug/L	498	4	1050	4516786	891	4516790	75	1	4516790	5230	2	4516790
Total Selenium (Se)	ug/L	<0.4	0.4	<0.1	4516786	<0.1	4516790	<0.1	0.1	4516790	<0.2	0.2	4516790
Total Silver (Ag)	ug/L	<0.08	0.08	<0.02	4516786	<0.02	4516790	<0.02	0.02	4516790	<0.04	0.04	4516790
Total Zinc (Zn)	ug/L	52	20	<5	4516786	<5	4516790	<5	5	4516790	97	10	4516790
Total Calcium (Ca)	mg/L	351	0.2	207	4505548	54.7	4505548	13.8	0.05	4505548	627	0.1	4505548
Total Magnesium (Mg)	mg/L	102	0.2	50.1	4505548	15.8	4505548	6.07	0.05	4505548	167	0.1	4505548
Total Magnesium (Mg)	ug/L	102000	200	50100	4516786	15800	4516790	6070	50	4516790	167000	100	4516790
Total Potassium (K)	mg/L	18.3	0.2	5.13	4505548	4.73	4505548	1.79	0.05	4505548	8.2	0.1	4505548
Total Potassium (K)	ug/L	18300	200	5130	4516786	4730	4516790	1790	50	4516790	8190	100	4516790
Total Sodium (Na)	mg/L	1080	0.2	100	4505548	277	4505548	109	0.05	4505548	137	0.1	4505548
Total Sulphur (S)	mg/L	915	10	213	4505548	67	4505548	11	3	4505548	732	6	4505548

RDL = Reportable Detection Limit
(1) - Duplicate RPD above control limit - (10% of analytes failure allowed)

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		Z05014			Z05015		Z05016		
Sampling Date		2010/12/13 12:00			2010/12/13 10:40		2010/12/13 10:30		
	Units	**LPLF8**	**RDL**	**QC Batch**	**LEACHATE**	**QC Batch**	**UD**	**RDL**	**QC Batch**
Elements									
Total Mercury (Hg)	ug/L	<0.08	0.08	4516790	<0.02	4526222	0.04	0.02	4516790
Dissolved Metals by ICPMS									
Dissolved Arsenic (As)	ug/L	9.2	0.2	4511238	2.1	4511238	0.6	0.1	4511238
Dissolved Barium (Ba)	ug/L	15	2	4511238	132	4511238	25	1	4511238
Dissolved Boron (B)	ug/L	928	100	4511238	2540	4511238	742	50	4511238
Dissolved Cadmium (Cd)	ug/L	0.22	0.02	4511238	0.15	4511238	0.53	0.01	4511238
Dissolved Chromium (Cr)	ug/L	<2	2	4511238	29	4511238	<1	1	4511238
Dissolved Iron (Fe)	ug/L	487000	10	4511238	141(1)	4511238	12800	5	4511238
Dissolved Lead (Pb)	ug/L	<0.4	0.4	4511238	<0.2	4511238	<0.2	0.2	4511238
Dissolved Manganese (Mn)	ug/L	10100	2	4511238	220(1)	4511238	9640	1	4511238
Dissolved Mercury (Hg)	ug/L	<0.04	0.04	4511238	<0.02	4511238	<0.02	0.02	4511238
Dissolved Selenium (Se)	ug/L	<0.2	0.2	4511238	17.8	4511238	0.2	0.1	4511238
Dissolved Silver (Ag)	ug/L	<0.04	0.04	4511238	<0.02	4511238	<0.02	0.02	4511238
Dissolved Zinc (Zn)	ug/L	570	10	4511238	<5	4511238	204	5	4511238
Dissolved Calcium (Ca)	mg/L	448	0.1	4505240	249	4505240	383	0.05	4505240
Dissolved Magnesium (Mg)	mg/L	169	0.1	4505240	20.4	4505240	149	0.05	4505240
Dissolved Potassium (K)	mg/L	12.7	0.1	4505240	45.4	4505240	13.7	0.05	4505240
Dissolved Sodium (Na)	mg/L	181	0.1	4505240	246	4505240	170	0.05	4505240

RDL = Reportable Detection Limit
(1) - Dissolved greater than total. Reanalysis yields similar results

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		Z05014			Z05015		Z05016		
Sampling Date		2010/12/13 12:00			2010/12/13 10:40		2010/12/13 10:30		
	Units	**LPLF8**	**RDL**	**QC Batch**	**LEACHATE**	**QC Batch**	**UD**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Arsenic (As)	ug/L	10.3	0.4	4516790	2.2	4516790	0.5	0.1	4516790
Total Barium (Ba)	ug/L	18	4	4516790	143	4516790	24	1	4516790
Total Boron (B)	ug/L	923	200	4516790	2900	4516790	769	50	4516790
Total Cadmium (Cd)	ug/L	0.28	0.04	4516790	0.09	4516790	0.46	0.01	4516790
Total Chromium (Cr)	ug/L	<4	4	4516790	36	4516790	<1	1	4516790
Total Iron (Fe)	ug/L	545000	20	4516790	40	4516790	14100	5	4516790
Total Lead (Pb)	ug/L	<0.8	0.8	4516790	<0.2	4516790	<0.2	0.2	4516790
Total Manganese (Mn)	ug/L	11000	4	4516790	20	4516790	10700	1	4516790
Total Selenium (Se)	ug/L	<0.4	0.4	4516790	18.4	4516790	0.1	0.1	4516790
Total Silver (Ag)	ug/L	<0.08	0.08	4516790	<0.02	4516790	<0.02	0.02	4516790
Total Zinc (Zn)	ug/L	625	20	4516790	<5	4516790	203	5	4516790
Total Calcium (Ca)	mg/L	483	0.2	4505548	274	4505548	401	0.05	4505548
Total Magnesium (Mg)	mg/L	180	0.2	4505548	20.6	4505548	162	0.05	4505548
Total Magnesium (Mg)	ug/L	180000	200	4516790	20600	4516790	162000	50	4516790
Total Potassium (K)	mg/L	13.5	0.2	4505548	51.3	4505548	15.0	0.05	4505548
Total Potassium (K)	ug/L	13500	200	4516790	51300	4516790	15000	50	4516790
Total Sodium (Na)	mg/L	205	0.2	4505548	294	4505548	198	0.05	4505548
Total Sulphur (S)	mg/L	1100	10	4505548	473	4505548	669	3	4505548

RDL = Reportable Detection Limit

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

Package 1	3.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

RESULTS OF CHEMICAL ANALYSES OF WATER Comments

Sample Z05014-01 Fluoride - Mining Clients: Detection limits raised due to insufficient sample volume.

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER) Comments

Sample Z05009-04 Elements by CRC ICPMS (dissolved): RDL raised due to sample matrix interference.

Sample Z05013-04 Elements by CRC ICPMS (dissolved): RDL raised due to sample matrix interference.

Sample Z05014-04 Elements by CRC ICPMS (dissolved): RDL raised due to sample matrix interference.

Sample Z05009-03 Elements by CRC ICPMS (total): RDL raised due to sample matrix interference.

Sample Z05013-03 Elements by CRC ICPMS (total): RDL raised due to sample matrix interference.

Sample Z05014-03 Elements by CRC ICPMS (total): RDL raised due to sample matrix interference.

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
4508843	Bicarbonate (HCO3)	2010/12/16					<0.5	mg/L	1.0	20
4508843	Carbonate (CO3)	2010/12/16					<0.5	mg/L	2.3	20
4509400	Fluoride (F)	2010/12/16	101	80 - 120	97	80 - 120	<0.01	mg/L	0.5	20
4509619	Ammonia (N)	2010/12/16	NC	80 - 120	96	80 - 120	<0.005	mg/L	2.4	20
4510064	Total Dissolved Solids	2010/12/16	108	80 - 120	98	80 - 120	<10	mg/L	NC	20
4511238	Dissolved Arsenic (As)	2010/12/17	105	80 - 120	100	80 - 120	<0.1	ug/L	NC	20
4511238	Dissolved Cadmium (Cd)	2010/12/17	108	80 - 120	100	80 - 120	<0.01	ug/L	NC	20
4511238	Dissolved Chromium (Cr)	2010/12/17	100	80 - 120	98	80 - 120	<1	ug/L	NC	20
4511238	Dissolved Lead (Pb)	2010/12/17	103	80 - 120	102	80 - 120	<0.2	ug/L	NC	20
4511238	Dissolved Selenium (Se)	2010/12/17	108	80 - 120	102	80 - 120	<0.1	ug/L	NC	20
4511238	Dissolved Zinc (Zn)	2010/12/17	105	80 - 120	97	80 - 120	<5	ug/L	NC	20
4511238	Dissolved Barium (Ba)	2010/12/17					<1	ug/L	1.0	20
4511238	Dissolved Boron (B)	2010/12/17					<50	ug/L		
4511238	Dissolved Iron (Fe)	2010/12/17					<5	ug/L	0.4	20
4511238	Dissolved Manganese (Mn)	2010/12/17					<1	ug/L	1.5	20
4511238	Dissolved Mercury (Hg)	2010/12/17					<0.02	ug/L	NC	20
4511238	Dissolved Silver (Ag)	2010/12/17					<0.02	ug/L	NC	20
4512104	Total Organic Carbon (C)	2010/12/16	NC	80 - 120	103	80 - 120	<0.5	mg/L	14.7	20
4512300	Nitrate plus Nitrite (N)	2010/12/16	99	80 - 120	104	80 - 120	<0.02	mg/L	0.9(1)	25
4512347	Nitrite (N)	2010/12/16	106	80 - 120	101	80 - 120	<0.005	mg/L	NC	20
4512599	Dissolved Chloride (Cl)	2010/12/16	NC	80 - 120	109	80 - 120	<0.5	mg/L	NC	20
4512601	Dissolved Sulphate (SO4)	2010/12/16	NC	80 - 120	100	80 - 120	0.8, RDL=0.5	mg/L	NC	20
4513468	Ammonia (N)	2010/12/17	NC	80 - 120	87	80 - 120	<0.005	mg/L	0.9	20
4514743	Nitrate plus Nitrite (N)	2010/12/17	94	80 - 120	100	80 - 120	<0.02	mg/L	NC	25
4516557	Dissolved Sulphate (SO4)	2010/12/17	NC	80 - 120	93	80 - 120	<0.5	mg/L	3.7	20
4516786	Total Arsenic (As)	2010/12/21	102	80 - 120	100	80 - 120	<0.1	ug/L	NC	20
4516786	Total Cadmium (Cd)	2010/12/21	105	80 - 120	100	80 - 120	<0.01	ug/L	NC	20
4516786	Total Chromium (Cr)	2010/12/21	103	80 - 120	99	80 - 120	<1	ug/L	NC	20
4516786	Total Lead (Pb)	2010/12/21	107	80 - 120	104	80 - 120	<0.2	ug/L	NC	20
4516786	Total Selenium (Se)	2010/12/21	103	80 - 120	102	80 - 120	<0.1	ug/L	NC	20
4516786	Total Zinc (Zn)	2010/12/21	112	80 - 120	105	80 - 120	<5	ug/L	NC	20
4516786	Total Barium (Ba)	2010/12/21					<1	ug/L	3.0	20
4516786	Total Boron (B)	2010/12/21					<50	ug/L	NC	20
4516786	Total Iron (Fe)	2010/12/21					<5	ug/L	3.6	20
4516786	Total Manganese (Mn)	2010/12/21					<1	ug/L	2.0	20
4516786	Total Mercury (Hg)	2010/12/21					<0.02	ug/L	NC	20
4516786	Total Silver (Ag)	2010/12/21					<0.02	ug/L	NC	20
4516786	Total Magnesium (Mg)	2010/12/21					<50	ug/L		
4516786	Total Potassium (K)	2010/12/21					<50	ug/L		

Maxxam Job #: B0C1615
Report Date: 2010/12/22

TRANSALTA CENTRALIA MINING LLC
Client Project #: LPLF 10 LF1210
Site Reference: TCM
Your P.O. #: 4700030233 LINE50

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
4516790	Total Arsenic (As)	2010/12/21	100	80 - 120	95	80 - 120	<0.1	ug/L	NC	20
4516790	Total Cadmium (Cd)	2010/12/21	98	80 - 120	100	80 - 120	<0.01	ug/L	NC	20
4516790	Total Chromium (Cr)	2010/12/21	105	80 - 120	105	80 - 120	<1	ug/L	NC	20
4516790	Total Lead (Pb)	2010/12/21	102	80 - 120	101	80 - 120	<0.2	ug/L	NC	20
4516790	Total Selenium (Se)	2010/12/21	100	80 - 120	102	80 - 120	<0.1	ug/L	NC	20
4516790	Total Zinc (Zn)	2010/12/21	99	80 - 120	111	80 - 120	<5	ug/L	NC	20
4516790	Total Barium (Ba)	2010/12/21					<1	ug/L	0.04	20
4516790	Total Boron (B)	2010/12/21					<50	ug/L	0.3	20
4516790	Total Iron (Fe)	2010/12/21					<5	ug/L	0.03	20
4516790	Total Manganese (Mn)	2010/12/21					<1	ug/L	3.8	20
4516790	Total Mercury (Hg)	2010/12/21					0.02, RDL=0.02	ug/L	NC	20
4516790	Total Silver (Ag)	2010/12/21					<0.02	ug/L	NC	20
4516790	Total Magnesium (Mg)	2010/12/21					<50	ug/L	3.9	20
4516790	Total Potassium (K)	2010/12/21					<50	ug/L	3.4	20
4526222	Total Mercury (Hg)	2010/12/22	98	80 - 120	102	80 - 120	<0.02	ug/L	NC	20
4527046	Dissolved Sulphate (SO4)	2010/12/22	107	80 - 120	96	80 - 120	<0.5	mg/L	NC	20

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Sample analysed past recommended hold time

Maxxam Analytics International Corporation o/a Maxxam Analytics
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel (604) 734 7276 Toll-free (604) 734 7276 Fax (604) 731 2386 www.maxxam.ca

CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:

Company Name: #1791 TRANSALTA CENTRALIA MINING LLC
Contact Name: Scott Keating
Address: 913 BIG HANAFORD ROAD, Centralia WA 98531
Phone: (360)330-8153 Fax: (360)330-8168
Email: Scott_Keating@transalta.com

REPORT INFORMATION (if differs from invoice):

Company Name:
Contact Name:
Address:
Phone: Fax:
Email:

PROJECT INFORMATION:

Quotation #: B00295
P.O. #: 4700030233 LINE50
Project #: LPLF 10
Project Name: LE1210
Site #: TCM
Sampled By: Michael S Keating

Laboratory Use Only:

MAXXAM JOB #: B0C1615
BOTTLE ORDER #: 118868
CHAIN OF CUSTODY #: C#118868-01-01
PROJECT MANAGER: NAMITA SAHNI

REGULATORY CRITERIA:

SPECIAL INSTRUCTIONS

Note: For regulated drinking water samples - please use the Drinking Water Chain of Custody Form

SAMPLES MUST BE KEPT COOL (< 10ºC) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (Please be specific):

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: [X]
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission) [ ]
Date Required: Time Required:
Rush Confirmation Number: (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	LPLF10 PACKAGE										# of Bottles	Comments
1		LPLF1	12.13.10	12:20	GW	N	Y	X										5	
2		LPLF2	↓	10:10	↓	↓	↓	↓										↓	
3		LPLF3	↓	9:45	↓	↓	↓	↓										↓	
4		LPLF4	↓	9:15	↓	↓	↓	↓										↓	
5		LPLF5	↓	12:45	↓	↓	↓	↓										↓	
6		LPLF8	↓	12:00	↓	↓	↓	↓										↓	
7		Leachate	↓	10:40	SW	↓	↓	↓										↓	
8		UD	↓	10:30	↓	↓	↓	↓										↓	
9																			
10																			

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (ºC) on Receipt	Custody Seal Intact on Cooler?
Michael S Keating	10.12.13	13:30	FedEx Central Plant	10.12.13	13:30				
			AMOL XLONG	10/12/16	10:55			4 4 2	NA Yes [ ] No [ ]

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Appendix B

Descriptive Statistics:

- Descriptive Statistics
- Time-Series Plots

APPENDIX B - Descriptive Statistics

Constituent Name	Well	N	Mean	Standard Deviation	Standard Error	Median	Lower Quartile,	Upper Quartile,	Minimum	Maximum	% Non-Detects
Ammonia (mg/L)	LPLF1 (bg)	6	1.359	1.114	0.4549	0.905	0.437	2.735	0.064	2.86	0
Ammonia (mg/L)	LPLF2	23	0.1739	0.202	0.04213	0.05	0.015	0.349	0.0025	0.65	4.348
Ammonia (mg/L)	LPLF3	23	0.2355	0.2155	0.04494	0.168	0.061	0.299	0.0025	0.77	4.348
Ammonia (mg/L)	LPLF4 (bg)	23	0.1977	0.06814	0.01421	0.197	0.148	0.25	0.08	0.315	0
Ammonia (mg/L)	LPLF5 (bg)	7	0.3123	0.06691	0.02529	0.308	0.292	0.359	0.188	0.396	0
Ammonia (mg/L)	LPLF8	12	5.181	0.6083	0.1756	5.07	4.63	5.65	4.47	6.2	0
Bicarbonate (mg/L)	LPLF1 (bg)	6	1178	456.5	186.4	1350	735	1450	270	1500	0
Bicarbonate (mg/L)	LPLF2	23	339.1	50.89	10.61	340	300	390	230	440	0
Bicarbonate (mg/L)	LPLF3	23	653	43	8.967	650	620	690	560	710	0
Bicarbonate (mg/L)	LPLF4 (bg)	23	277.8	31.33	6.532	280	250	300	230	340	0
Bicarbonate (mg/L)	LPLF5 (bg)	7	664.3	46.5	17.57	660	620	720	610	720	0
Bicarbonate (mg/L)	LPLF8	12	119.9	72.06	20.8	115	74	180	2	230	0
Cadmium (mg/L)	LPLF1 (bg)	6	0.0003	0.0002181	0.00008903	0.0003	0.00008	0.00052	0.00004	0.00066	0
Cadmium (mg/L)	LPLF2	23	0.0001652	0.00008877	0.00001851	0.00016	0.00011	0.00021	0.00001	0.00045	0
Cadmium (mg/L)	LPLF3	23	0.00006587	0.00003881	0.000008092	0.00006	0.00004	0.00008	0.000005	0.00019	4.348
Cadmium (mg/L)	LPLF4 (bg)	23	0.00005196	0.00003506	0.00000731	0.00004	0.00003	0.00007	0.000005	0.00017	4.348
Cadmium (mg/L)	LPLF5 (bg)	7	0.0003243	0.0001714	0.00006477	0.00026	0.00022	0.00034	0.00021	0.0007	0
Cadmium (mg/L)	LPLF8	12	0.0007258	0.0004558	0.0001316	0.000845	0.000385	0.001095	0.000005	0.00128	16.67
Calcium (mg/L)	LPLF1 (bg)	6	306.5	114.4	46.7	355	191.5	373	79	376	0
Calcium (mg/L)	LPLF2	23	257.6	44.92	9.367	252	218	281	191	345	0
Calcium (mg/L)	LPLF3	23	46.74	6.398	1.334	45	42	50	39	63	0
Calcium (mg/L)	LPLF4 (bg)	23	17.52	2.02	0.4211	17	16	18	15	22	0
Calcium (mg/L)	LPLF5 (bg)	7	140.9	8.454	3.195	141	137	147	126	151	0
Calcium (mg/L)	LPLF8	12	516.1	40.49	11.69	527.5	483.5	548	447	573	0
Carbonate (mg/L)	LPLF1 (bg)	6	0.25	0	0	0.25	0.25	0.25	0.25	0.25	100
Carbonate (mg/L)	LPLF2	23	0.25	0	0	0.25	0.25	0.25	0.25	0.25	100
Carbonate (mg/L)	LPLF3	23	2.822	5.846	1.219	0.25	0.25	0.25	0.25	21	78.26
Carbonate (mg/L)	LPLF4 (bg)	23	0.5217	1.303	0.2717	0.25	0.25	0.25	0.25	6.5	95.65
Carbonate (mg/L)	LPLF5 (bg)	7	0.25	0	0	0.25	0.25	0.25	0.25	0.25	100
Carbonate (mg/L)	LPLF8	12	0.25	0	0	0.25	0.25	0.25	0.25	0.25	100
Chloride (mg/L)	LPLF1 (bg)	6	13.58	7.437	3.036	9.55	8.8	22.4	8.7	27	0
Chloride (mg/L)	LPLF2	23	3.804	0.5423	0.1131	3.7	3.6	3.9	3.1	6	0
Chloride (mg/L)	LPLF3	23	5.596	1.016	0.2119	5.1	4.9	6.2	4.6	8	0
Chloride (mg/L)	LPLF4 (bg)	23	3.161	0.3602	0.07511	3.2	2.9	3.3	2.3	3.8	0
Chloride (mg/L)	LPLF5 (bg)	7	4.757	0.8203	0.31	4.7	4	5.3	3.9	6.1	0
Chloride (mg/L)	LPLF8	12	10.41	2.069	0.5973	9.6	8.9	11.5	8.2	15	0

APPENDIX B - Descriptive Statistics

Constituent Name	Well	N	Mean	Standard Deviation	Standard Error	Median	Lower Quartile,	Upper Quartile,	Minimum	Maximum	% Non-Detects
Dis. Arsenic (mg/L)	LPLF1 (bg)	6	0.00125	0.001099	0.0004485	0.0008	0.00055	0.0024	0.0005	0.0034	0
Dis. Arsenic (mg/L)	LPLF2	23	0.0008391	0.002439	0.0005086	0.0003	0.0002	0.0005	0.0001	0.012	0
Dis. Arsenic (mg/L)	LPLF3	23	0.0004609	0.0003448	0.00007189	0.0003	0.0002	0.0005	0.0002	0.0014	0
Dis. Arsenic (mg/L)	LPLF4 (bg)	23	0.0003957	0.0001522	0.00003173	0.0004	0.0003	0.0005	0.0001	0.0007	0
Dis. Arsenic (mg/L)	LPLF5 (bg)	7	0.001657	0.0004685	0.0001771	0.0015	0.0014	0.0022	0.001	0.0023	0
Dis. Arsenic (mg/L)	LPLF8	12	0.0054	0.00218	0.0006293	0.005	0.00395	0.0065	0.0027	0.0108	0
Dis. Barium (mg/L)	LPLF1 (bg)	6	0.0465	0.02627	0.01072	0.0365	0.034	0.069	0.033	0.1	0
Dis. Barium (mg/L)	LPLF2	23	0.06217	0.01678	0.003498	0.061	0.049	0.069	0.04	0.109	0
Dis. Barium (mg/L)	LPLF3	23	0.1187	0.02585	0.005389	0.122	0.116	0.136	0.033	0.155	0
Dis. Barium (mg/L)	LPLF4 (bg)	23	0.09822	0.1248	0.02602	0.066	0.06	0.075	0.001	0.5	0
Dis. Barium (mg/L)	LPLF5 (bg)	7	0.05871	0.008118	0.003068	0.059	0.052	0.063	0.048	0.072	0
Dis. Barium (mg/L)	LPLF8	12	0.02442	0.007585	0.00219	0.021	0.019	0.0285	0.018	0.039	0
Dis. Boron (mg/L)	LPLF1 (bg)	6	0.7978	0.08147	0.03326	0.801	0.7125	0.88	0.665	0.89	0
Dis. Boron (mg/L)	LPLF2	23	0.167	0.01496	0.00312	0.165	0.154	0.175	0.143	0.201	0
Dis. Boron (mg/L)	LPLF3	23	0.2796	0.1332	0.02777	0.251	0.234	0.269	0.151	0.87	0
Dis. Boron (mg/L)	LPLF4 (bg)	23	0.208	0.04798	0.01	0.209	0.188	0.241	0.05	0.28	0
Dis. Boron (mg/L)	LPLF5 (bg)	7	0.1861	0.02816	0.01064	0.203	0.155	0.211	0.153	0.213	0
Dis. Boron (mg/L)	LPLF8	12	0.7154	0.1173	0.03385	0.6655	0.626	0.785	0.601	0.994	0
Dis. Chromium (mg/L)	LPLF1 (bg)	5	0.0007	0.0002739	0.0001225	0.0005	0.0005	0.001	0.0005	0.001	60
Dis. Chromium (mg/L)	LPLF2	23	0.0005	0	0	0.0005	0.0005	0.0005	0.0005	0.0005	100
Dis. Chromium (mg/L)	LPLF3	23	0.0005	0	0	0.0005	0.0005	0.0005	0.0005	0.0005	100
Dis. Chromium (mg/L)	LPLF4 (bg)	23	0.0005217	0.0001043	0.00002174	0.0005	0.0005	0.0005	0.0005	0.001	95.65
Dis. Chromium (mg/L)	LPLF5 (bg)	7	0.0005	0	0	0.0005	0.0005	0.0005	0.0005	0.0005	100
Dis. Chromium (mg/L)	LPLF8	12	0.0005	0	0	0.0005	0.0005	0.0005	0.0005	0.0005	100
Dis. Hardness (mg/L)	LPLF1 (bg)	6	1064	400	163.3	1230	672	1290	264	1320	0
Dis. Hardness (mg/L)	LPLF2	23	856.5	145.9	30.43	843	718	935	652	1160	0
Dis. Hardness (mg/L)	LPLF3	23	162.1	19.96	4.162	155	146	176	137	211	0
Dis. Hardness (mg/L)	LPLF4 (bg)	23	66.61	5.975	1.246	66	62	68	58	79	0
Dis. Hardness (mg/L)	LPLF5 (bg)	7	472.6	23.5	8.882	473	461	493	430	500	0
Dis. Hardness (mg/L)	LPLF8	12	2033	143.7	41.49	2070	1915	2140	1770	2250	0
Dis. Lead (mg/L)	LPLF1 (bg)	6	0.00015	0.00008367	0.00003416	0.0001	0.0001	0.00025	0.0001	0.0003	66.67
Dis. Lead (mg/L)	LPLF2	23	0.0001043	0.00002085	0.000004348	0.0001	0.0001	0.0001	0.0001	0.0002	95.65
Dis. Lead (mg/L)	LPLF3	23	0.0001261	0.0001251	0.00002609	0.0001	0.0001	0.0001	0.0001	0.0007	95.65
Dis. Lead (mg/L)	LPLF4 (bg)	23	0.0002174	0.0004997	0.0001042	0.0001	0.0001	0.0001	0.0001	0.0025	86.96
Dis. Lead (mg/L)	LPLF5 (bg)	7	0.0001571	0.0001512	0.00005714	0.0001	0.0001	0.0001	0.0001	0.0005	85.71
Dis. Lead (mg/L)	LPLF8	12	0.0001833	0.0002887	0.00008333	0.0001	0.0001	0.0001	0.0001	0.0011	91.67

APPENDIX B - Descriptive Statistics

Constituent Name	Well	N	Mean	Standard Deviation	Standard Error	Median	Lower Quartile,	Upper Quartile,	Minimum	Maximum	% Non-Detects
Dis. Mercury (mg/L)	LPLF1 (bg)	6	0.00002	0.00001673	0.000006831	0.00001	0.00001	0.00004	0.00001	0.00005	66.67
Dis. Mercury (mg/L)	LPLF2	23	0.00001	0	0	0.00001	0.00001	0.00001	0.00001	0.00001	100
Dis. Mercury (mg/L)	LPLF3	23	0.00001174	0.000008341	0.000001739	0.00001	0.00001	0.00001	0.00001	0.00005	95.65
Dis. Mercury (mg/L)	LPLF4 (bg)	23	0.00001043	0.000002085	4.30E-07	0.00001	0.00001	0.00001	0.00001	0.00002	95.65
Dis. Mercury (mg/L)	LPLF5 (bg)	7	0.00001	0	0	0.00001	0.00001	0.00001	0.00001	0.00001	100
Dis. Mercury (mg/L)	LPLF8	12	0.00001	0	0	0.00001	0.00001	0.00001	0.00001	0.00001	100
Dis. Silver (mg/L)	LPLF1 (bg)	6	0.00003167	0.00002639	0.00001078	0.000025	0.00001	0.00006	0.00001	0.00008	33.33
Dis. Silver (mg/L)	LPLF2	23	0.00001826	0.00001696	0.000003537	0.00001	0.00001	0.00002	0.00001	0.00008	69.57
Dis. Silver (mg/L)	LPLF3	23	0.00001435	0.0000108	0.000002252	0.00001	0.00001	0.00001	0.00001	0.00005	82.61
Dis. Silver (mg/L)	LPLF4 (bg)	23	0.00001043	0.000002085	4.30E-07	0.00001	0.00001	0.00001	0.00001	0.00002	95.65
Dis. Silver (mg/L)	LPLF5 (bg)	7	0.00001	0	0	0.00001	0.00001	0.00001	0.00001	0.00001	100
Dis. Silver (mg/L)	LPLF8	12	0.00004333	0.00004459	0.00001287	0.00001	0.00001	0.00009	0.00001	0.00013	58.33
Dis. Sulfite (mg/L)	LPLF1 (bg)	6	0.25	0	0	0.25	0.25	0.25	0.25	0.25	100
Dis. Sulfite (mg/L)	LPLF2	23	0.4565	0.9904	0.2065	0.25	0.25	0.25	0.25	5	95.65
Dis. Sulfite (mg/L)	LPLF3	23	0.8348	1.373	0.2863	0.25	0.25	0.25	0.25	5.3	78.26
Dis. Sulfite (mg/L)	LPLF4 (bg)	23	0.2848	0.1238	0.02581	0.25	0.25	0.25	0.25	0.8	91.3
Dis. Sulfite (mg/L)	LPLF5 (bg)	7	0.25	0	0	0.25	0.25	0.25	0.25	0.25	100
Dis. Sulfite (mg/L)	LPLF8	12	0.25	0	0	0.25	0.25	0.25	0.25	0.25	100
Fluoride (mg/L)	LPLF1 (bg)	6	0.2083	0.1214	0.04956	0.155	0.14	0.33	0.13	0.45	0
Fluoride (mg/L)	LPLF2	23	0.06913	0.03999	0.008339	0.05	0.04	0.09	0.03	0.18	0
Fluoride (mg/L)	LPLF3	23	0.1222	0.04776	0.00996	0.1	0.09	0.14	0.07	0.26	0
Fluoride (mg/L)	LPLF4 (bg)	23	0.2609	0.05984	0.01248	0.26	0.25	0.28	0.09	0.41	0
Fluoride (mg/L)	LPLF5 (bg)	7	0.1386	0.03185	0.01204	0.14	0.11	0.18	0.1	0.18	0
Fluoride (mg/L)	LPLF8	12	0.1333	0.06527	0.01884	0.115	0.1	0.155	0.05	0.27	0
Iron (mg/L)	LPLF1 (bg)	6	0.1272	0.1653	0.06748	0.0785	0.0135	0.2895	0.006	0.447	0
Iron (mg/L)	LPLF2	23	0.1147	0.1412	0.02945	0.044	0.019	0.212	0.002	0.572	0
Iron (mg/L)	LPLF3	23	0.03674	0.06595	0.01375	0.02	0.01	0.034	0.007	0.324	0
Iron (mg/L)	LPLF4 (bg)	23	0.21	0.1959	0.04084	0.151	0.073	0.33	0.03	0.723	0
Iron (mg/L)	LPLF5 (bg)	7	0.5186	0.9864	0.3728	0.06	0.06	0.59	0.02	2.71	0
Iron (mg/L)	LPLF8	12	809.7	213.5	61.63	795	612	967	516	1200	0
Magnesium (mg/L)	LPLF1 (bg)	6	72.93	28.28	11.54	80.75	47.65	90.4	16.3	93.2	0
Magnesium (mg/L)	LPLF2	23	51.79	9.192	1.917	51.3	42.4	57	40.6	72.3	0
Magnesium (mg/L)	LPLF3	23	11.08	1.276	0.2661	11.1	9.9	12.3	9.4	13.3	0
Magnesium (mg/L)	LPLF4 (bg)	23	5.557	0.374	0.07797	5.6	5.4	5.7	5	6.9	0
Magnesium (mg/L)	LPLF5 (bg)	7	29.36	1.484	0.561	28.6	28.1	30.4	27.9	32	0
Magnesium (mg/L)	LPLF8	12	181.3	14.03	4.051	179	172	193.5	159	206	0

APPENDIX B - Descriptive Statistics

Constituent Name	Well	N	Mean	Standard Deviation	Standard Error	Median	Lower Quartile,	Upper Quartile,	Minimum	Maximum	% Non-Detects
Manganese (mg/L)	LPLF1 (bg)	6	0.5998	0.3027	0.1236	0.6155	0.2925	0.8915	0.26	0.913	0
Manganese (mg/L)	LPLF2	23	0.3297	0.3217	0.06708	0.235	0.036	0.633	0.013	1.03	0
Manganese (mg/L)	LPLF3	23	0.04787	0.0643	0.01341	0.02	0.012	0.073	0.007	0.28	0
Manganese (mg/L)	LPLF4 (bg)	23	0.1121	0.05947	0.0124	0.089	0.063	0.164	0.045	0.249	0
Manganese (mg/L)	LPLF5 (bg)	7	0.322	0.05759	0.02177	0.313	0.262	0.361	0.252	0.417	0
Manganese (mg/L)	LPLF8	12	14.18	2.248	0.649	14.3	12.6	15.8	10.7	18.1	0
Nitrate (mg/L)	LPLF1 (bg)	6	2.333	2.258	0.9218	2.055	0.395	4.55	0.01	6.5	16.67
Nitrate (mg/L)	LPLF2	23	0.3448	0.435	0.0907	0.25	0.15	0.47	0.01	2.16	4.348
Nitrate (mg/L)	LPLF3	23	0.5557	0.2698	0.05625	0.62	0.39	0.69	0.04	0.99	0
Nitrate (mg/L)	LPLF4 (bg)	23	0.04174	0.03725	0.007768	0.03	0.01	0.07	0.01	0.13	39.13
Nitrate (mg/L)	LPLF5 (bg)	7	0.08143	0.08295	0.03135	0.06	0.02	0.11	0.01	0.25	14.29
Nitrate (mg/L)	LPLF8	12	0.1008	0.0902	0.02604	0.075	0.03	0.15	0.01	0.3	25
Nitrate-Nitrite (mg/L)	LPLF1 (bg)	6	2.35	2.251	0.9191	2.09	0.41	4.55	0.01	6.5	16.67
Nitrate-Nitrite (mg/L)	LPLF2	23	0.3491	0.4333	0.09034	0.25	0.15	0.47	0.04	2.16	0
Nitrate-Nitrite (mg/L)	LPLF3	23	0.563	0.2668	0.05563	0.64	0.4	0.7	0.05	0.99	0
Nitrate-Nitrite (mg/L)	LPLF4 (bg)	23	0.04174	0.03725	0.007768	0.03	0.01	0.07	0.01	0.13	39.13
Nitrate-Nitrite (mg/L)	LPLF5 (bg)	7	0.1057	0.07764	0.02935	0.09	0.05	0.14	0.03	0.26	0
Nitrate-Nitrite (mg/L)	LPLF8	12	0.1217	0.0882	0.02546	0.105	0.055	0.17	0.01	0.3	8.333
Nitrite (mg/L)	LPLF1 (bg)	6	0.03483	0.02921	0.01193	0.022	0.012	0.0705	0.011	0.081	0
Nitrite (mg/L)	LPLF2	23	0.005804	0.005819	0.001213	0.0025	0.0025	0.009	0.0025	0.023	65.22
Nitrite (mg/L)	LPLF3	23	0.008522	0.007889	0.001645	0.005	0.0025	0.012	0.0025	0.032	43.48
Nitrite (mg/L)	LPLF4 (bg)	23	0.0025	0	0	0.0025	0.0025	0.0025	0.0025	0.0025	100
Nitrite (mg/L)	LPLF5 (bg)	7	0.007214	0.01101	0.00416	0.0025	0.0025	0.006	0.0025	0.032	71.43
Nitrite (mg/L)	LPLF8	12	0.02258	0.03213	0.009275	0.00525	0.0025	0.0375	0.0025	0.11	50
pH (SIU)	LPLF1 (bg)	6	6.765	0.1983	0.08094	6.785	6.575	6.935	6.4	6.98	0
pH (SIU)	LPLF2	23	6.543	0.2448	0.05104	6.51	6.41	6.67	6.1	7.14	0
pH (SIU)	LPLF3	23	6.753	0.4507	0.09398	6.85	6.6	7	5.23	7.36	0
pH (SIU)	LPLF4 (bg)	23	6.601	0.5264	0.1098	6.73	6.5	6.8	5.1	7.4	0
pH (SIU)	LPLF5 (bg)	7	6.743	0.2225	0.08411	6.7	6.6	6.9	6.4	7.1	0
pH (SIU)	LPLF8	12	5.698	0.2553	0.07369	5.64	5.5	5.955	5.3	6	0
Potassium (mg/L)	LPLF1 (bg)	6	16.45	2.892	1.181	17.95	13	18.4	11.3	18.6	0
Potassium (mg/L)	LPLF2	23	5.822	0.9793	0.2042	5.5	5	6.6	4.6	8	0
Potassium (mg/L)	LPLF3	23	4.465	0.6278	0.1309	4.3	4.1	4.6	3.7	6.6	0
Potassium (mg/L)	LPLF4 (bg)	23	1.674	0.1137	0.02371	1.6	1.6	1.8	1.5	1.9	0
Potassium (mg/L)	LPLF5 (bg)	7	4.9	0.866	0.3273	4.5	4.2	5.9	4.1	6.3	0
Potassium (mg/L)	LPLF8	12	13.05	0.8196	0.2366	12.75	12.55	13.65	11.9	14.6	0

APPENDIX B - Descriptive Statistics

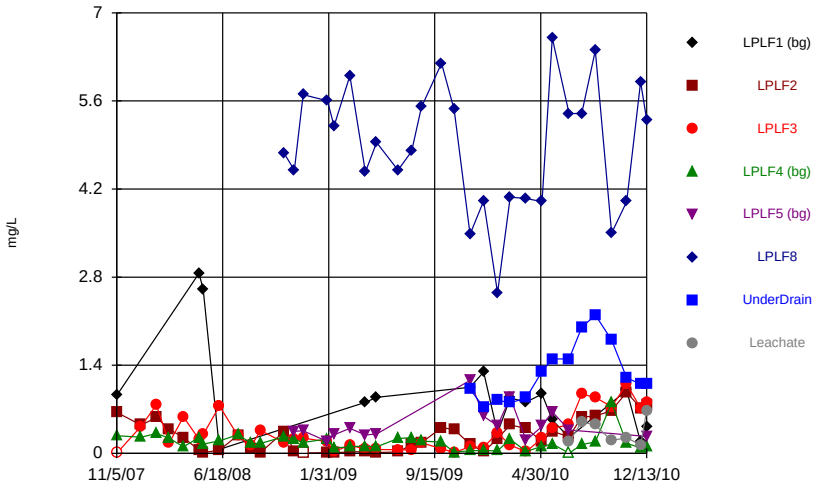
Constituent Name	Well	N	Mean	Standard Deviation	Standard Error	Median	Lower Quartile,	Upper Quartile,	Minimum	Maximum	% Non-Detects
Selenium (mg/L)	LPLF1 (bg)	6	0.0001833	0.0001125	0.00004595	0.0002	0.00005	0.0003	0.00005	0.0003	33.33
Selenium (mg/L)	LPLF2	23	0.00008478	0.00005728	0.00001194	0.00005	0.00005	0.0001	0.00005	0.0002	65.22
Selenium (mg/L)	LPLF3	23	0.00008043	0.00007796	0.00001625	0.00005	0.00005	0.0001	0.00005	0.0004	73.91
Selenium (mg/L)	LPLF4 (bg)	23	0.00005	0	0	0.00005	0.00005	0.00005	0.00005	0.00005	100
Selenium (mg/L)	LPLF5 (bg)	7	0.00007143	0.00002673	0.0000101	0.00005	0.00005	0.0001	0.00005	0.0001	57.14
Selenium (mg/L)	LPLF8	12	0.000125	0.0001288	0.00003718	0.00005	0.00005	0.0002	0.00005	0.0004	66.67
Sodium (mg/L)	LPLF1 (bg)	6	927.7	362.4	147.9	1085	563	1135	207	1150	0
Sodium (mg/L)	LPLF2	23	101.4	12.56	2.619	101	92	108	80	130	0
Sodium (mg/L)	LPLF3	23	269.5	16.1	3.356	269	263	279	239	306	0
Sodium (mg/L)	LPLF4 (bg)	23	81.39	13.04	2.719	82	73	90	61	107	0
Sodium (mg/L)	LPLF5 (bg)	7	174.6	44.44	16.8	148	140	219	126	233	0
Sodium (mg/L)	LPLF8	12	152.4	14.32	4.135	152.5	141.5	158.5	132	184	0
Specific Conductance (uS/cm)	LPLF1 (bg)	6	3539	1341	547.6	3898	2318	4400	864	4500	0
Specific Conductance (uS/cm)	LPLF2	23	1319	310.8	64.82	1280	1144	1400	915	2565	0
Specific Conductance (uS/cm)	LPLF3	23	1053	224.8	46.87	1037	927	1100	777	1925	0
Specific Conductance (uS/cm)	LPLF4 (bg)	23	374.7	104.1	21.7	360	310	403	250	708	0
Specific Conductance (uS/cm)	LPLF5 (bg)	7	1200	200	75.59	1100	1000	1400	1000	1500	0
Specific Conductance (uS/cm)	LPLF8	12	3911	443.8	128.1	3874	3563	4300	3207	4500	0
Sulfate (mg/L)	LPLF1 (bg)	6	2009	778.8	317.9	2200	1327	2500	453	2600	0
Sulfate (mg/L)	LPLF2	23	694	146.2	30.49	700	591	800	450	1000	0
Sulfate (mg/L)	LPLF3	23	199.4	39.65	8.268	190	170	244	140	260	0
Sulfate (mg/L)	LPLF4 (bg)	23	21.39	11.19	2.333	17	13	28	10	45	0
Sulfate (mg/L)	LPLF5 (bg)	7	301.4	84.35	31.88	260	230	360	230	450	0
Sulfate (mg/L)	LPLF8	12	3550	566.5	163.5	3600	3250	3900	2300	4500	0
TDS (mg/L)	LPLF1 (bg)	6	3767	1194	487.6	4100	2650	4550	1400	4700	0
TDS (mg/L)	LPLF2	23	1339	210.5	43.89	1300	1200	1400	1100	1900	0
TDS (mg/L)	LPLF3	23	860.9	80.28	16.74	840	800	900	750	1100	0
TDS (mg/L)	LPLF4 (bg)	23	310.4	61.61	12.85	290	270	350	230	450	0
TDS (mg/L)	LPLF5 (bg)	7	998.6	162.4	61.39	910	870	1200	830	1200	0
TDS (mg/L)	LPLF8	12	4600	822.4	237.4	4300	4000	4900	3900	6400	0
Temperature (Deg C)	LPLF1 (bg)	6	12.73	0.7312	0.2985	12.55	12.1	13.55	12	14	0
Temperature (Deg C)	LPLF2	23	11.6	1.37	0.2857	12	10.6	12.5	8.7	14	0
Temperature (Deg C)	LPLF3	23	11.69	1.038	0.2164	11.3	11	12.4	10.1	14	0
Temperature (Deg C)	LPLF4 (bg)	23	12.31	1.692	0.3529	12.3	11	14	9.3	15	0
Temperature (Deg C)	LPLF5 (bg)	7	12.29	1.976	0.7469	11	11	14	11	16	0
Temperature (Deg C)	LPLF8	12	12.89	0.903	0.2607	12.95	12	13.05	12	15	0

APPENDIX B - Descriptive Statistics

Constituent Name	Well	N	Mean	Standard Deviation	Standard Error	Median	Lower Quartile,	Upper Quartile,	Minimum	Maximum	% Non-Detects
TOC (mg/L)	LPLF1 (bg)	6	44.53	96.25	39.29	5.3	4.9	123.4	4.9	241	0
TOC (mg/L)	LPLF2	23	13.47	59.85	12.48	1	0.25	1.7	0.25	288	34.78
TOC (mg/L)	LPLF3	23	14.3	59.67	12.44	1.8	1.4	2.6	0.25	288	4.348
TOC (mg/L)	LPLF4 (bg)	23	13.14	54.25	11.31	1.9	1.5	2.2	0.25	262	8.696
TOC (mg/L)	LPLF5 (bg)	7	2.571	1.447	0.5467	2.1	1.8	2.6	1.3	5.7	0
TOC (mg/L)	LPLF8	12	7.167	2.719	0.7849	7.55	5.15	9.65	1.9	10.5	0
Zinc (mg/L)	LPLF1 (bg)	2	0.0135	0.002121	0.0015	0.0135	0.0135	0.0135	0.012	0.015	0
Zinc (mg/L)	LPLF2	23	0.005587	0.002687	0.0005603	0.005	0.0025	0.007	0.0025	0.011	30.43
Zinc (mg/L)	LPLF3	23	0.002652	0.0007298	0.0001522	0.0025	0.0025	0.0025	0.0025	0.006	95.65
Zinc (mg/L)	LPLF4 (bg)	23	0.002935	0.00151	0.0003148	0.0025	0.0025	0.0025	0.0025	0.009	91.3
Zinc (mg/L)	LPLF5 (bg)	7	0.0085	0.003253	0.00123	0.009	0.007	0.01	0.0025	0.013	14.29
Zinc (mg/L)	LPLF8	12	0.6258	0.09664	0.0279	0.6085	0.5535	0.6885	0.494	0.833	0

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Time Series

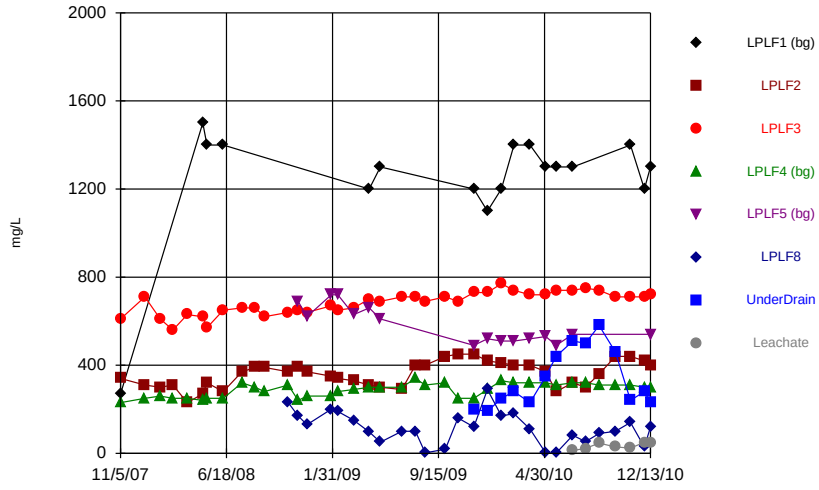


Constituent: Ammonia Analysis Run 01/25/2011 1:14 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Time Series

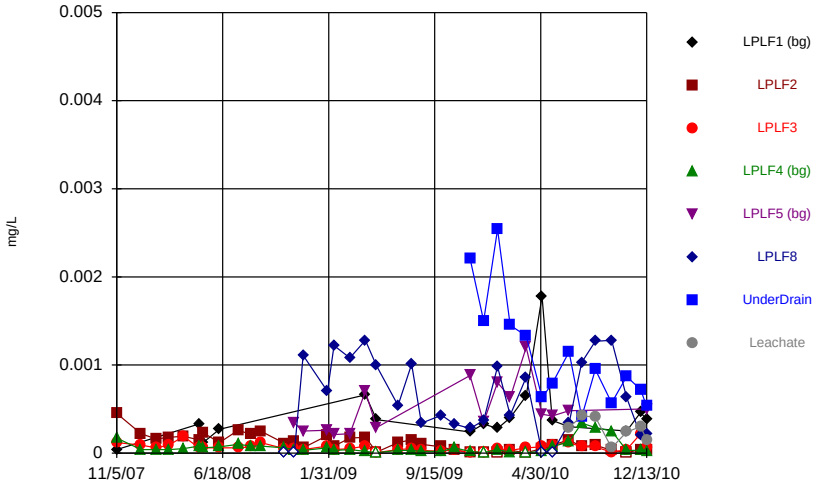


Constituent: Bicarbonate Analysis Run 01/25/2011 1:14 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Time Series



Constituent: Cadmium Analysis Run 01/25/2011 1:14 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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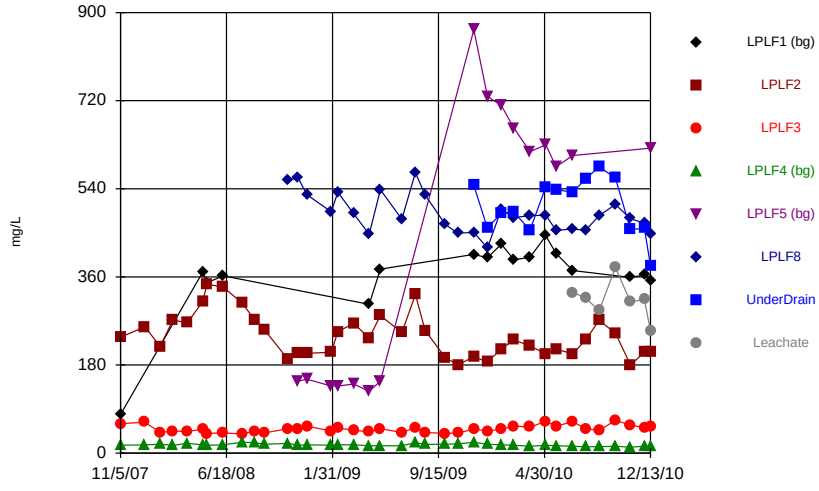
Time Series

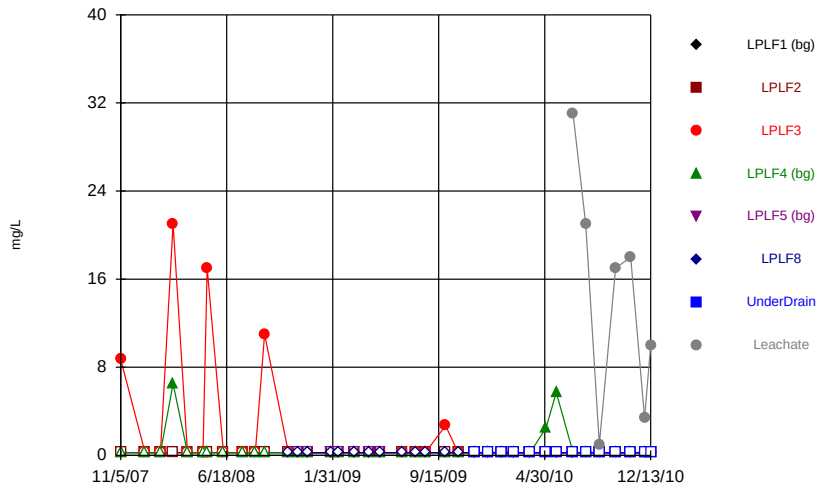


Constituent: Calcium Analysis Run 01/25/2011 1:14 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Time Series



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Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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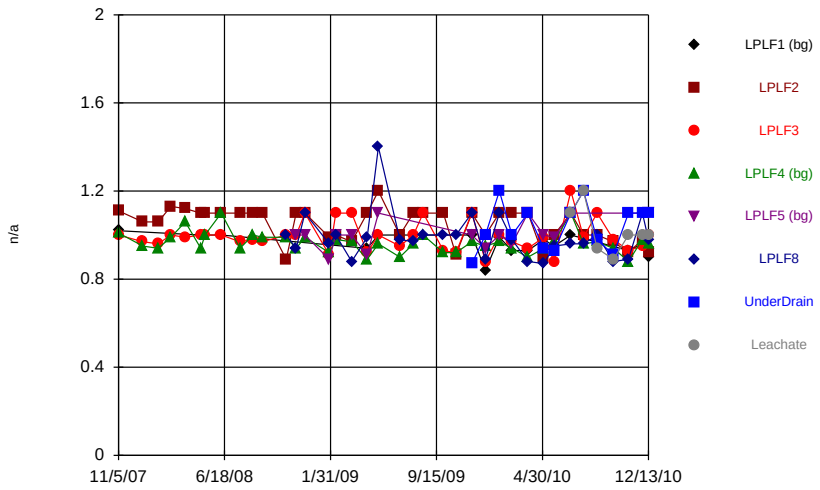
Time Series



Constituent: Cation Balance Analysis Run 01/25/2011 1:15 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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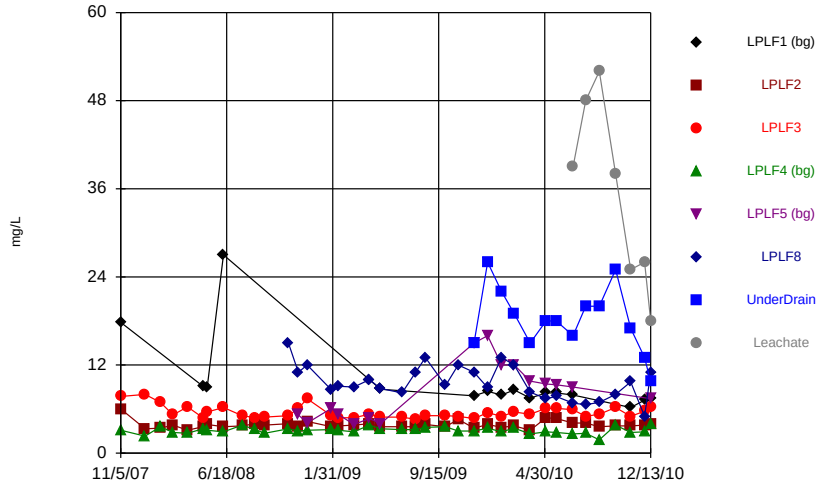
Time Series



Constituent: Chloride Analysis Run 01/25/2011 1:15 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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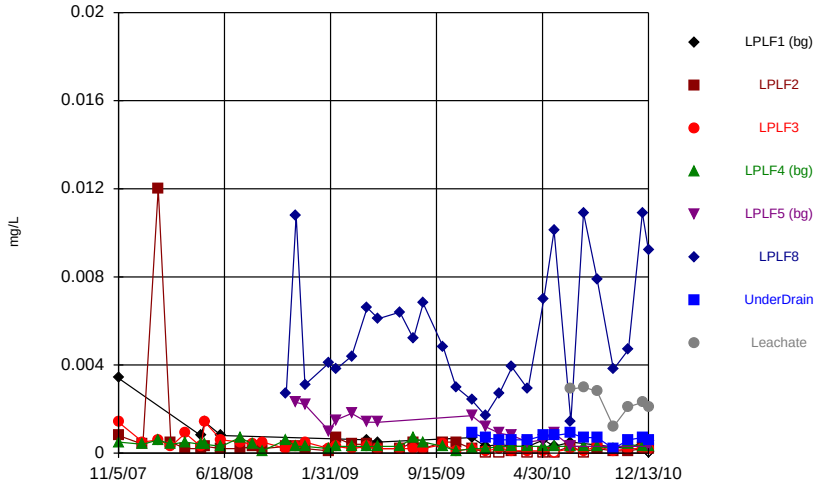
Hollow symbols indicate censored values.

Time Series



Constituent: Dis. Arsenic Analysis Run 01/25/2011 1:15 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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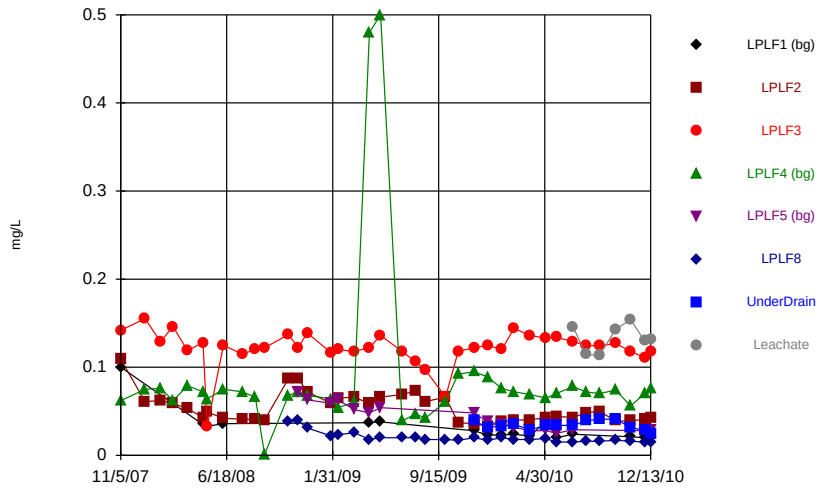
Time Series



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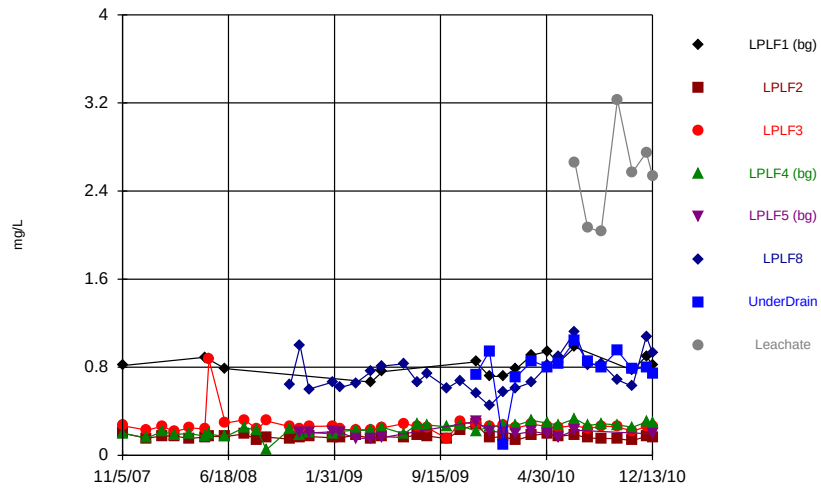
v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Time Series



Constituent: Dis. Boron Analysis Run 01/25/2011 1:16 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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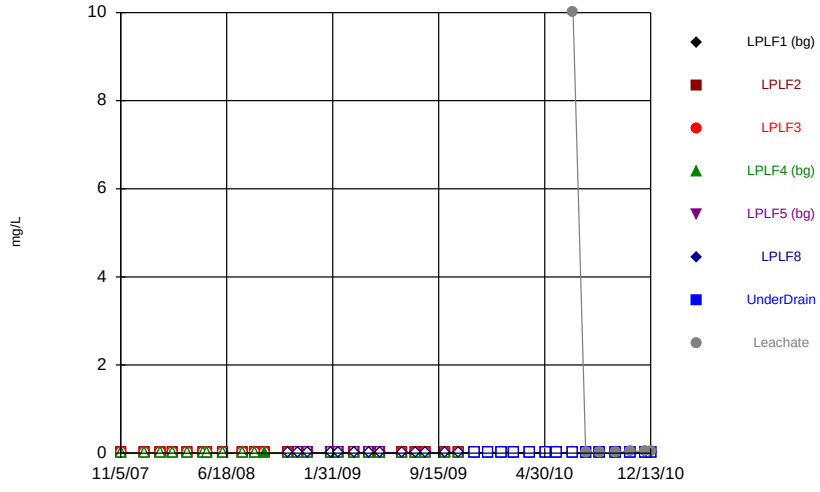
Time Series

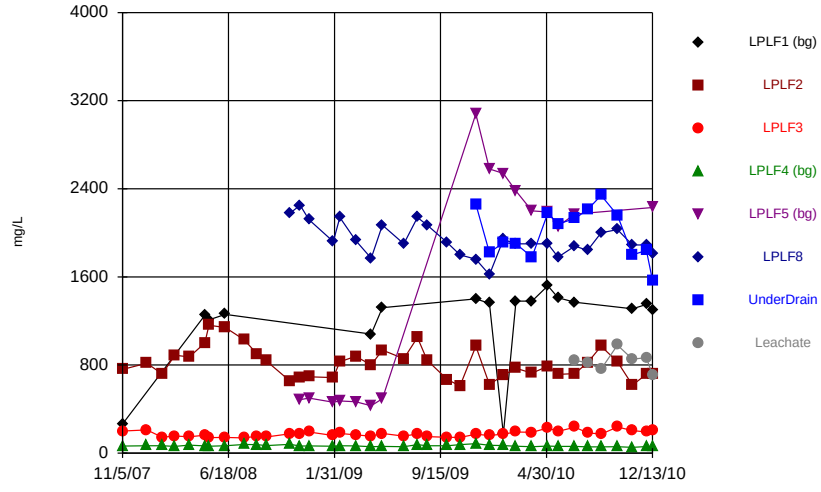


Constituent: Dis. Chromium Analysis Run 01/25/2011 1:16 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Time Series



Constituent: Dis. Hardness Analysis Run 01/25/2011 1:16 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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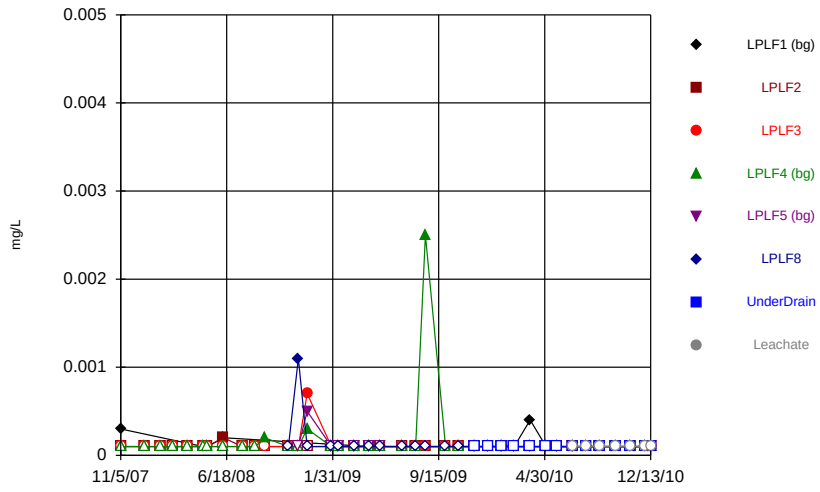
Time Series



Constituent: Dis. Lead Analysis Run 01/25/2011 1:16 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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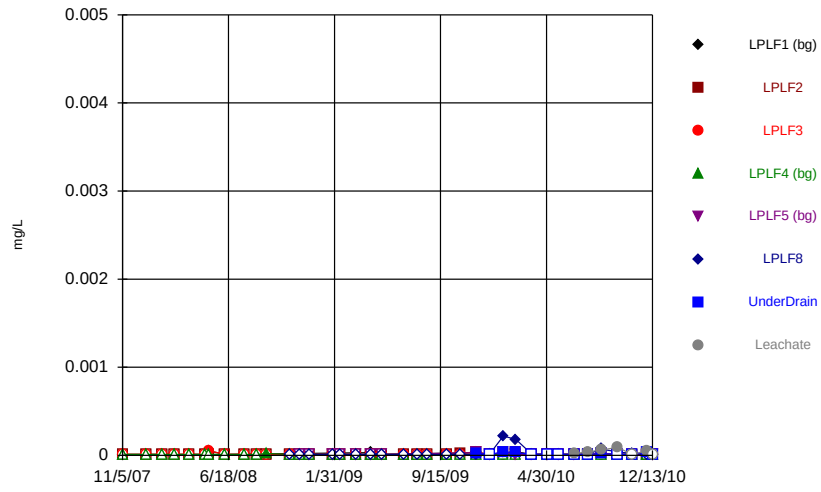

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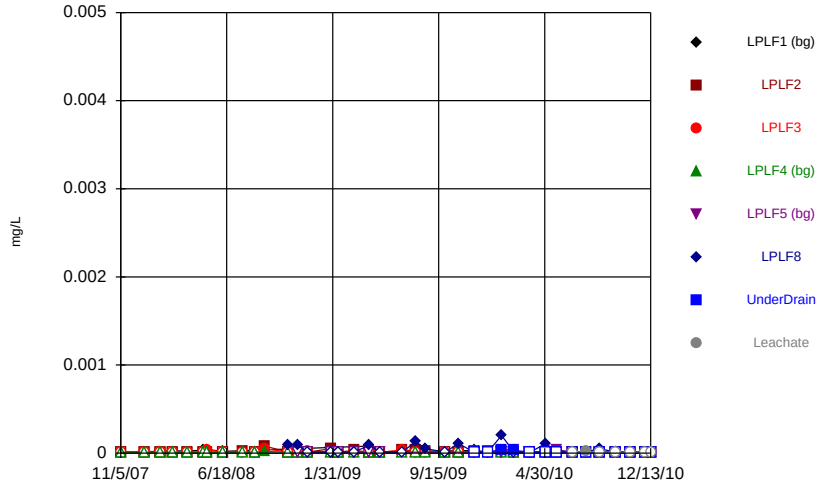

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Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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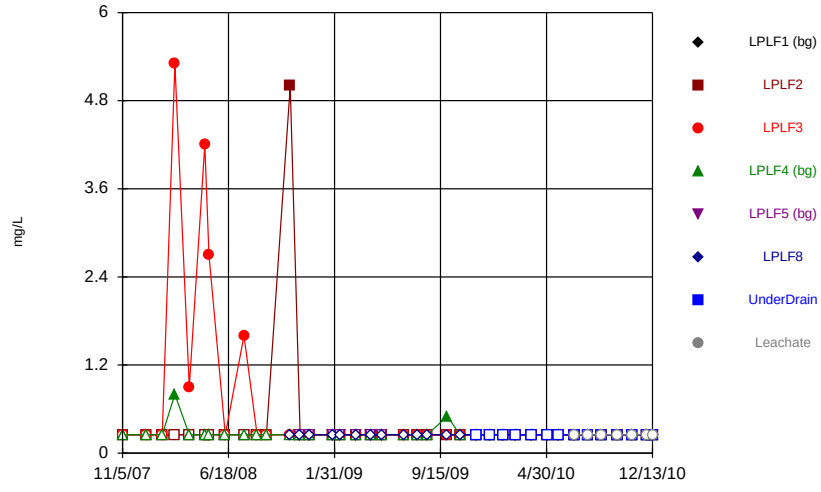

Constituent: Dis. Sulfite Analysis Run 01/25/2011 1:16 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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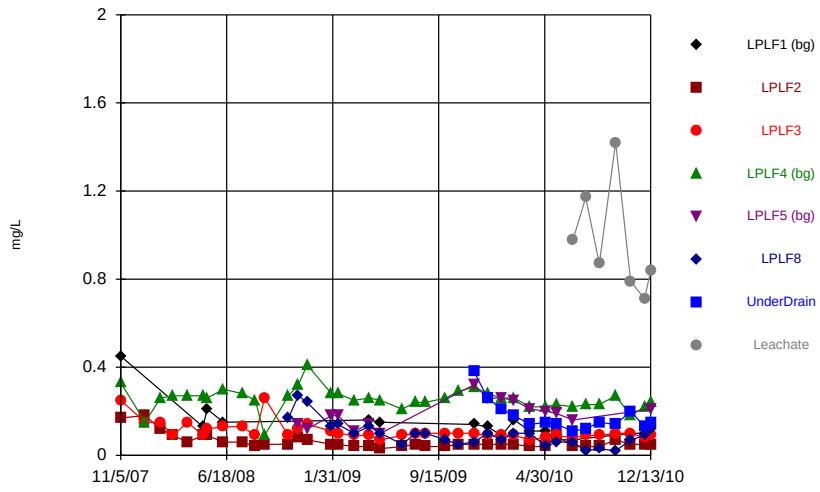
Time Series



Constituent: Fluoride Analysis Run 01/25/2011 1:17 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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Hollow symbols indicate censored values.

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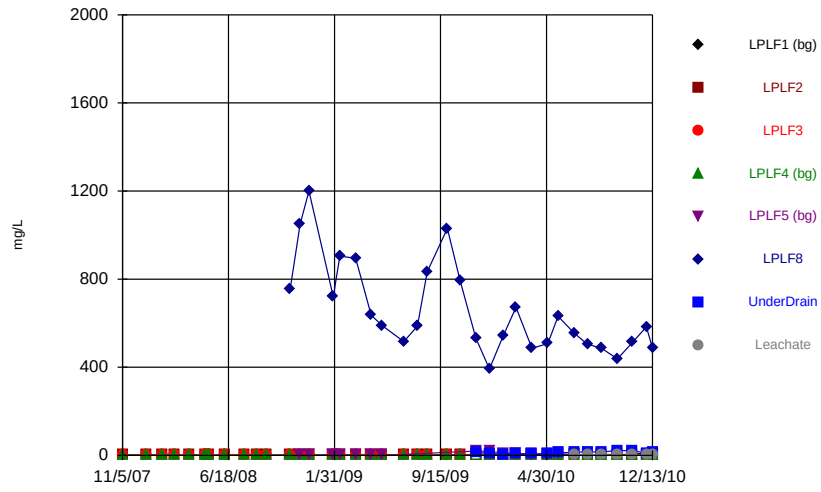

Constituent: Iron Analysis Run 01/25/2011 1:17 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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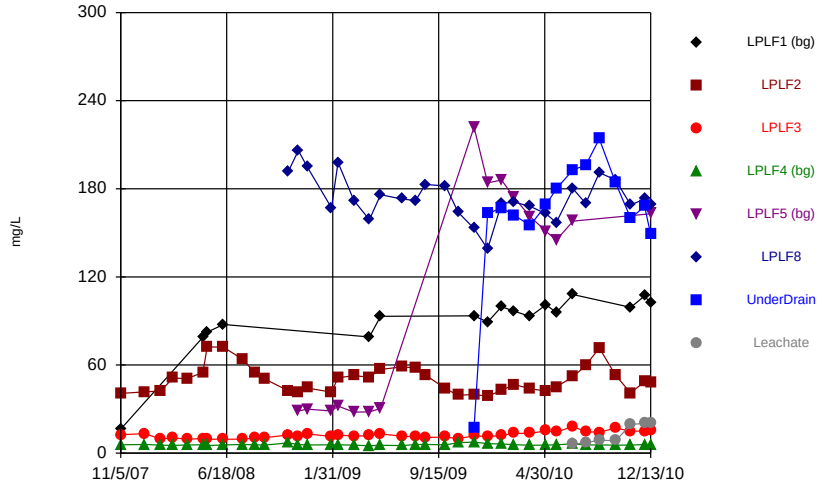
Time Series



Constituent: Magnesium Analysis Run 01/25/2011 1:17 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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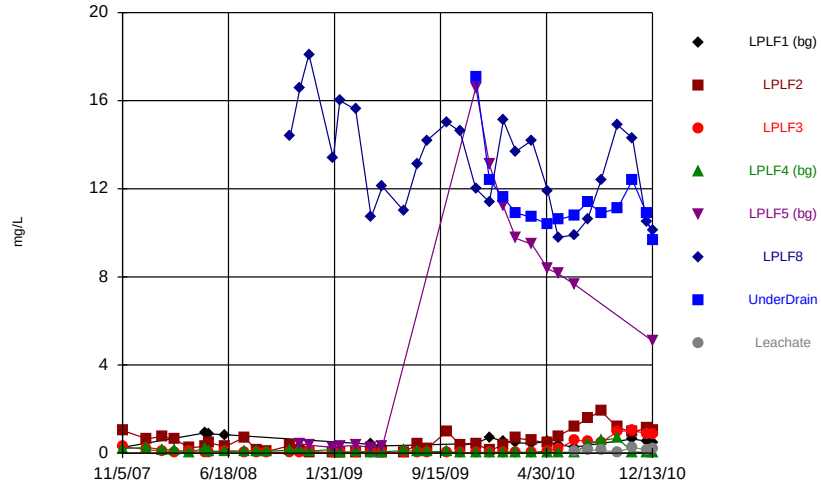

Constituent: Manganese Analysis Run 01/25/2011 1:17 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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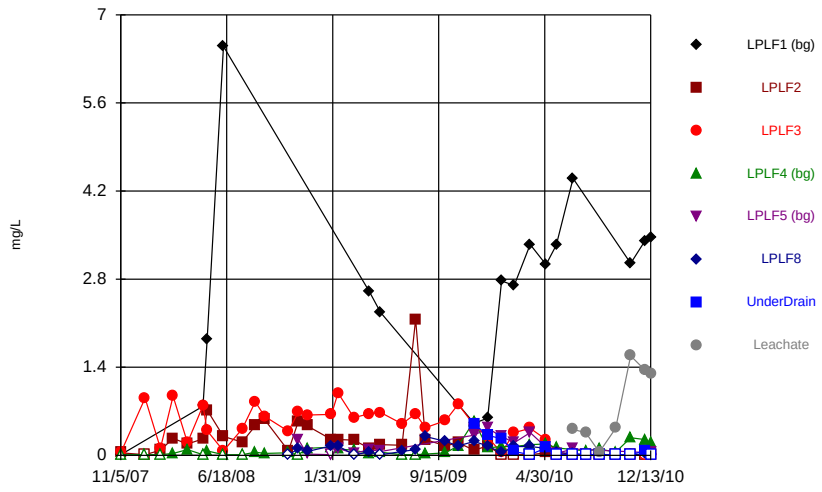

Constituent: Nitrate Analysis Run 01/25/2011 1:17 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
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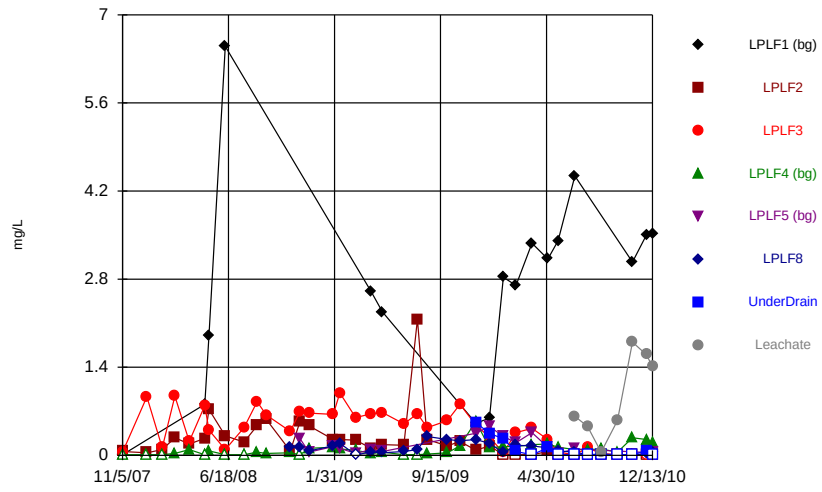

Constituent: Nitrate-Nitrite Analysis Run 01/25/2011 1:17 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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Hollow symbols indicate censored values.

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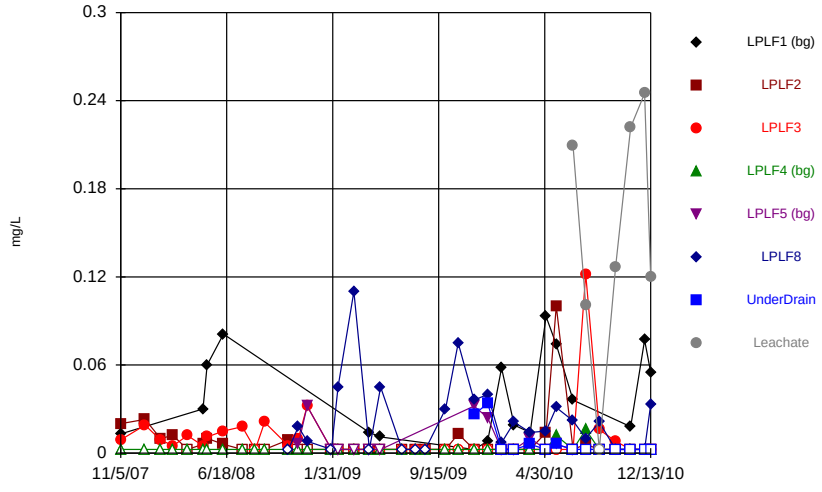

Constituent: Nitrite Analysis Run 01/25/2011 1:17 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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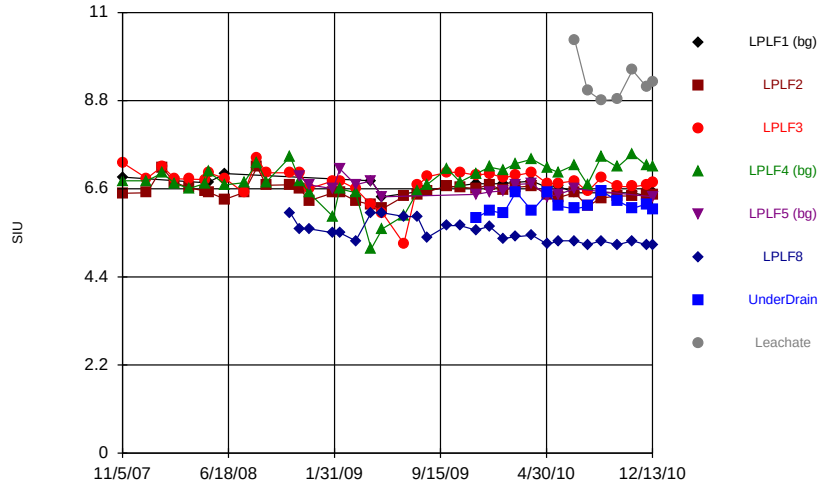
Time Series



Constituent: pH Analysis Run 01/25/2011 1:17 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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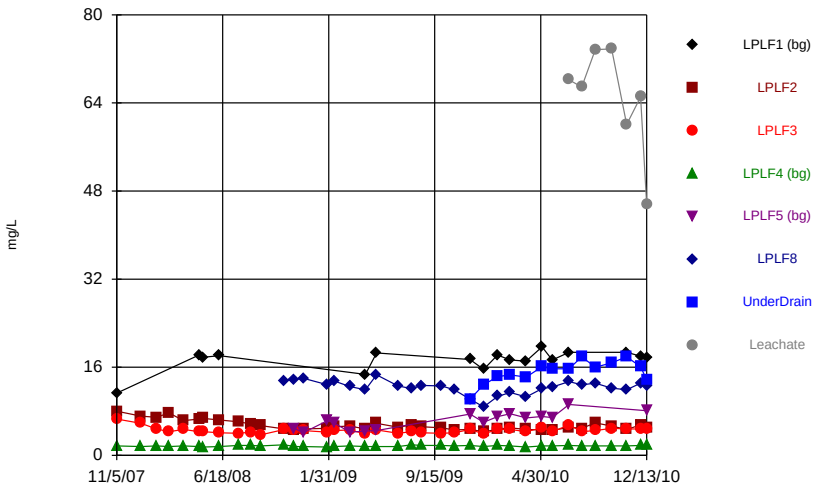
Time Series



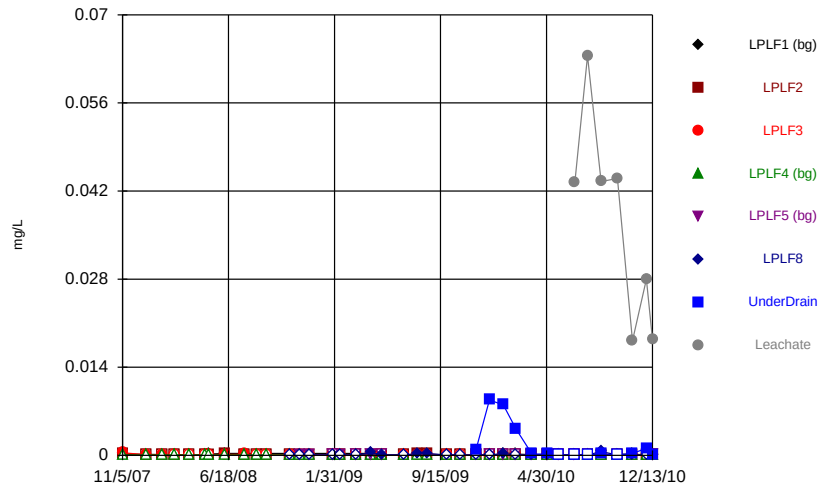
Constituent: Potassium Analysis Run 01/25/2011 1:18 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Hollow symbols indicate censored values.

Time Series

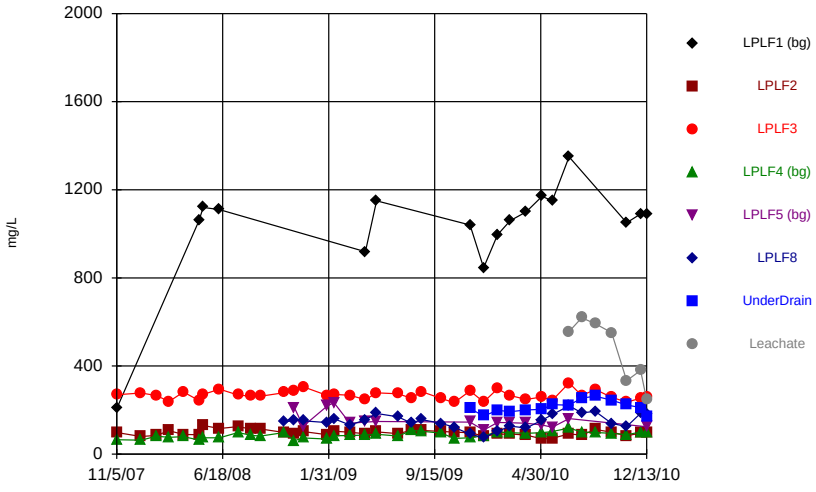


Constituent: Selenium Analysis Run 01/25/2011 1:18 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Time Series

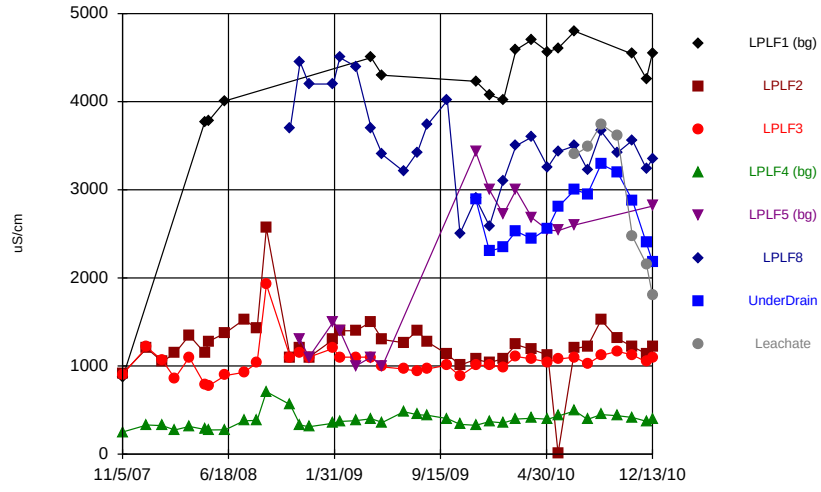


Constituent: Sodium Analysis Run 01/25/2011 1:18 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Time Series

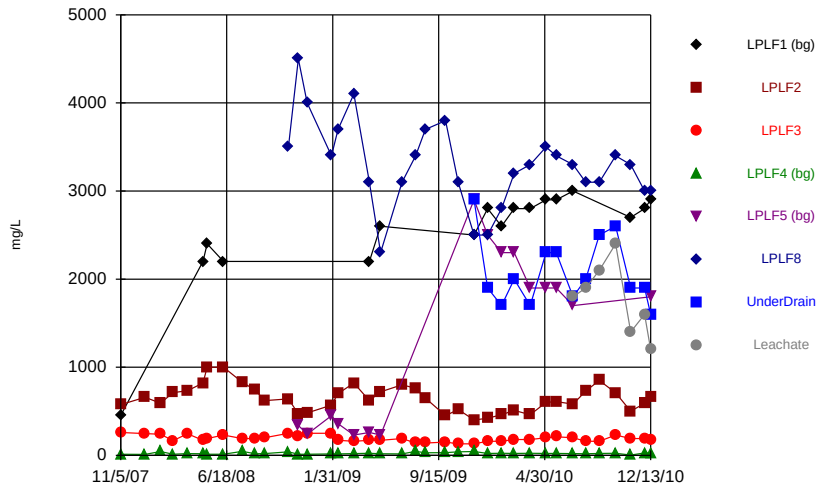


Constituent: Specific Conductance Analysis Run 01/25/2011 1:18 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Time Series



Constituent: Sulfate Analysis Run 01/25/2011 1:18 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

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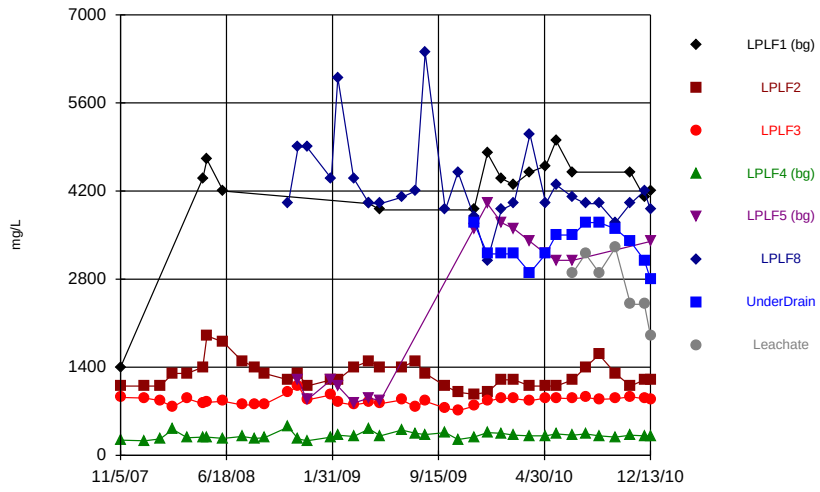
Time Series



Constituent: TDS Analysis Run 01/25/2011 1:18 PM

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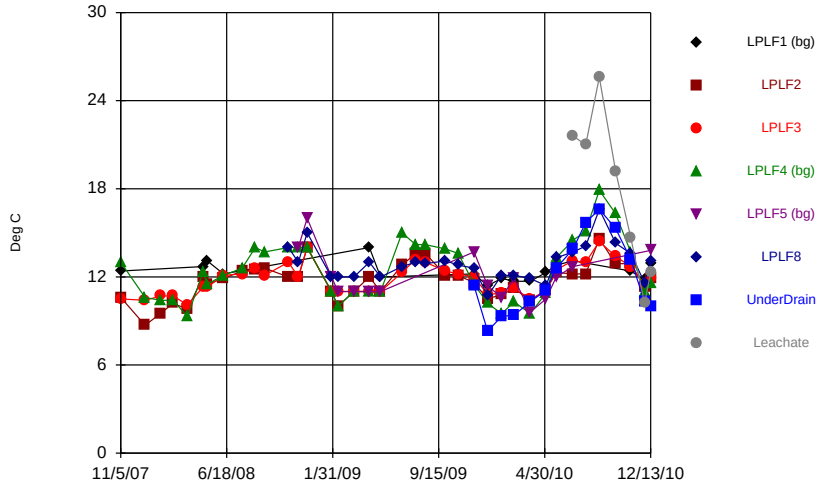
Time Series



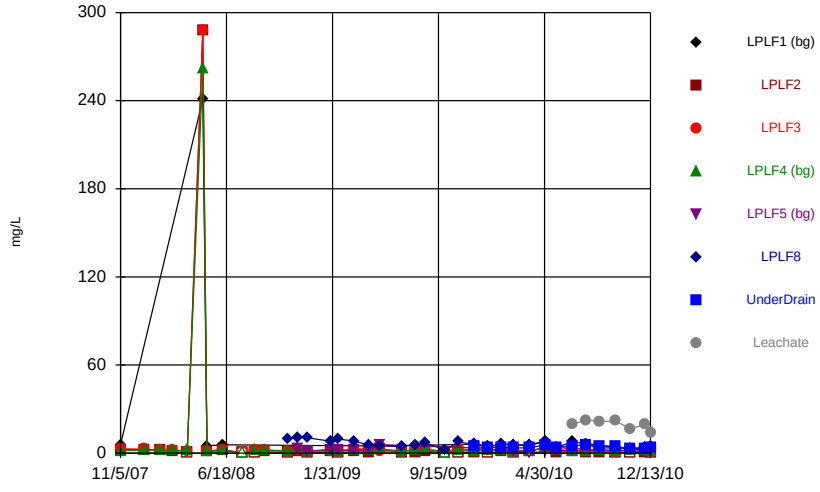
Constituent: Temperature Analysis Run 01/25/2011 1:18 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Hollow symbols indicate censored values.

Time Series

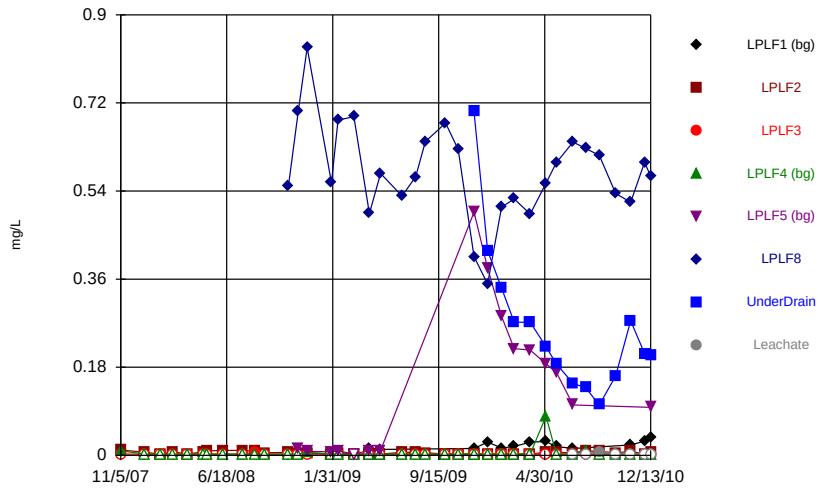


Constituent: TOC Analysis Run 01/25/2011 1:18 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Time Series



Constituent: Zinc Analysis Run 01/25/2011 1:18 PM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Appendix C
Test for Trend via Mann-Kendall/Sen's Slope

Legend for Sen's Slope Evaluation:

Slope: The calculated "best fit" line for the well-constituent pair.

Mann-K: The Mann-Kendall statistic.

Critical: The critical value to which the Mann-Kendall statistic is compared. When the Mann-Kendall statistic exceeds the critical value, a trend is identified.

Trend: Indicates if a statistically significant trend has been identified.

N: Number of data points used for the evaluation.

Alpha: An alpha value of 0.05 indicates a 5% probability that a trend will be incorrectly indentified.

Sen's Slope plots are presented for well-constituent pairs where statistically-significant trends were identified. Refer to Table 4-1 for significant cases.

Appendix C - Mann-Kendall Trend Results via Sanitas

Constituent Name	Well	Slope	Mann-Kendall	Critical Value	Trend	N	Alpha
Ammonia (mg/L)	LPLF1 (bg)	-0.3699	-44	-49	No	17	0.05
Ammonia (mg/L)	LPLF2	0.1116	206	158	Yes	38	0.05
Ammonia (mg/L)	LPLF3	0.05941	83	158	No	38	0.05
Ammonia (mg/L)	LPLF4 (bg)	-0.04807	-236	-158	Yes	38	0.05
Ammonia (mg/L)	LPLF5 (bg)	0.05548	18	45	No	16	0.05
Ammonia (mg/L)	LPLF8	-0.1417	-28	-96	No	27	0.05
Ammonia (mg/L)	UnderDrain	0.5863	35	37	No	14	0.05
Ammonia (mg/L)	Leachate	0.08022	1	15	No	7	0.05
Bicarbonate (mg/L)	LPLF1 (bg)	0	-2	-49	No	17	0.05
Bicarbonate (mg/L)	LPLF2	29.8	230	158	Yes	38	0.05
Bicarbonate (mg/L)	LPLF3	47.1	454	158	Yes	38	0.05
Bicarbonate (mg/L)	LPLF4 (bg)	22.08	307	158	Yes	38	0.05
Bicarbonate (mg/L)	LPLF5 (bg)	-96.35	-51	-45	Yes	16	0.05
Bicarbonate (mg/L)	LPLF8	-42.75	-95	-96	No	27	0.05
Bicarbonate (mg/L)	UnderDrain	269.5	27	37	No	14	0.05
Bicarbonate (mg/L)	Leachate	64.18	11	15	No	7	0.05
Cadmium (mg/L)	LPLF1 (bg)	0.0000765	40	49	No	17	0.05
Cadmium (mg/L)	LPLF2	-0.00006919	-378	-158	Yes	38	0.05
Cadmium (mg/L)	LPLF3	-0.000009656	-131	-158	No	38	0.05
Cadmium (mg/L)	LPLF4 (bg)	-0.000009682	-133	-158	No	38	0.05
Cadmium (mg/L)	LPLF5 (bg)	0.0001438	46	45	Yes	16	0.05
Cadmium (mg/L)	LPLF8	-0.0001095	-36	-96	No	27	0.05
Cadmium (mg/L)	UnderDrain	-0.001239	-57	-37	Yes	14	0.05
Cadmium (mg/L)	Leachate	-0.0003476	-7	-15	No	7	0.05
Calcium (mg/L)	LPLF1 (bg)	16.51	26	49	No	17	0.05
Calcium (mg/L)	LPLF2	-19.37	-222	-158	Yes	38	0.05
Calcium (mg/L)	LPLF3	3.185	210	158	Yes	38	0.05
Calcium (mg/L)	LPLF4 (bg)	-1.412	-275	-158	Yes	38	0.05
Calcium (mg/L)	LPLF5 (bg)	271.1	32	45	No	16	0.05
Calcium (mg/L)	LPLF8	-32.9	-123	-96	Yes	27	0.05
Calcium (mg/L)	UnderDrain	-3.578	-3	-37	No	14	0.05
Calcium (mg/L)	Leachate	-139.4	-9	-15	No	7	0.05
Carbonate (mg/L)	LPLF3	0	-107	-158	No	38	0.05
Carbonate (mg/L)	Leachate	-38.58	-9	-15	No	7	0.05
Chloride (mg/L)	LPLF1 (bg)	-1.304	-92	-49	Yes	17	0.05
Chloride (mg/L)	LPLF2	0.0548	91	158	No	38	0.05
Chloride (mg/L)	LPLF3	0	-19	-158	No	38	0.05
Chloride (mg/L)	LPLF4 (bg)	0	-39	-158	No	38	0.05
Chloride (mg/L)	LPLF5 (bg)	2.253	23	45	No	16	0.05
Chloride (mg/L)	LPLF8	-1.712	-121	-96	Yes	27	0.05
Chloride (mg/L)	UnderDrain	-5.118	-22	-37	No	14	0.05
Chloride (mg/L)	Leachate	-63.73	-13	-15	No	7	0.05
Dis. Arsenic (mg/L)	LPLF1 (bg)	-0.0002761	-85	-49	Yes	17	0.05
Dis. Arsenic (mg/L)	LPLF2	-0.00008346	-251	-158	Yes	38	0.05
Dis. Arsenic (mg/L)	LPLF3	-0.0001409	-392	-158	Yes	38	0.05
Dis. Arsenic (mg/L)	LPLF4 (bg)	-0.00003373	-201	-158	Yes	38	0.05
Dis. Arsenic (mg/L)	LPLF5 (bg)	-0.0009233	-89	-45	Yes	16	0.05
Dis. Arsenic (mg/L)	LPLF8	0.001197	54	96	No	27	0.05
Dis. Arsenic (mg/L)	UnderDrain	-0.0001046	-19	-37	No	14	0.05
Dis. Arsenic (mg/L)	Leachate	-0.002028	-10	-15	No	7	0.05
Dis. Barium (mg/L)	LPLF1 (bg)	-0.006871	-79	-49	Yes	17	0.05
Dis. Barium (mg/L)	LPLF2	-0.006677	-200	-158	Yes	38	0.05
Dis. Barium (mg/L)	LPLF3	-0.002296	-91	-158	No	38	0.05
Dis. Barium (mg/L)	LPLF4 (bg)	0.0007652	33	158	No	38	0.05
Dis. Barium (mg/L)	LPLF5 (bg)	-0.02484	-101	-45	Yes	16	0.05
Dis. Barium (mg/L)	LPLF8	-0.004571	-245	-96	Yes	27	0.05
Dis. Barium (mg/L)	UnderDrain	-0.00149	-9	-37	No	14	0.05
Dis. Barium (mg/L)	Leachate	0.02374	1	15	No	7	0.05

Appendix C - Mann-Kendall Trend Results via Sanitas

Constituent Name	Well	Slope	Mann-Kendall	Critical Value	Trend	N	Alpha
Dis. Boron (mg/L)	LPLF1 (bg)	0.026	20	49	No	17	0.05
Dis. Boron (mg/L)	LPLF2	-0.001877	-49	-158	No	38	0.05
Dis. Boron (mg/L)	LPLF3	0	8	158	No	38	0.05
Dis. Boron (mg/L)	LPLF4 (bg)	0.0395	431	158	Yes	38	0.05
Dis. Boron (mg/L)	LPLF5 (bg)	0.002065	4	45	No	16	0.05
Dis. Boron (mg/L)	LPLF8	0.07189	81	96	No	27	0.05
Dis. Boron (mg/L)	UnderDrain	0.006661	1	37	No	14	0.05
Dis. Boron (mg/L)	Leachate	0.2147	1	15	No	7	0.05
Dis. Chromium (mg/L)	LPLF1 (bg)	0	-28	-45	No	16	0.05
Dis. Chromium (mg/L)	Leachate	0.005703	2	15	No	7	0.05
Dis. Hardness (mg/L)	LPLF1 (bg)	67.51	43	49	No	17	0.05
Dis. Hardness (mg/L)	LPLF2	-47.01	-147	-158	No	38	0.05
Dis. Hardness (mg/L)	LPLF3	15.99	262	158	Yes	38	0.05
Dis. Hardness (mg/L)	LPLF4 (bg)	-3.206	-237	-158	Yes	38	0.05
Dis. Hardness (mg/L)	LPLF5 (bg)	986.3	32	45	No	16	0.05
Dis. Hardness (mg/L)	LPLF8	-116.3	-134	-96	Yes	27	0.05
Dis. Hardness (mg/L)	UnderDrain	-83.5	-9	-37	No	14	0.05
Dis. Hardness (mg/L)	Leachate	-185.8	-1	-15	No	7	0.05
Dis. Lead (mg/L)	LPLF1 (bg)	0	-21	-49	No	17	0.05
Dis. Mercury (mg/L)	LPLF1 (bg)	0	-23	-49	No	17	0.05
Dis. Mercury (mg/L)	LPLF2	0	80	158	No	38	0.05
Dis. Mercury (mg/L)	LPLF5 (bg)	0	2	45	No	16	0.05
Dis. Mercury (mg/L)	LPLF8	0	60	96	No	27	0.05
Dis. Mercury (mg/L)	UnderDrain	0	-11	-37	No	14	0.05
Dis. Mercury (mg/L)	Leachate	-0.00002199	-2	-15	No	7	0.05
Dis. Silver (mg/L)	LPLF1 (bg)	0	-47	-49	No	17	0.05
Dis. Silver (mg/L)	LPLF2	0	-26	-158	No	38	0.05
Dis. Silver (mg/L)	LPLF3	0	-46	-145	No	36	0.05
Dis. Silver (mg/L)	LPLF8	0	-45	-96	No	27	0.05
Dis. Silver (mg/L)	UnderDrain	0	-17	-37	No	14	0.05
Dis. Silver (mg/L)	Leachate	0	-4	-15	No	7	0.05
Dis. Sulfite (mg/L)	LPLF3	0	-137	-158	No	38	0.05
Fluoride (mg/L)	LPLF1 (bg)	-0.03911	-76	-49	Yes	17	0.05
Fluoride (mg/L)	LPLF2	-0.009432	-256	-158	Yes	38	0.05
Fluoride (mg/L)	LPLF3	-0.0154	-297	-158	Yes	38	0.05
Fluoride (mg/L)	LPLF4 (bg)	-0.0167	-203	-158	Yes	38	0.05
Fluoride (mg/L)	LPLF5 (bg)	0.02571	24	45	No	16	0.05
Fluoride (mg/L)	LPLF8	-0.05328	-173	-96	Yes	27	0.05
Fluoride (mg/L)	UnderDrain	-0.1043	-37	-37	No	14	0.05
Fluoride (mg/L)	Leachate	-0.6021	-9	-15	No	7	0.05
Iron (mg/L)	LPLF1 (bg)	1.726	78	49	Yes	17	0.05
Iron (mg/L)	LPLF2	0.118	258	158	Yes	38	0.05
Iron (mg/L)	LPLF3	-0.006581	-166	-158	Yes	38	0.05
Iron (mg/L)	LPLF4 (bg)	-0.06011	-417	-158	Yes	38	0.05
Iron (mg/L)	LPLF5 (bg)	0.6665	19	45	No	16	0.05
Iron (mg/L)	LPLF8	-170.5	-186	-96	Yes	27	0.05
Iron (mg/L)	UnderDrain	9.76	35	37	No	14	0.05
Iron (mg/L)	Leachate	-2.848	-11	-15	No	7	0.05
Magnesium (mg/L)	LPLF1 (bg)	10.58	100	49	Yes	17	0.05
Magnesium (mg/L)	LPLF2	-0.2897	-15	-158	No	38	0.05
Magnesium (mg/L)	LPLF3	1.867	382	158	Yes	38	0.05
Magnesium (mg/L)	LPLF4 (bg)	0.03219	62	158	No	38	0.05
Magnesium (mg/L)	LPLF5 (bg)	77.31	41	45	No	16	0.05
Magnesium (mg/L)	LPLF8	-4.977	-75	-96	No	27	0.05
Magnesium (mg/L)	UnderDrain	36.74	21	37	No	14	0.05
Magnesium (mg/L)	Leachate	33.88	18	15	Yes	7	0.05
Manganese (mg/L)	LPLF1 (bg)	-0.09368	-17	-49	No	17	0.05
Manganese (mg/L)	LPLF2	0.1938	187	158	Yes	38	0.05

Appendix C - Mann-Kendall Trend Results via Sanitas

Constituent Name	Well	Slope	Mann-Kendall	Critical Value	Trend	N	Alpha
Manganese (mg/L)	LPLF3	0.01237	102	158	No	38	0.05
Manganese (mg/L)	LPLF4 (bg)	-0.03068	-242	-158	Yes	38	0.05
Manganese (mg/L)	LPLF5 (bg)	2.598	20	45	No	16	0.05
Manganese (mg/L)	LPLF8	-1.77	-126	-96	Yes	27	0.05
Manganese (mg/L)	UnderDrain	-1.448	-23	-37	No	14	0.05
Manganese (mg/L)	Leachate	0.3318	8	15	No	7	0.05
Nitrate (mg/L)	LPLF1 (bg)	0.9106	76	49	Yes	17	0.05
Nitrate (mg/L)	LPLF2	-0.09656	-320	-158	Yes	38	0.05
Nitrate (mg/L)	LPLF3	-0.2129	-290	-158	Yes	38	0.05
Nitrate (mg/L)	LPLF4 (bg)	0.04932	333	158	Yes	38	0.05
Nitrate (mg/L)	LPLF5 (bg)	0.01622	13	45	No	16	0.05
Nitrate (mg/L)	LPLF8	-0.02967	-93	-96	No	27	0.05
Nitrate (mg/L)	UnderDrain	-0.1792	-43	-37	Yes	14	0.05
Nitrate (mg/L)	Leachate	2.442	9	15	No	7	0.05
Nitrate-Nitrite (mg/L)	LPLF1 (bg)	0.8838	76	49	Yes	17	0.05
Nitrate-Nitrite (mg/L)	LPLF2	-0.1007	-330	-158	Yes	38	0.05
Nitrate-Nitrite (mg/L)	LPLF3	-0.2333	-299	-158	Yes	38	0.05
Nitrate-Nitrite (mg/L)	LPLF4 (bg)	0.05	340	158	Yes	38	0.05
Nitrate-Nitrite (mg/L)	LPLF5 (bg)	-0.01029	-7	-45	No	16	0.05
Nitrate-Nitrite (mg/L)	LPLF8	-0.04363	-103	-96	Yes	27	0.05
Nitrate-Nitrite (mg/L)	UnderDrain	-0.1792	-43	-37	Yes	14	0.05
Nitrate-Nitrite (mg/L)	Leachate	2.495	7	15	No	7	0.05
Nitrite (mg/L)	LPLF1 (bg)	0.006816	27	49	No	17	0.05
Nitrite (mg/L)	LPLF2	0	-152	-158	No	38	0.05
Nitrite (mg/L)	LPLF3	0	-202	-158	Yes	38	0.05
Nitrite (mg/L)	LPLF5 (bg)	0	-15	-45	No	16	0.05
Nitrite (mg/L)	LPLF8	0	-11	-96	No	27	0.05
Nitrite (mg/L)	UnderDrain	0	-33	-37	No	14	0.05
Nitrite (mg/L)	Leachate	0.08588	5	15	No	7	0.05
pH (SIU)	LPLF1 (bg)	-0.1243	-70	-49	Yes	17	0.05
pH (SIU)	LPLF2	-0.0491	-150	-158	No	38	0.05
pH (SIU)	LPLF3	-0.07249	-159	-158	Yes	38	0.05
pH (SIU)	LPLF4 (bg)	0.1629	207	158	Yes	38	0.05
pH (SIU)	LPLF5 (bg)	-0.1617	-42	-45	No	16	0.05
pH (SIU)	LPLF8	-0.2913	-211	-96	Yes	27	0.05
pH (SIU)	UnderDrain	0.1738	23	37	No	14	0.05
pH (SIU)	Leachate	0.2086	1	15	No	7	0.05
Potassium (mg/L)	LPLF1 (bg)	0.4029	28	49	No	17	0.05
Potassium (mg/L)	LPLF2	-0.6278	-313	-158	Yes	38	0.05
Potassium (mg/L)	LPLF3	0.07588	75	158	No	38	0.05
Potassium (mg/L)	LPLF4 (bg)	0	136	158	No	38	0.05
Potassium (mg/L)	LPLF5 (bg)	1.984	72	45	Yes	16	0.05
Potassium (mg/L)	LPLF8	-0.4484	-70	-96	No	27	0.05
Potassium (mg/L)	UnderDrain	4.368	46	37	Yes	14	0.05
Potassium (mg/L)	Leachate	-25.85	-9	-15	No	7	0.05
Selenium (mg/L)	LPLF1 (bg)	-0.00003891	-34	-49	No	17	0.05
Selenium (mg/L)	LPLF2	0	-77	-158	No	38	0.05
Selenium (mg/L)	LPLF3	0	-128	-158	No	38	0.05
Selenium (mg/L)	LPLF5 (bg)	0	-38	-45	No	16	0.05
Selenium (mg/L)	LPLF8	0	-14	-96	No	27	0.05
Selenium (mg/L)	UnderDrain	-0.0008172	-30	-37	No	14	0.05
Selenium (mg/L)	Leachate	-0.08329	-9	-15	No	7	0.05
Sodium (mg/L)	LPLF1 (bg)	52.35	35	49	No	17	0.05
Sodium (mg/L)	LPLF2	-4.73	-146	-158	No	38	0.05
Sodium (mg/L)	LPLF3	-3.596	-86	-158	No	38	0.05
Sodium (mg/L)	LPLF4 (bg)	9.635	322	158	Yes	38	0.05
Sodium (mg/L)	LPLF5 (bg)	-18.39	-44	-45	No	16	0.05
Sodium (mg/L)	LPLF8	8.747	29	96	No	27	0.05

Appendix C - Mann-Kendall Trend Results via Sanitas

Constituent Name	Well	Slope	Mann-Kendall	Critical Value	Trend	N	Alpha
Sodium (mg/L)	UnderDrain	39.05	27	37	No	14	0.05
Sodium (mg/L)	Leachate	-692.3	-15	-15	No	7	0.05
Specific Conductance (uS/cm)	LPLF1 (bg)	312.5	74	49	Yes	17	0.05
Specific Conductance (uS/cm)	LPLF2	-21.67	-43	-158	No	38	0.05
Specific Conductance (uS/cm)	LPLF3	29.99	126	158	No	38	0.05
Specific Conductance (uS/cm)	LPLF4 (bg)	41.54	283	158	Yes	38	0.05
Specific Conductance (uS/cm)	LPLF5 (bg)	839.9	34	45	No	16	0.05
Specific Conductance (uS/cm)	LPLF8	-352.3	-112	-96	Yes	27	0.05
Specific Conductance (uS/cm)	UnderDrain	523.2	17	37	No	14	0.05
Specific Conductance (uS/cm)	Leachate	-3844	-11	-15	No	7	0.05
Sulfate (mg/L)	LPLF1 (bg)	327.7	95	49	Yes	17	0.05
Sulfate (mg/L)	LPLF2	-41.91	-127	-158	No	38	0.05
Sulfate (mg/L)	LPLF3	-14.78	-164	-158	Yes	38	0.05
Sulfate (mg/L)	LPLF4 (bg)	2.92	170	158	Yes	38	0.05
Sulfate (mg/L)	LPLF5 (bg)	814.9	25	45	No	16	0.05
Sulfate (mg/L)	LPLF8	-262.6	-102	-96	Yes	27	0.05
Sulfate (mg/L)	UnderDrain	-114.4	-7	-37	No	14	0.05
Sulfate (mg/L)	Leachate	-1319	-7	-15	No	7	0.05
TDS (mg/L)	LPLF1 (bg)	127.5	26	49	No	17	0.05
TDS (mg/L)	LPLF2	0	-93	-158	No	38	0.05
TDS (mg/L)	LPLF3	15.63	95	158	No	38	0.05
TDS (mg/L)	LPLF4 (bg)	16.98	182	158	Yes	38	0.05
TDS (mg/L)	LPLF5 (bg)	1256	30	45	No	16	0.05
TDS (mg/L)	LPLF8	-217.7	-96	-96	No	27	0.05
TDS (mg/L)	UnderDrain	0	-5	-37	No	14	0.05
TDS (mg/L)	Leachate	-2317	-11	-15	No	7	0.05
Temperature (Deg C)	LPLF1 (bg)	-0.05852	-6	-49	No	17	0.05
Temperature (Deg C)	LPLF2	0.4184	179	158	Yes	38	0.05
Temperature (Deg C)	LPLF3	0.4011	199	158	Yes	38	0.05
Temperature (Deg C)	LPLF4 (bg)	0.4424	112	158	No	38	0.05
Temperature (Deg C)	LPLF5 (bg)	-0.3377	-13	-45	No	16	0.05
Temperature (Deg C)	LPLF8	0.1064	28	96	No	27	0.05
Temperature (Deg C)	UnderDrain	5.57	32	37	No	14	0.05
Temperature (Deg C)	Leachate	-23.95	-15	-15	No	7	0.05
TOC (mg/L)	LPLF1 (bg)	-0.6042	-35	-49	No	17	0.05
TOC (mg/L)	LPLF2	-0.231	-177	-158	Yes	38	0.05
TOC (mg/L)	LPLF3	0.06959	48	158	No	38	0.05
TOC (mg/L)	LPLF4 (bg)	-0.07449	-59	-158	No	38	0.05
TOC (mg/L)	LPLF5 (bg)	-0.5681	-45	-45	No	16	0.05
TOC (mg/L)	LPLF8	-2.802	-192	-96	Yes	27	0.05
TOC (mg/L)	UnderDrain	-0.1807	-7	-37	No	14	0.05
TOC (mg/L)	Leachate	-10.07	-11	-15	No	7	0.05
Zinc (mg/L)	LPLF1 (bg)	0.008115	40	34	Yes	13	0.05
Zinc (mg/L)	LPLF2	0	-102	-158	No	38	0.05
Zinc (mg/L)	LPLF4 (bg)	0	2	158	No	38	0.05
Zinc (mg/L)	LPLF5 (bg)	0.05275	27	45	No	16	0.05
Zinc (mg/L)	LPLF8	-0.03681	-59	-96	No	27	0.05
Zinc (mg/L)	UnderDrain	-0.3333	-48	-37	Yes	14	0.05
Zinc (mg/L)	Leachate	0	-2	-15	No	7	0.05

i. Trend results represent all possible well-constituent combinations where the number of detects was at least 10 percent or greater.

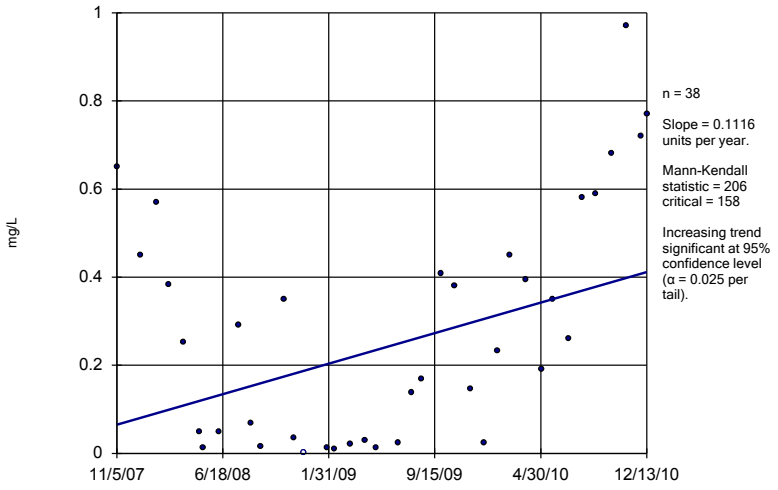
ii. Result is significant if trend value is "yes"; all cases with "no" are not statistically significant (i.e., not increasing or decreasing). If significant, a positive slope value represents an increasing trend, whereas a negative slope value represents a decreasing trend.

iii. Alpha set to 0.05 (or 95 percent confidence).

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF2



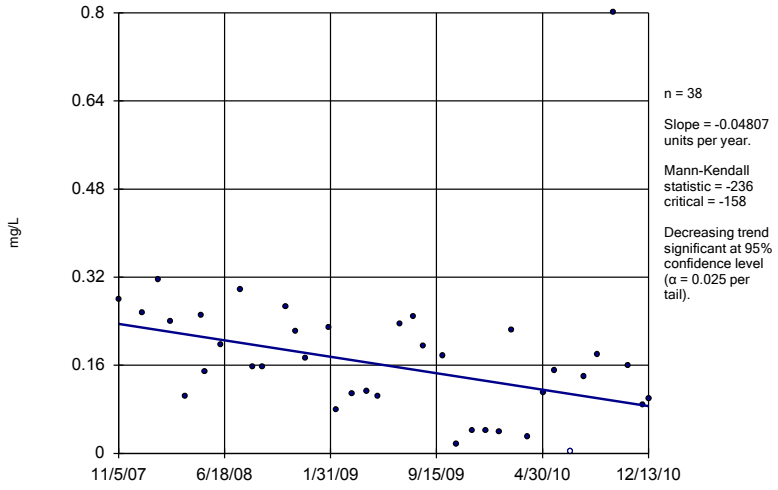
Constituent: Ammonia Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF4 (bg)



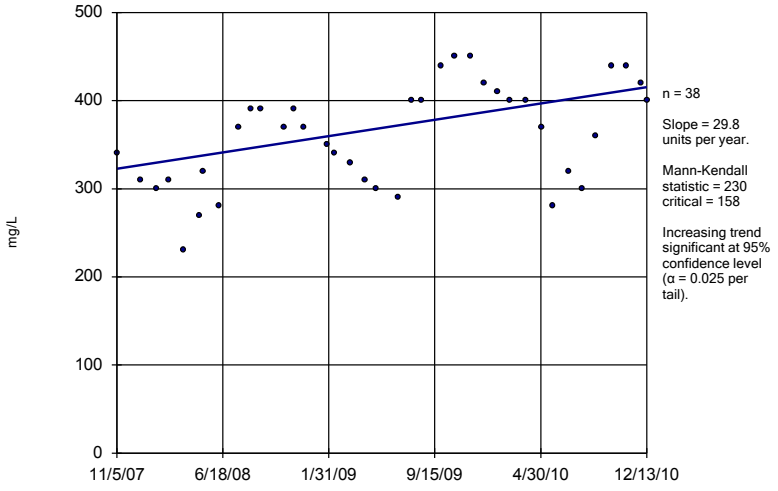
Constituent: Ammonia Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF2



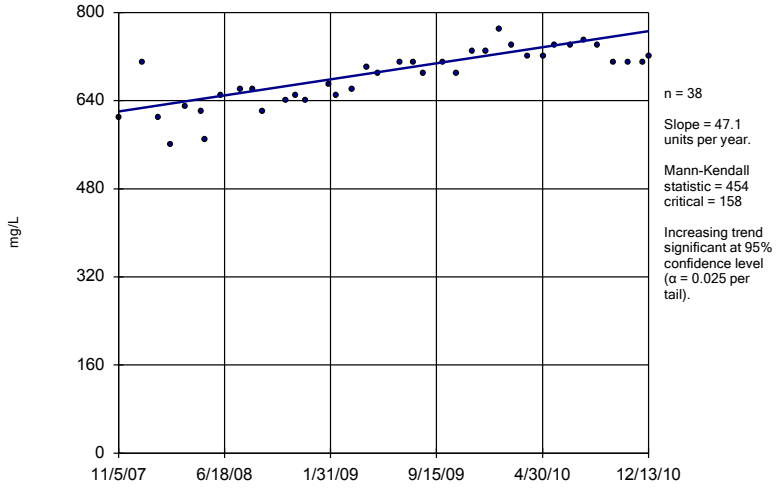
Constituent: Bicarbonate Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF3



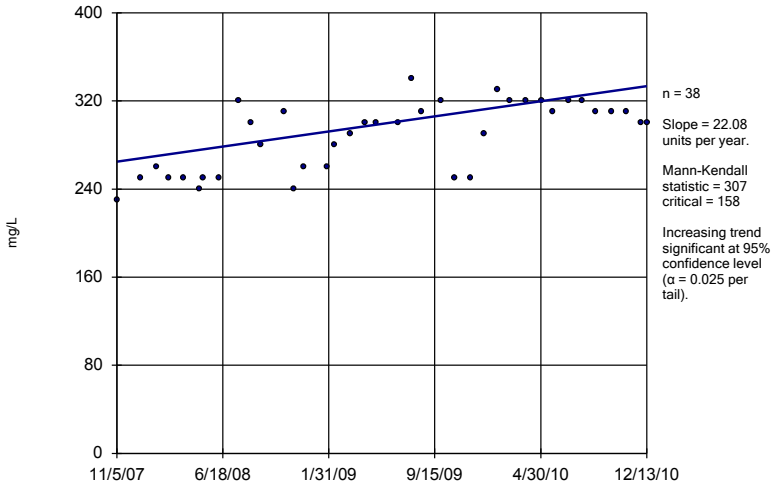
Constituent: Bicarbonate Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF4 (bg)



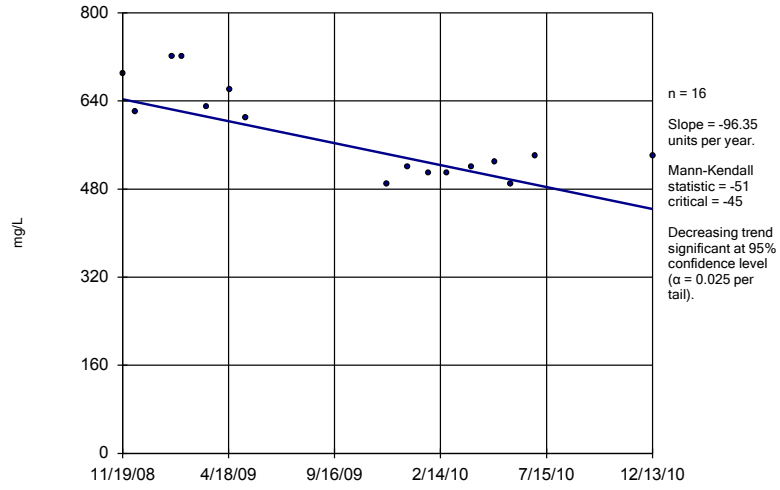
Constituent: Bicarbonate Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF5 (bg)



Constituent: Bicarbonate Analysis Run 2/10/2011 11:33 AM

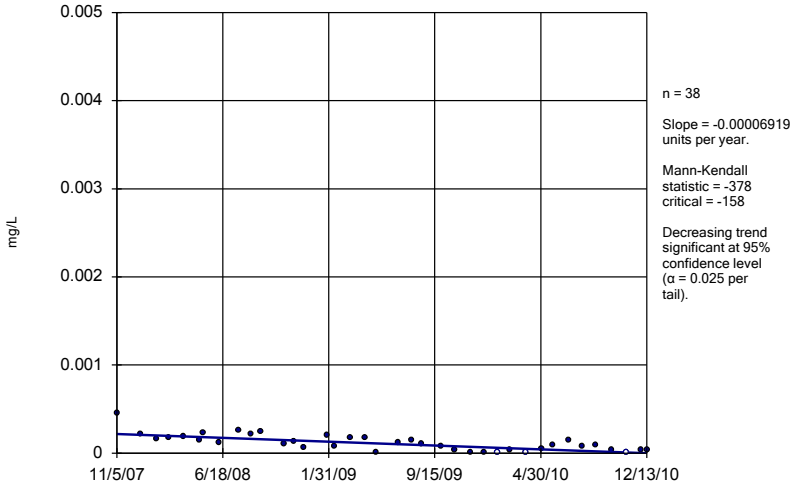
Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF2



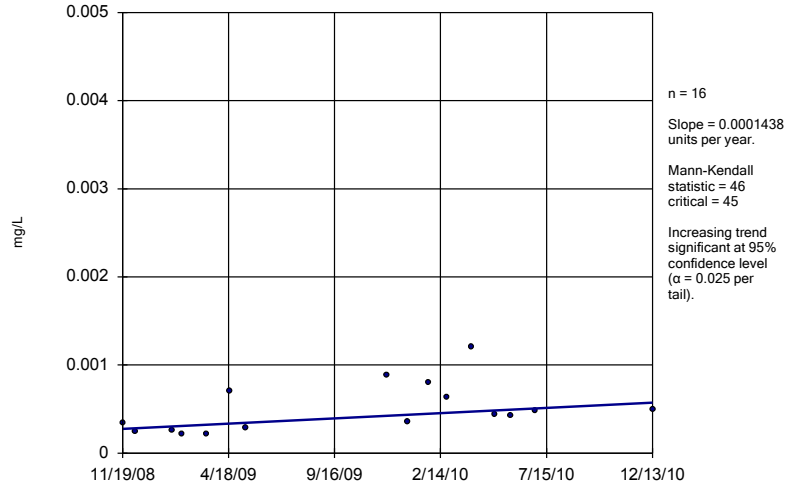
Constituent: Cadmium Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF5 (bg)

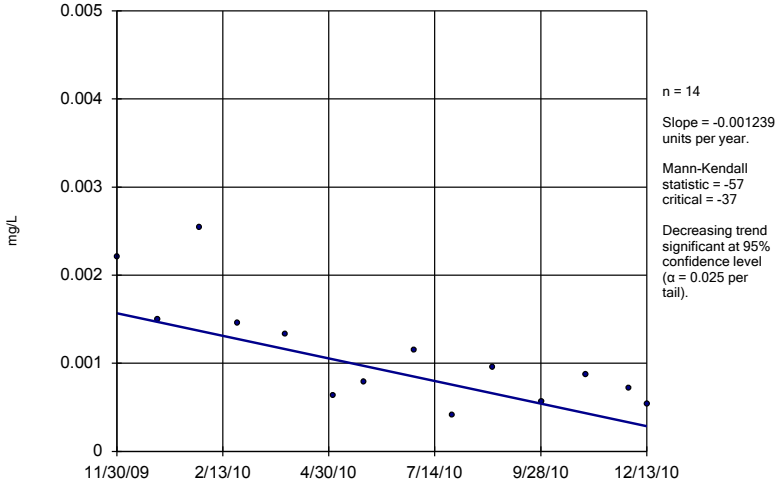


Constituent: Cadmium Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

UnderDrain



n = 14

Slope = -0.001239 units per year.

Mann-Kendall statistic = -57
critical = -37

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

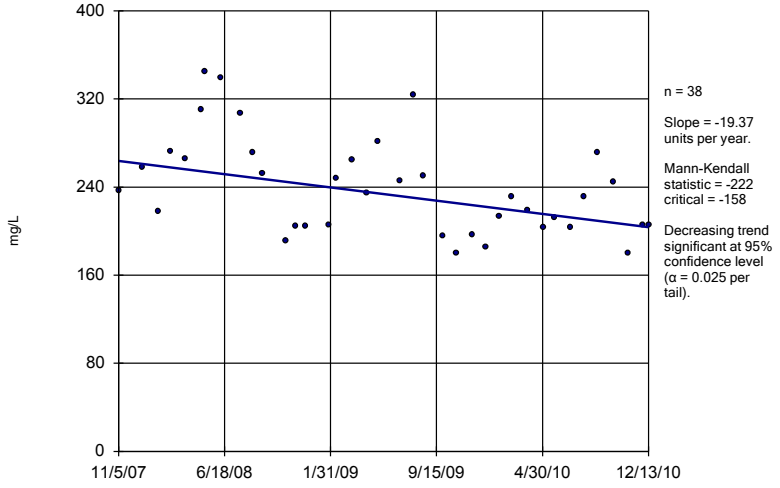
Constituent: Cadmium Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF2



n = 38

Slope = -19.37 units per year.

Mann-Kendall statistic = -222
critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

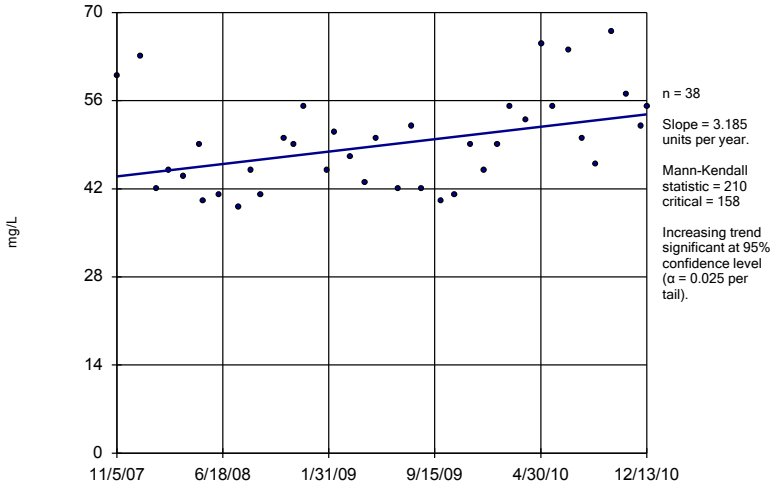
Constituent: Calcium Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF3



n = 38

Slope = 3.185 units per year.

Mann-Kendall statistic = 210
critical = 158

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

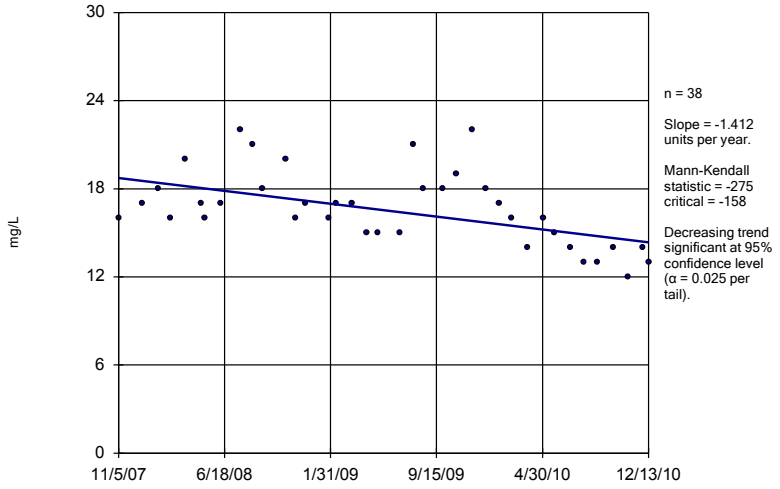
Constituent: Calcium Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = -1.412 units per year.

Mann-Kendall statistic = -275
critical = -158

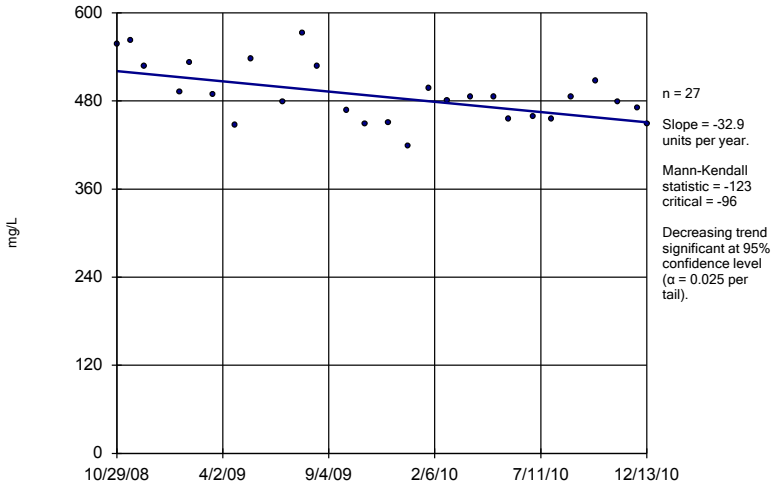
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Calcium Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF8



n = 27

Slope = -32.9 units per year.

Mann-Kendall statistic = -123 critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

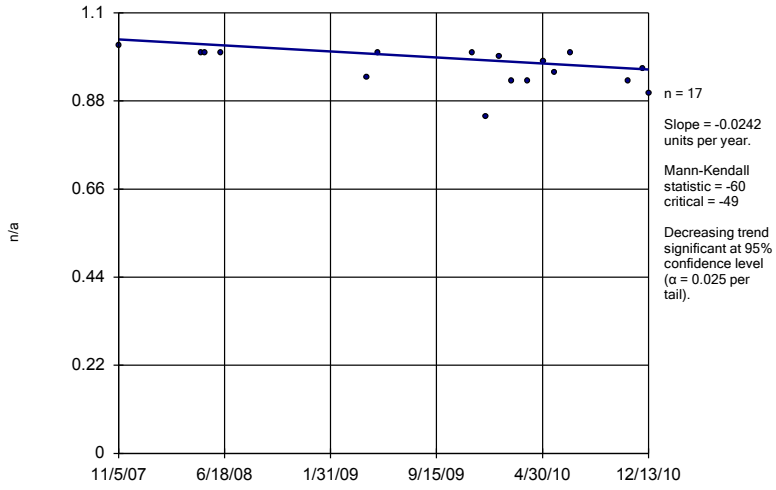
Constituent: Calcium Analysis Run 2/10/2011 11:33 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = -0.0242 units per year.

Mann-Kendall statistic = -60 critical = -49

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

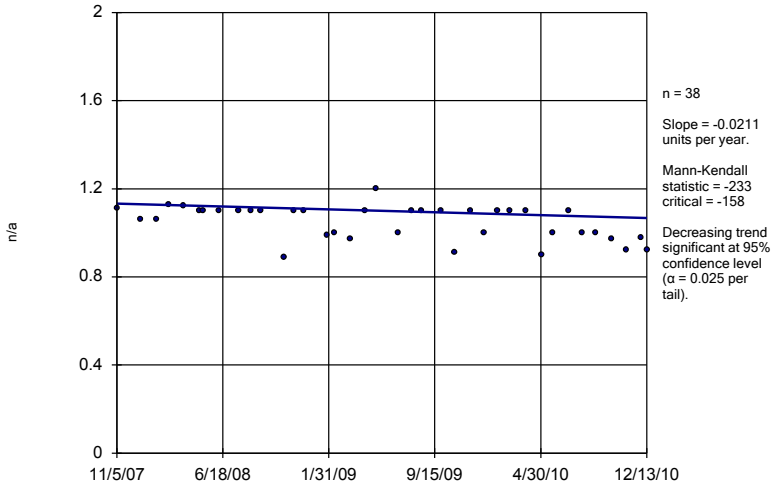
Constituent: Cation Balance Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF2



n = 38

Slope = -0.0211 units per year.

Mann-Kendall statistic = -233 critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

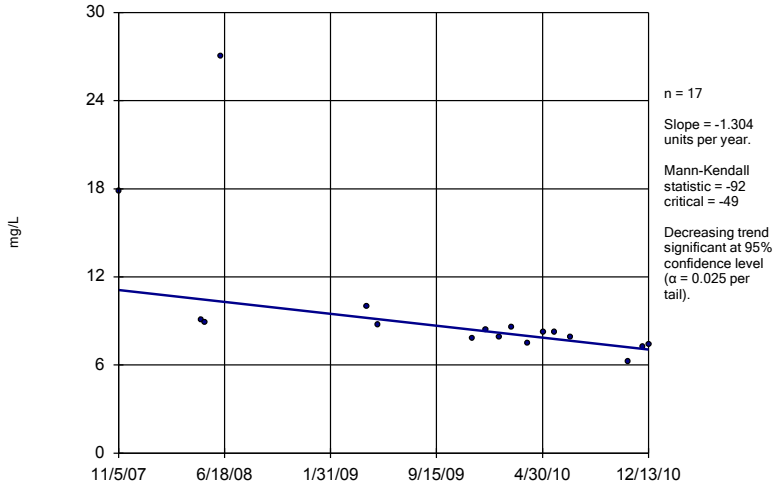
Constituent: Cation Balance Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = -1.304 units per year.

Mann-Kendall statistic = -92 critical = -49

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

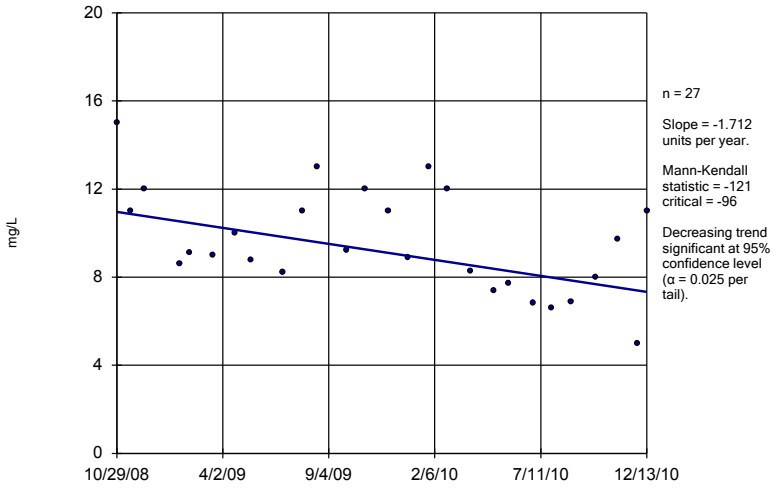
Constituent: Chloride Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF8



n = 27

Slope = -1.712 units per year.

Mann-Kendall statistic = -121
critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Chloride Analysis Run 2/10/2011 11:34 AM

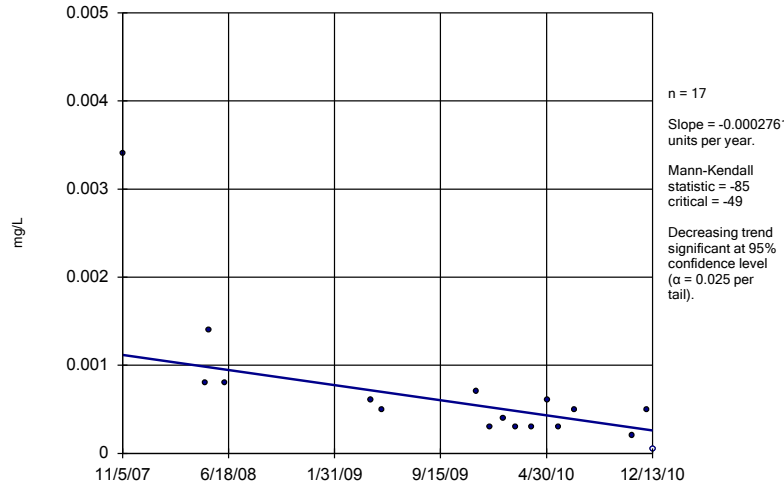
Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = -0.0002761 units per year.

Mann-Kendall statistic = -85
critical = -49

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Dis. Arsenic Analysis Run 2/10/2011 11:34 AM

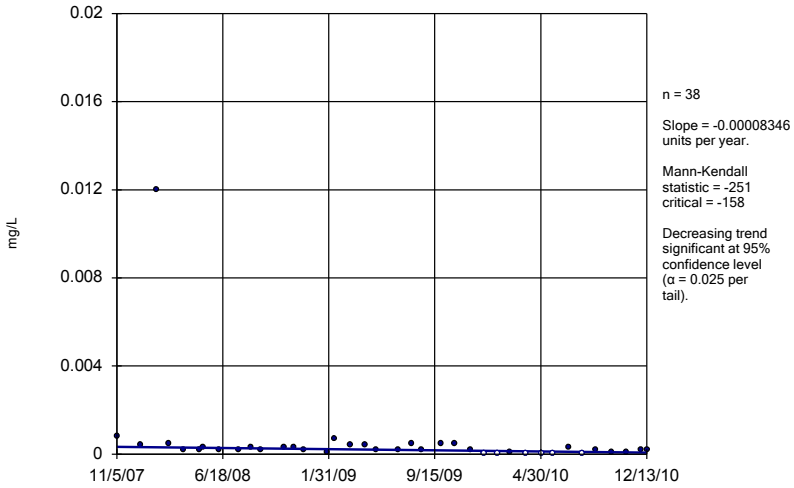
Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF2



n = 38

Slope = -0.00008346 units per year.

Mann-Kendall statistic = -251
critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Dis. Arsenic Analysis Run 2/10/2011 11:34 AM

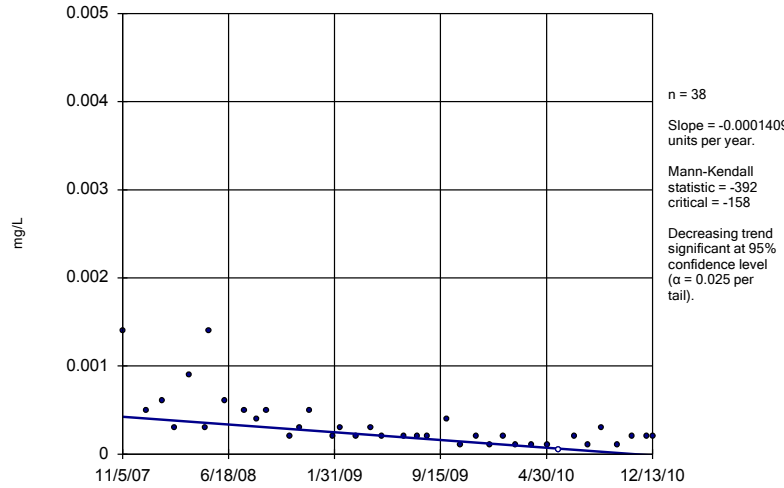
Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF3



n = 38

Slope = -0.0001409 units per year.

Mann-Kendall statistic = -392
critical = -158

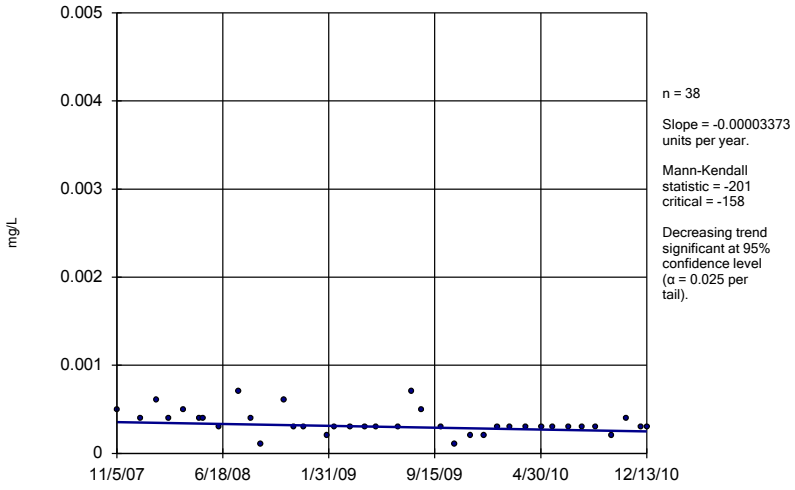
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Dis. Arsenic Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = -0.00003373 units per year.

Mann-Kendall statistic = -201 critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

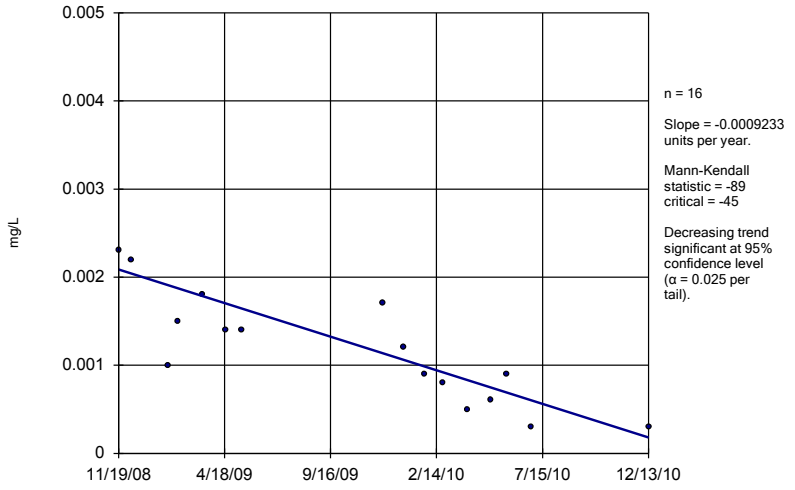
Constituent: Dis. Arsenic Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF5 (bg)



n = 16

Slope = -0.0009233 units per year.

Mann-Kendall statistic = -89 critical = -45

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

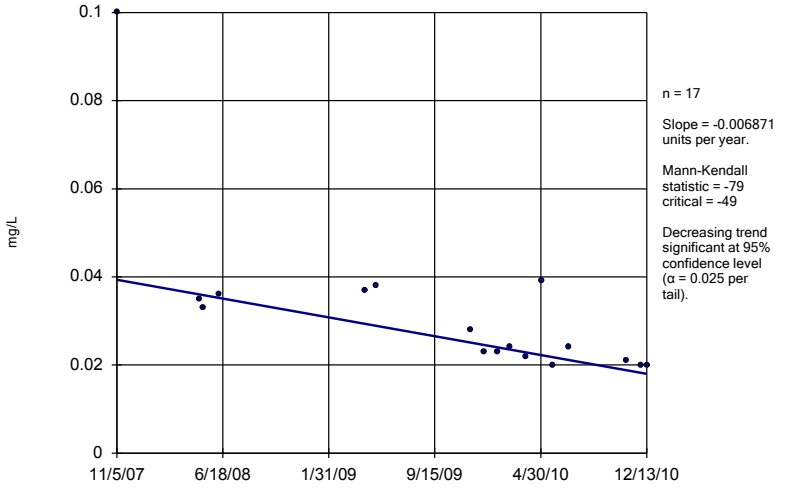
Constituent: Dis. Arsenic Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = -0.006871 units per year.

Mann-Kendall statistic = -79 critical = -49

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

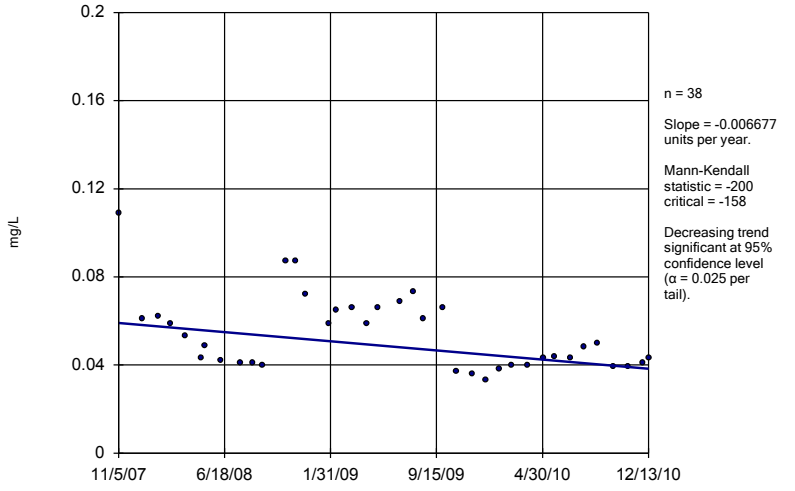
Constituent: Dis. Barium Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF2



n = 38

Slope = -0.006677 units per year.

Mann-Kendall statistic = -200 critical = -158

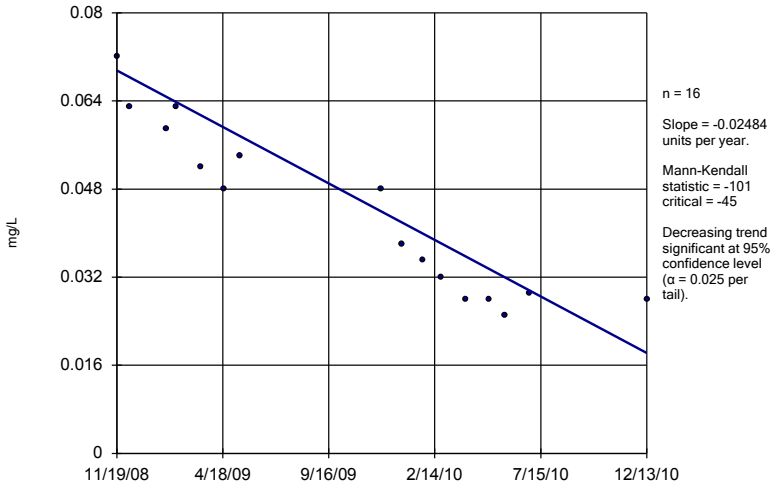
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Dis. Barium Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF5 (bg)



n = 16

Slope = -0.02484 units per year.

Mann-Kendall statistic = -101 critical = -45

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

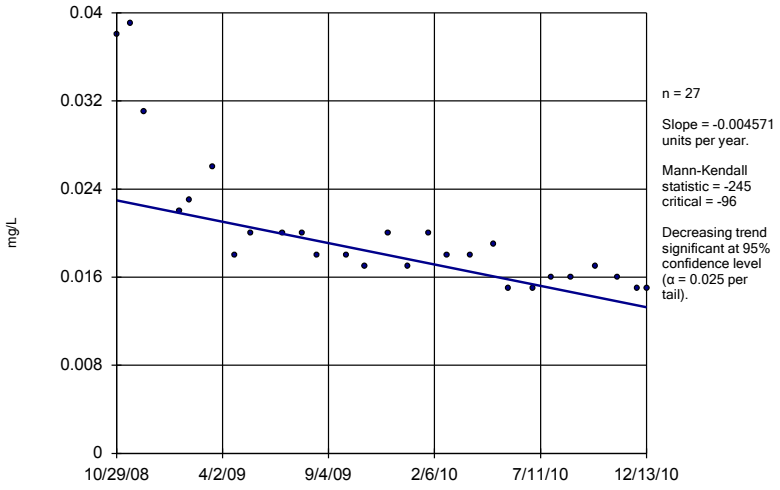
Constituent: Dis. Barium Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF8



n = 27

Slope = -0.004571 units per year.

Mann-Kendall statistic = -245 critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

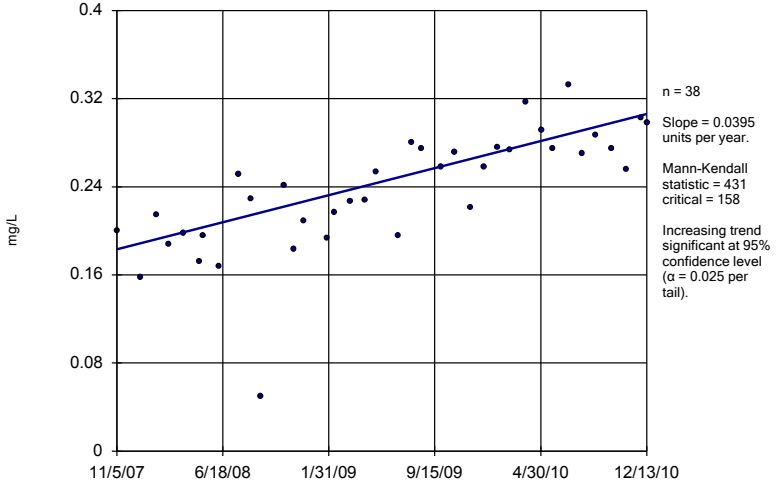
Constituent: Dis. Barium Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = 0.0395 units per year.

Mann-Kendall statistic = 431 critical = 158

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

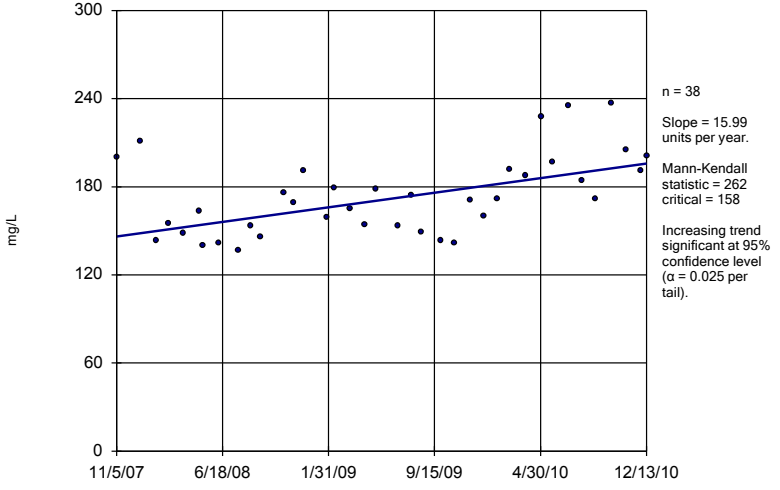
Constituent: Dis. Boron Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF3



n = 38

Slope = 15.99 units per year.

Mann-Kendall statistic = 262 critical = 158

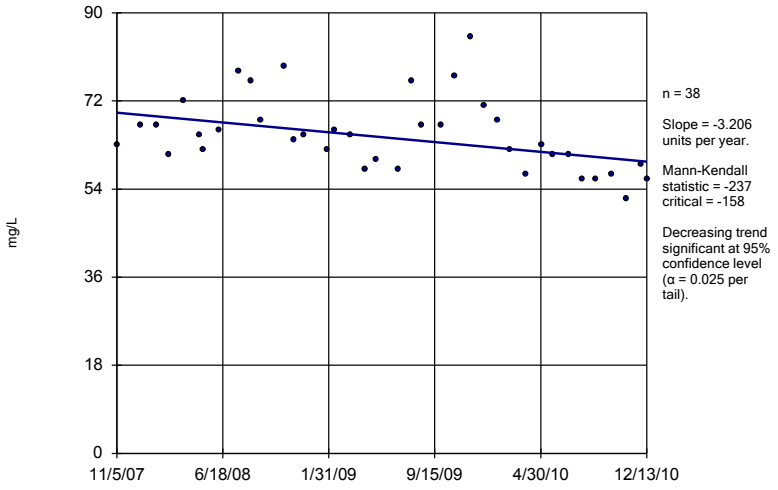
Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Dis. Hardness Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = -3.206 units per year.

Mann-Kendall statistic = -237
critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

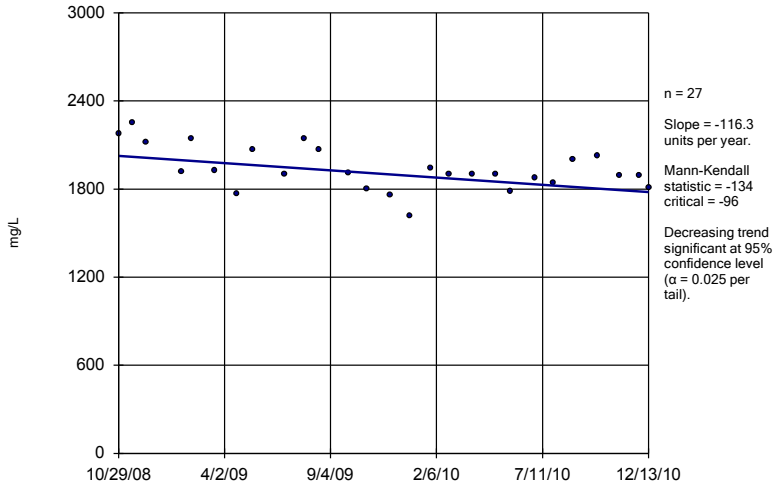
Constituent: Dis. Hardness Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF8



n = 27

Slope = -116.3 units per year.

Mann-Kendall statistic = -134
critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

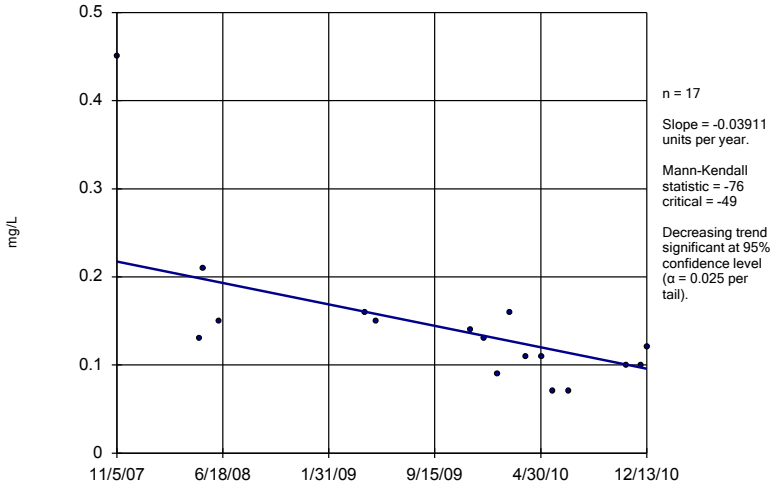
Constituent: Dis. Hardness Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = -0.03911 units per year.

Mann-Kendall statistic = -76
critical = -49

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

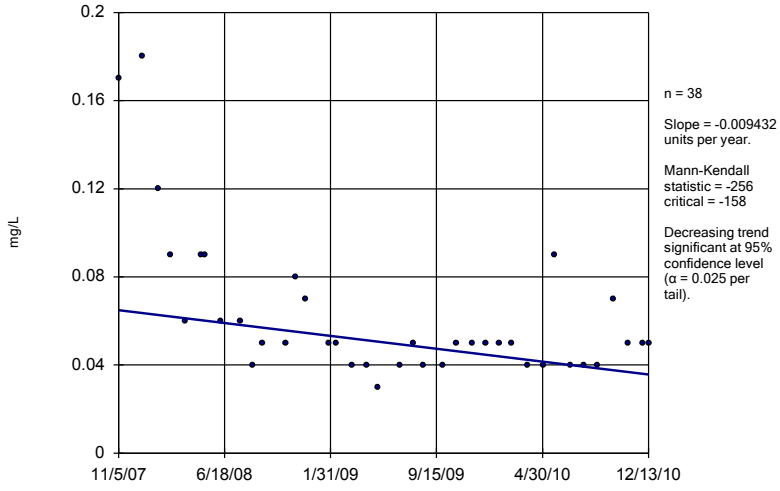
Constituent: Fluoride Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF2



n = 38

Slope = -0.009432 units per year.

Mann-Kendall statistic = -256
critical = -158

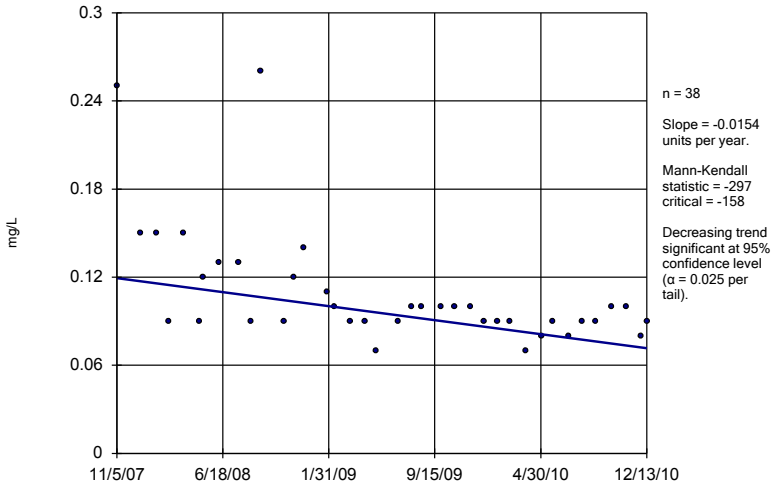
Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Fluoride Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF3



n = 38

Slope = -0.0154 units per year.

Mann-Kendall statistic = -297 critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

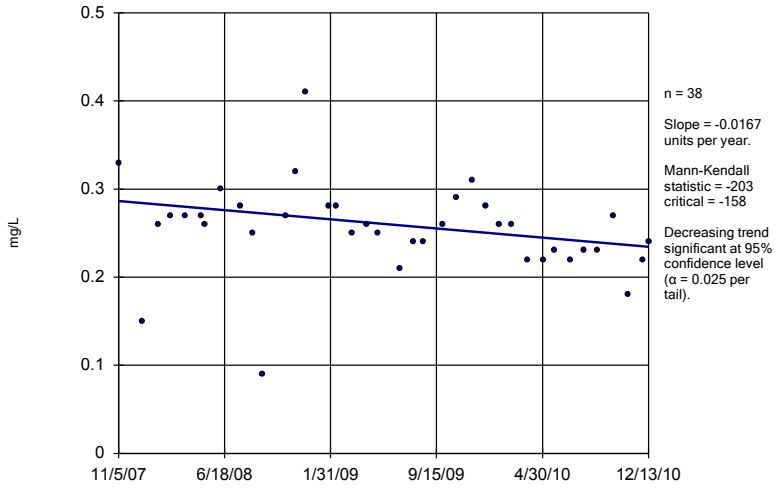
Constituent: Fluoride Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = -0.0167 units per year.

Mann-Kendall statistic = -203 critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

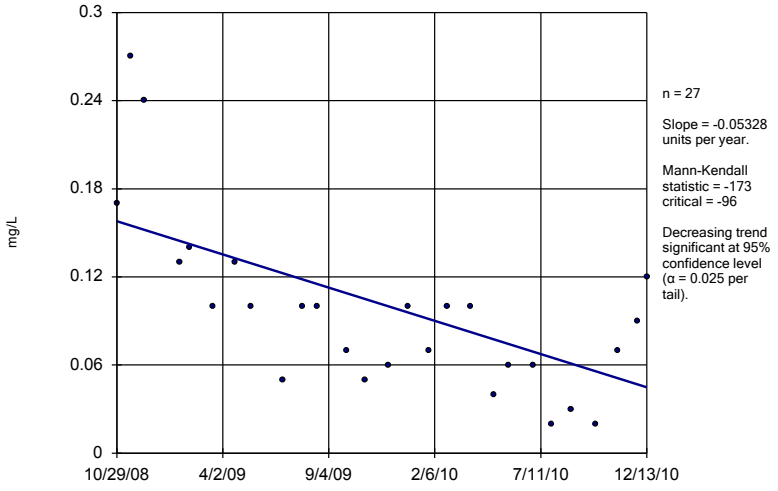
Constituent: Fluoride Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF8



n = 27

Slope = -0.05328 units per year.

Mann-Kendall statistic = -173 critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

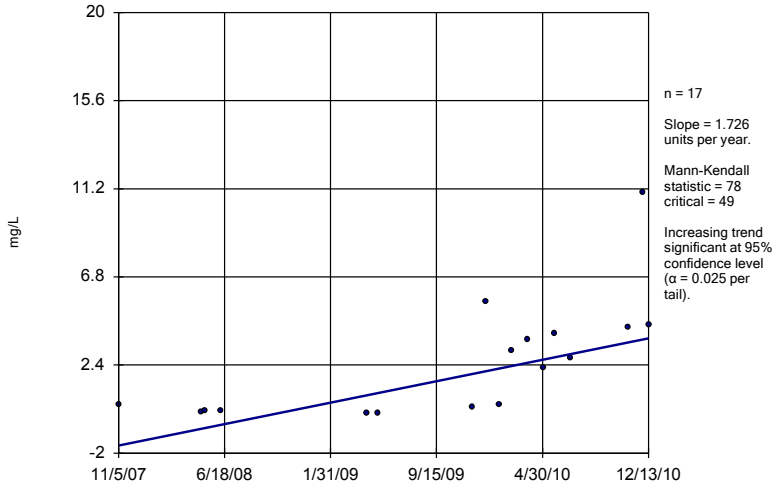
Constituent: Fluoride Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = 1.726 units per year.

Mann-Kendall statistic = 78 critical = 49

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

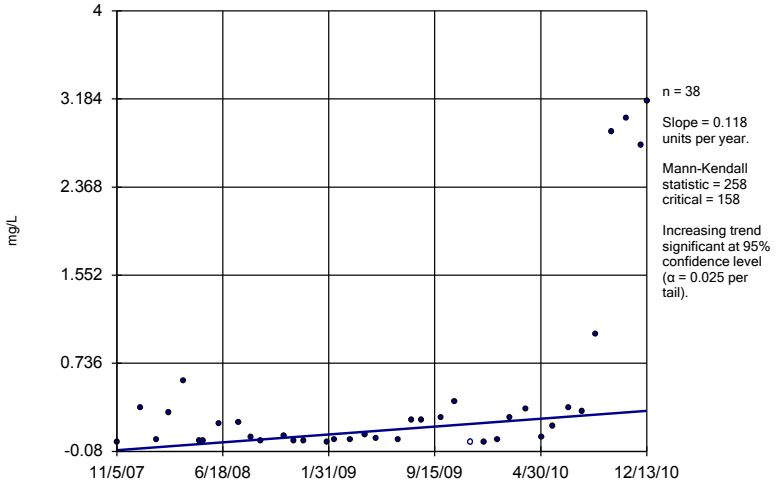
Constituent: Iron Analysis Run 2/10/2011 11:34 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF2



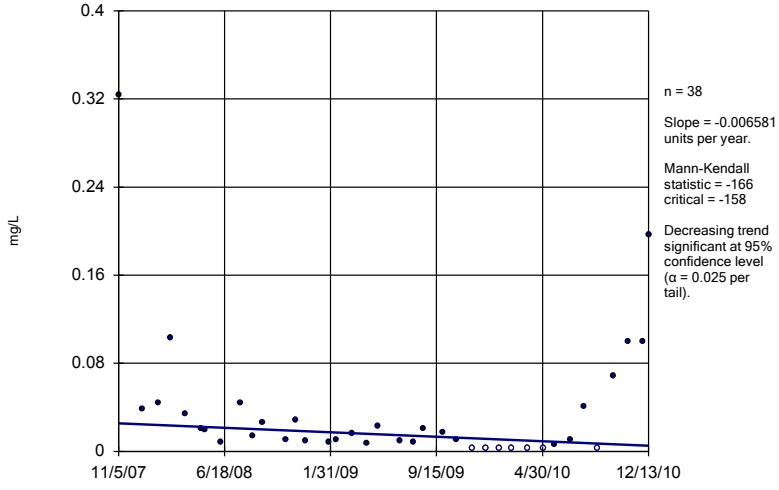
Constituent: Iron Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF3



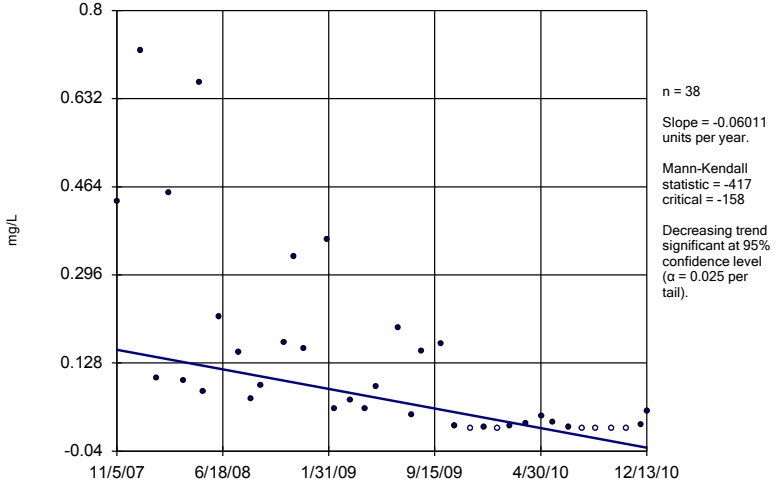
Constituent: Iron Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF4 (bg)



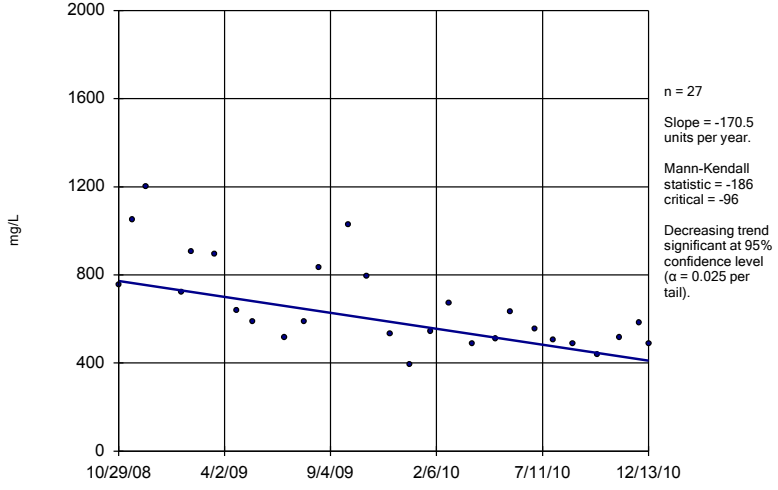
Constituent: Iron Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF8

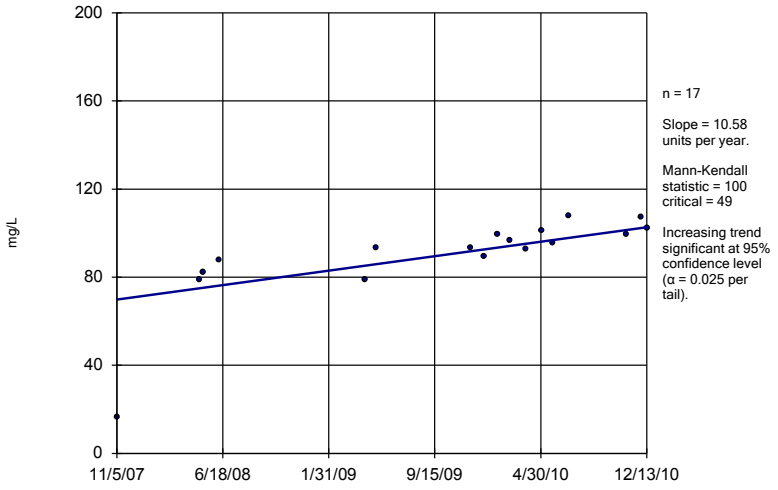


Constituent: Iron Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF1 (bg)



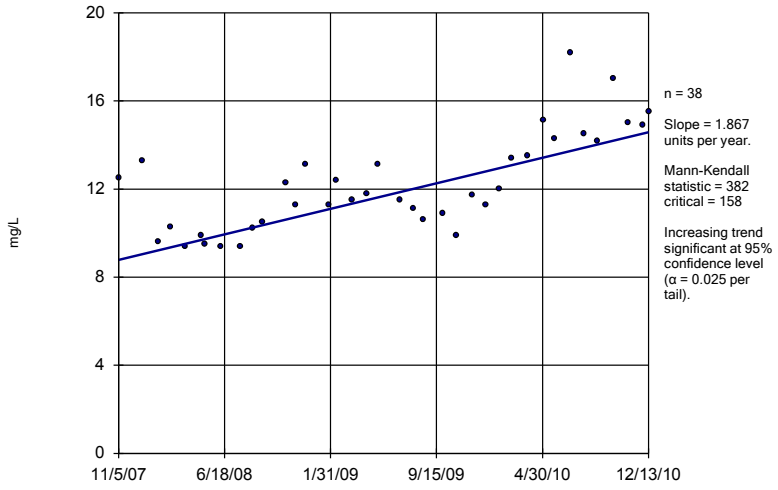
Constituent: Magnesium Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF3



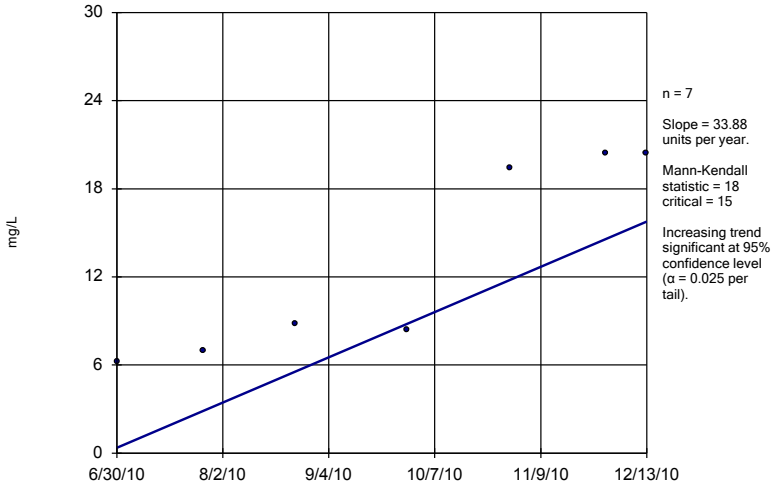
Constituent: Magnesium Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

Leachate



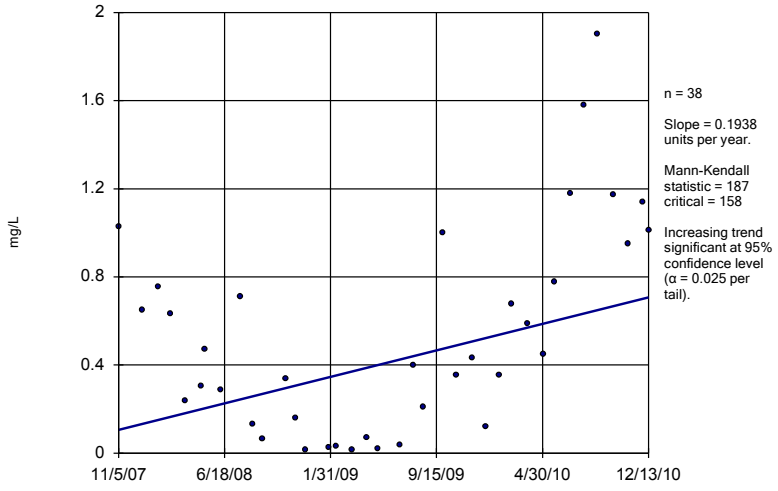
Constituent: Magnesium Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF2



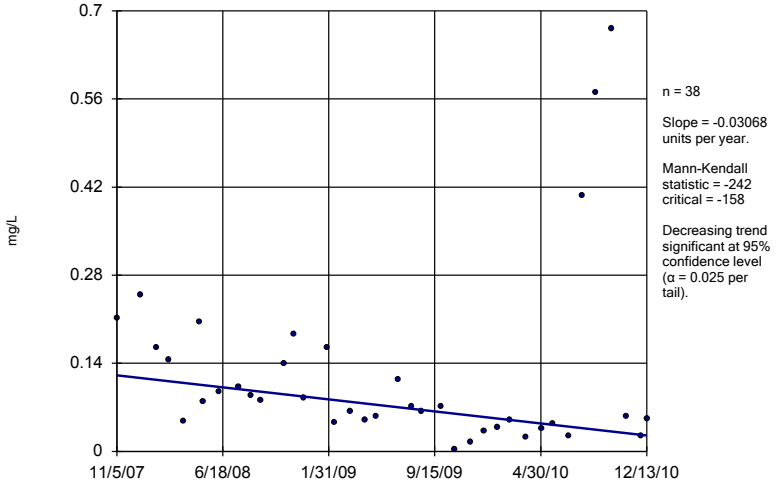
Constituent: Manganese Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = -0.03068 units per year.

Mann-Kendall statistic = -242 critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

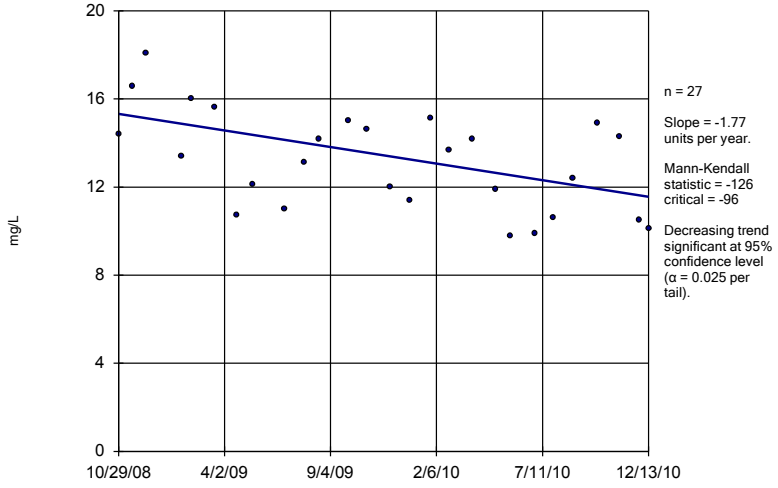
Constituent: Manganese Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF8



n = 27

Slope = -1.77 units per year.

Mann-Kendall statistic = -126 critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Manganese Analysis Run 2/10/2011 11:35 AM

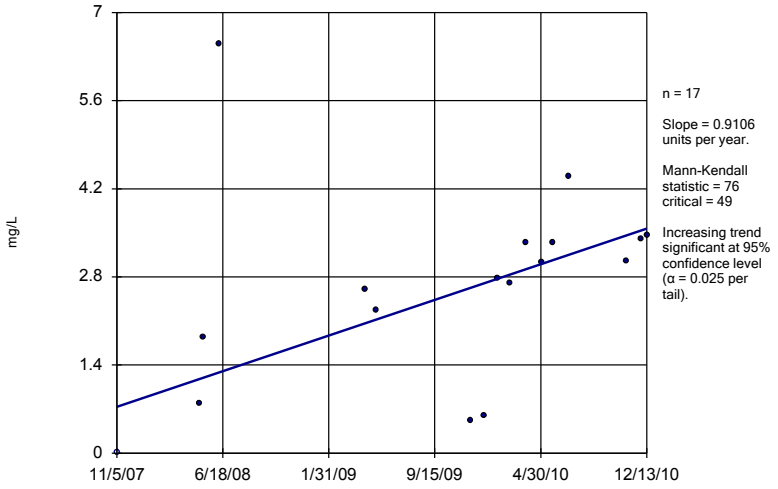
Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = 0.9106 units per year.

Mann-Kendall statistic = 76 critical = 49

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Nitrate Analysis Run 2/10/2011 11:35 AM

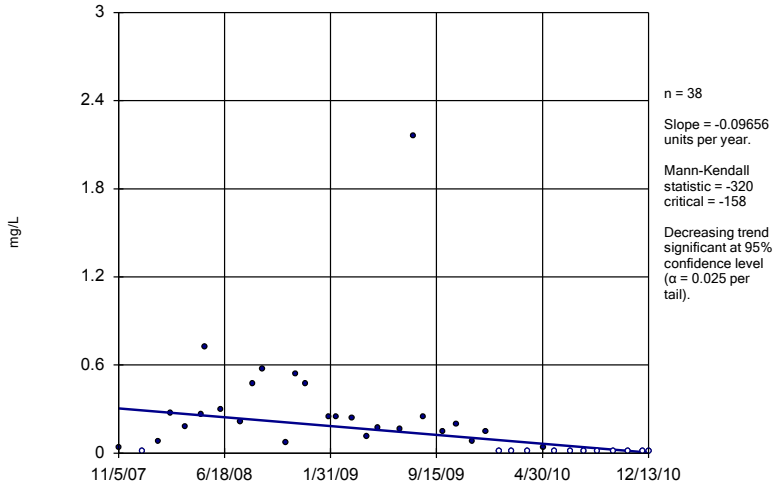
Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF2



n = 38

Slope = -0.09656 units per year.

Mann-Kendall statistic = -320 critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

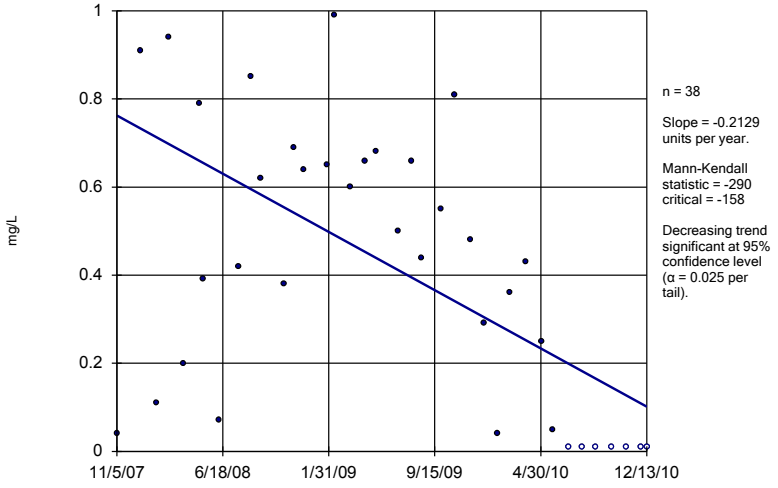
Constituent: Nitrate Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF3



n = 38

Slope = -0.2129 units per year.

Mann-Kendall statistic = -290
critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

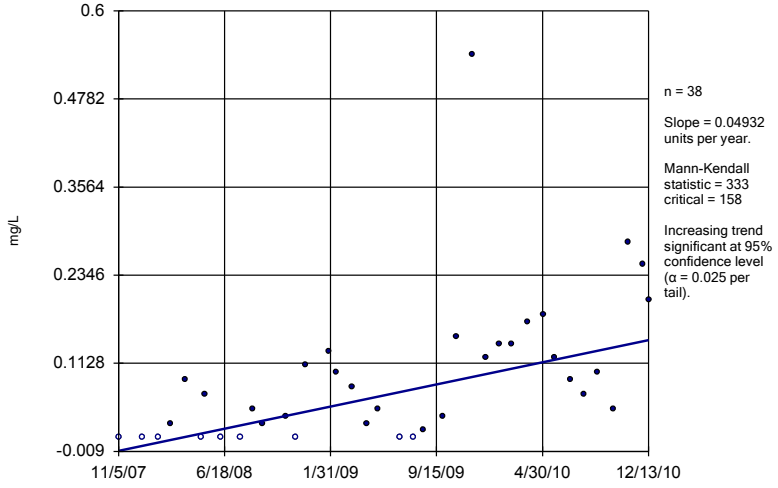
Constituent: Nitrate Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = 0.04932 units per year.

Mann-Kendall statistic = 333
critical = 158

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

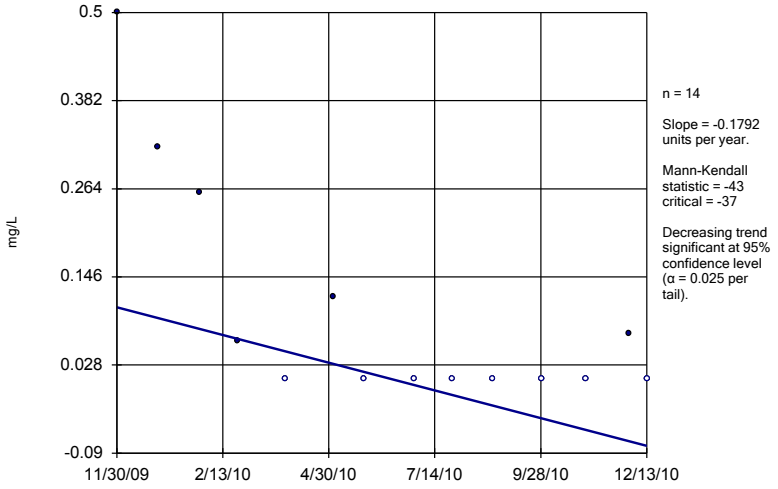
Constituent: Nitrate Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

UnderDrain



n = 14

Slope = -0.1792 units per year.

Mann-Kendall statistic = -43
critical = -37

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

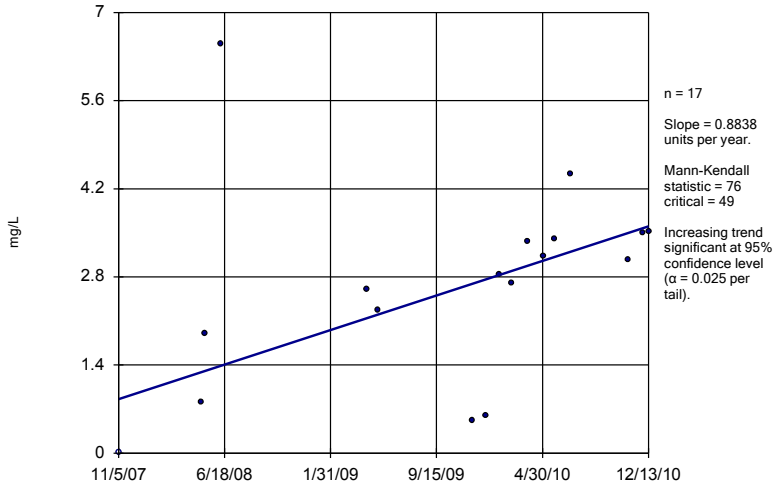
Constituent: Nitrate Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = 0.8838 units per year.

Mann-Kendall statistic = 76
critical = 49

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

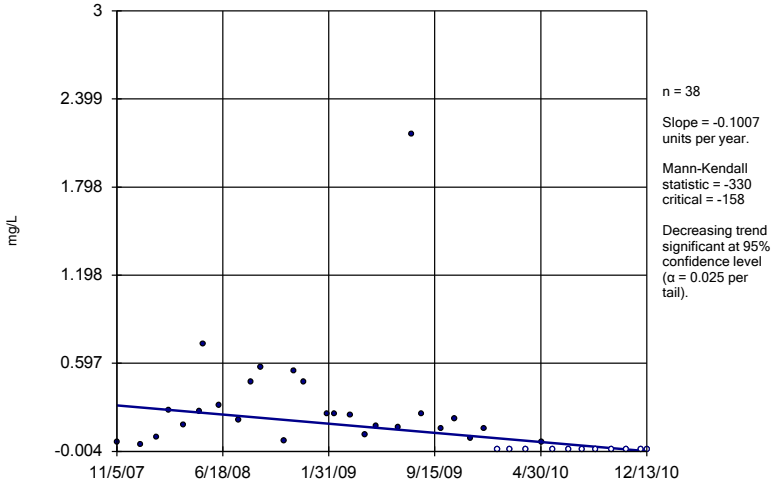
Constituent: Nitrate-Nitrite Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF2



n = 38

Slope = -0.1007 units per year.

Mann-Kendall statistic = -330
critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

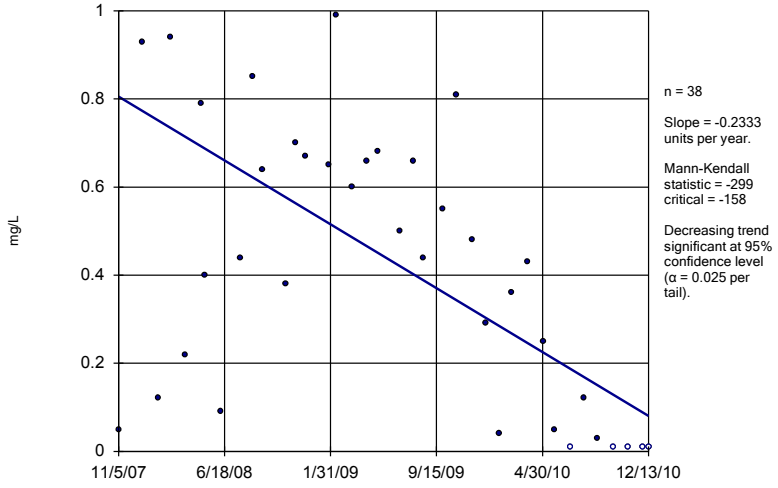
Constituent: Nitrate-Nitrite Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF3



n = 38

Slope = -0.2333 units per year.

Mann-Kendall statistic = -299
critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

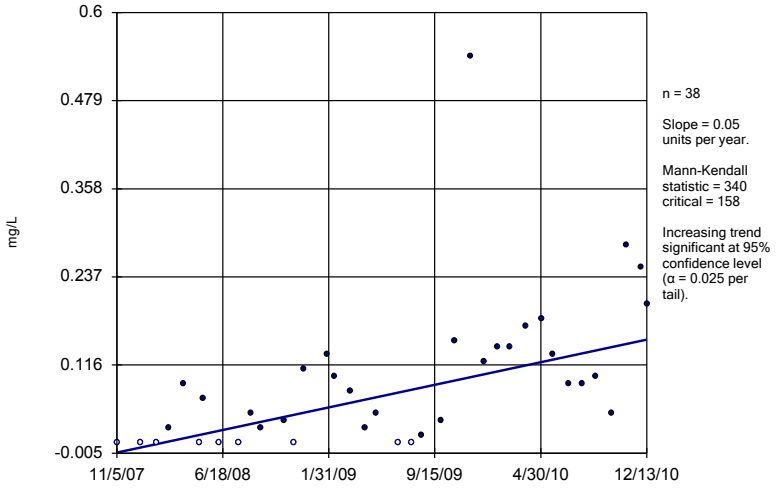
Constituent: Nitrate-Nitrite Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = 0.05 units per year.

Mann-Kendall statistic = 340
critical = 158

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

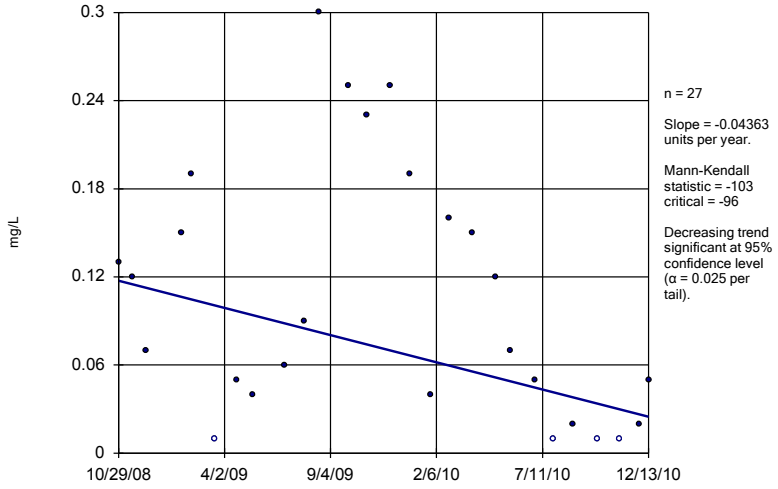
Constituent: Nitrate-Nitrite Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF8



n = 27

Slope = -0.04363 units per year.

Mann-Kendall statistic = -103
critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

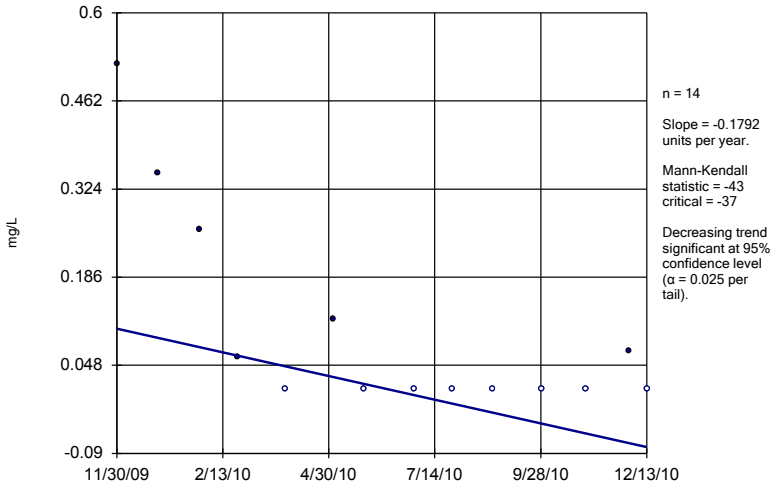
Constituent: Nitrate-Nitrite Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

UnderDrain



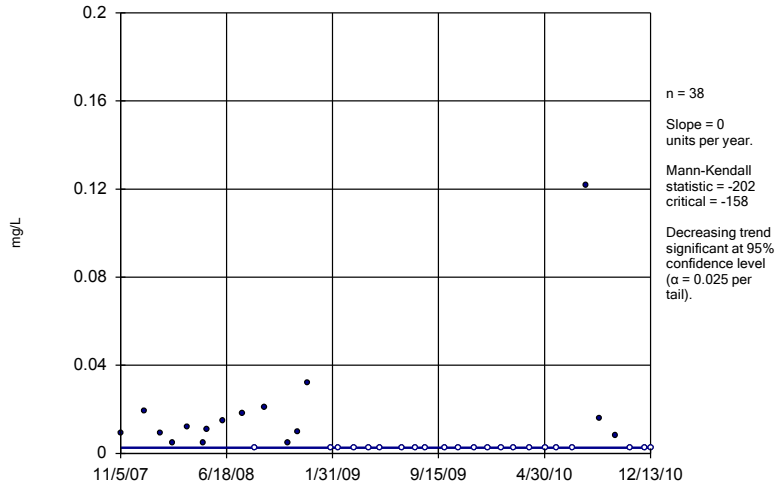
Constituent: Nitrate-Nitrite Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA
Hollow symbols indicate censored values.

Sen's Slope Estimator

LPLF3



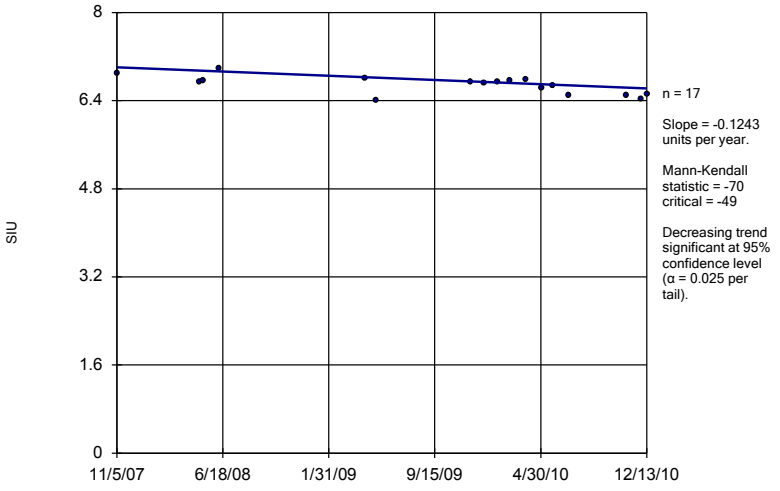
Constituent: Nitrite Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF1 (bg)



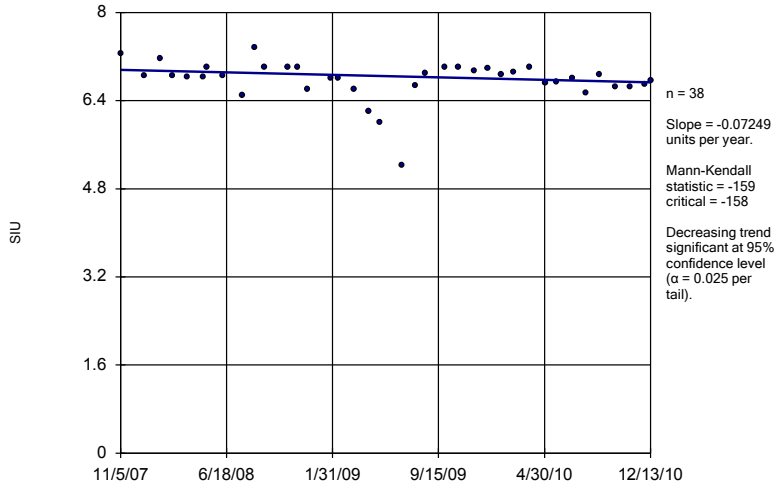
Constituent: pH Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF3

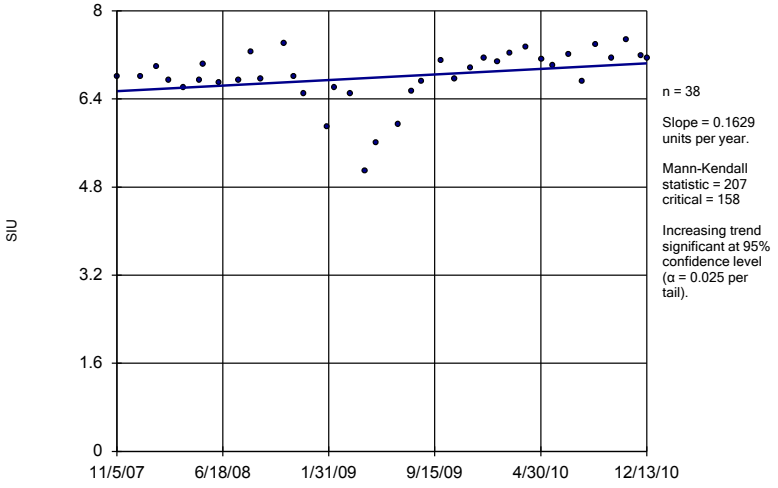


Constituent: pH Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = 0.1629 units per year.

Mann-Kendall statistic = 207 critical = 158

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

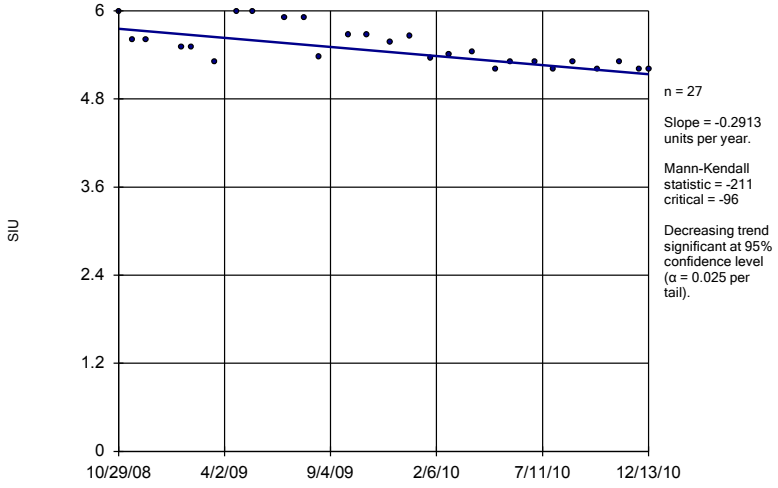
Constituent: pH Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF8



n = 27

Slope = -0.2913 units per year.

Mann-Kendall statistic = -211 critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

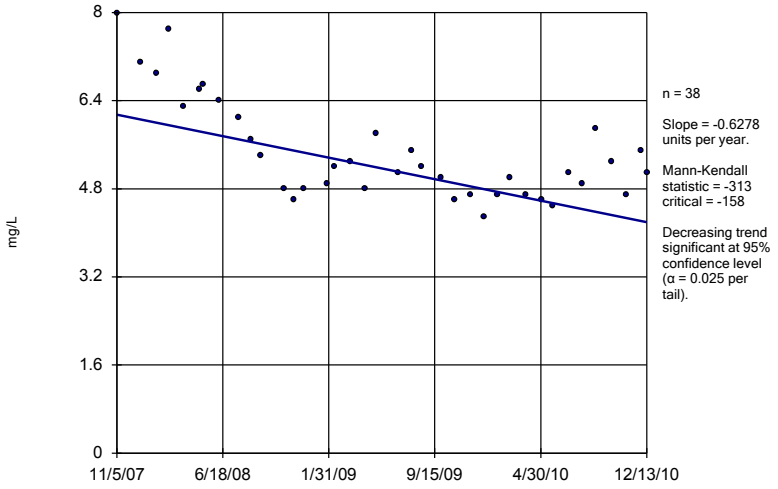
Constituent: pH Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF2



n = 38

Slope = -0.6278 units per year.

Mann-Kendall statistic = -313 critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

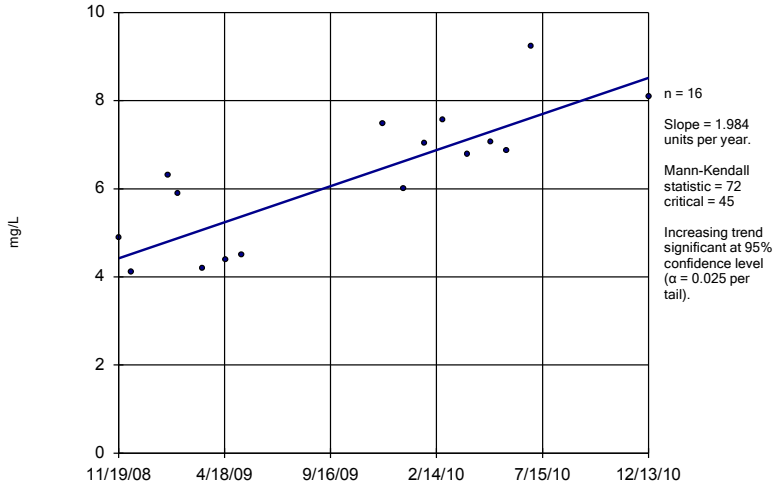
Constituent: Potassium Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF5 (bg)



n = 16

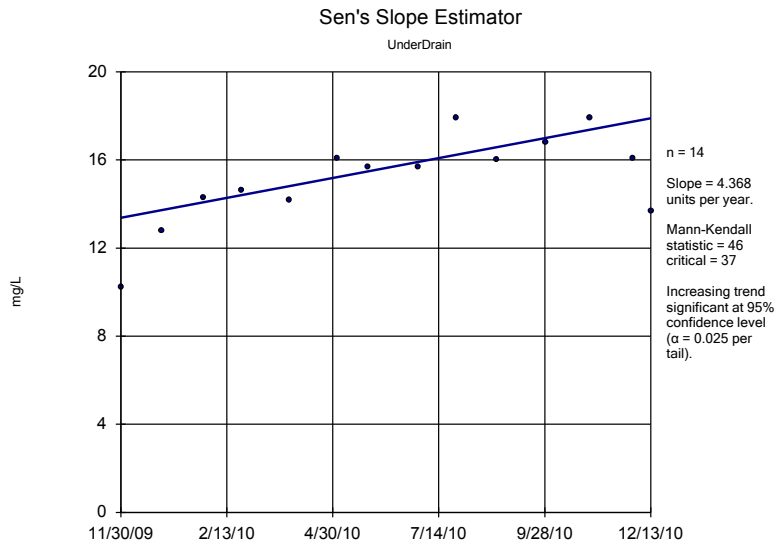
Slope = 1.984 units per year.

Mann-Kendall statistic = 72 critical = 45

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Potassium Analysis Run 2/10/2011 11:35 AM

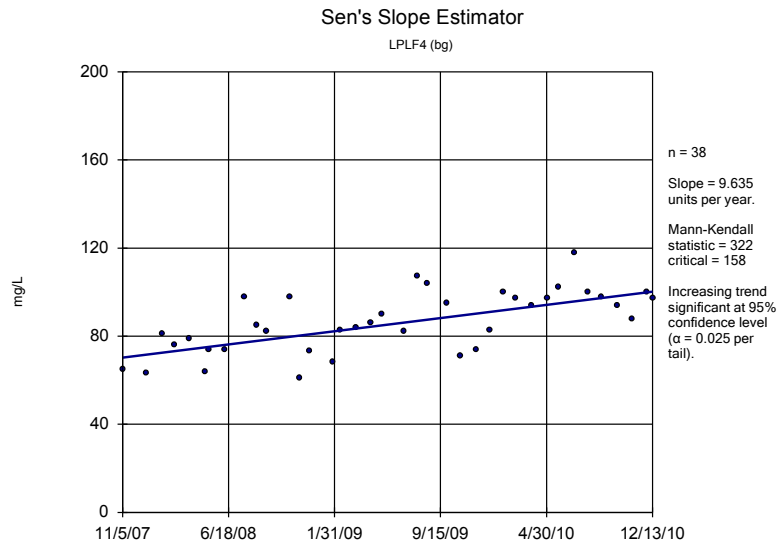
Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_



Constituent: Potassium Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

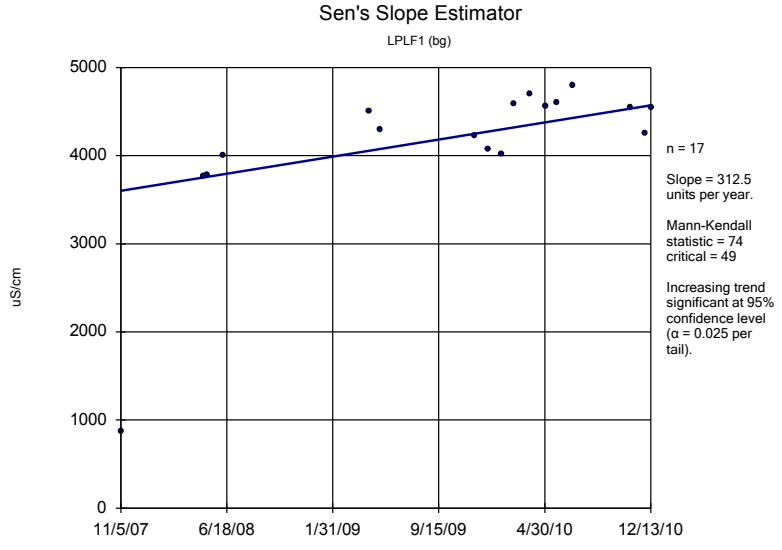
v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA



Constituent: Sodium Analysis Run 2/10/2011 11:35 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

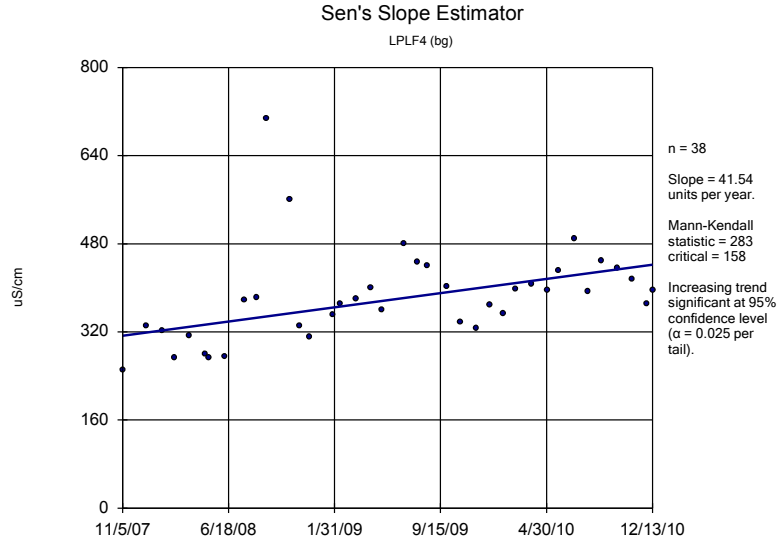
v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA



Constituent: Specific Conductance Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

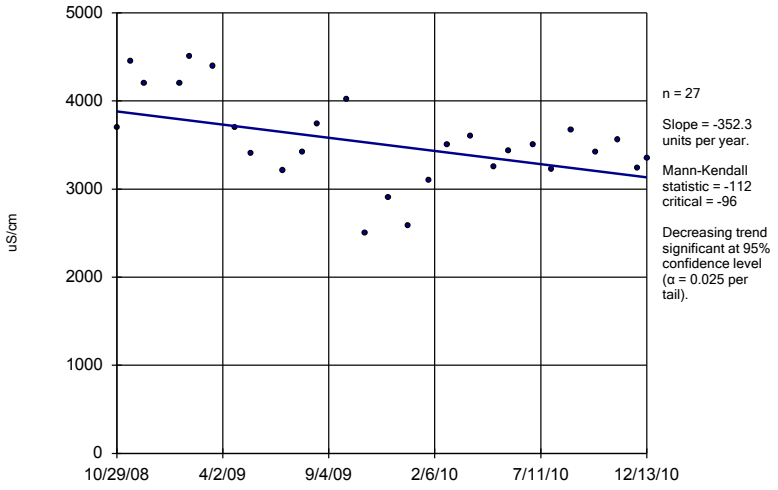


Constituent: Specific Conductance Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF8



n = 27

Slope = -352.3 units per year.

Mann-Kendall statistic = -112 critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

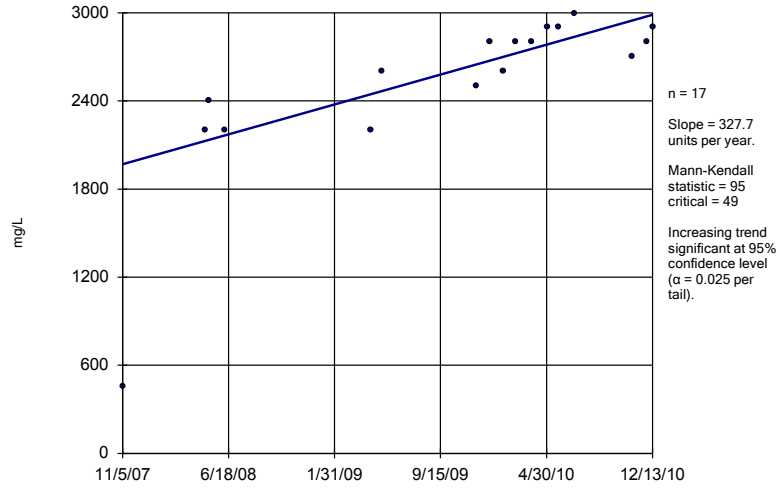
Constituent: Specific Conductance Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF1 (bg)



n = 17

Slope = 327.7 units per year.

Mann-Kendall statistic = 95 critical = 49

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

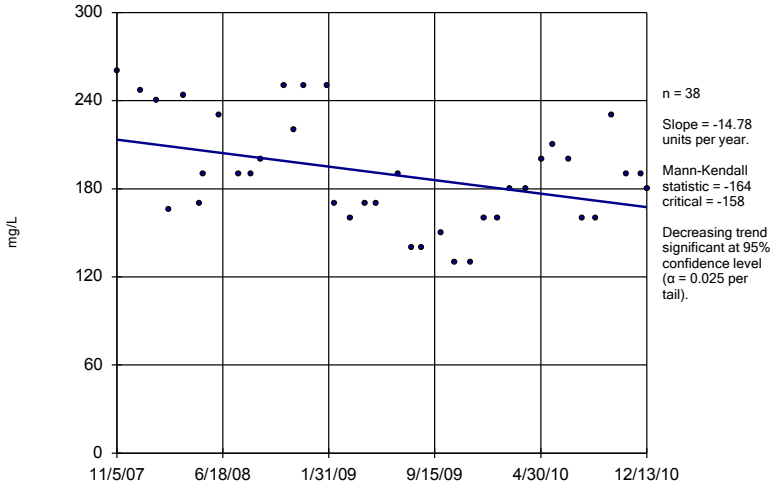
Constituent: Sulfate Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF3



n = 38

Slope = -14.78 units per year.

Mann-Kendall statistic = -164 critical = -158

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

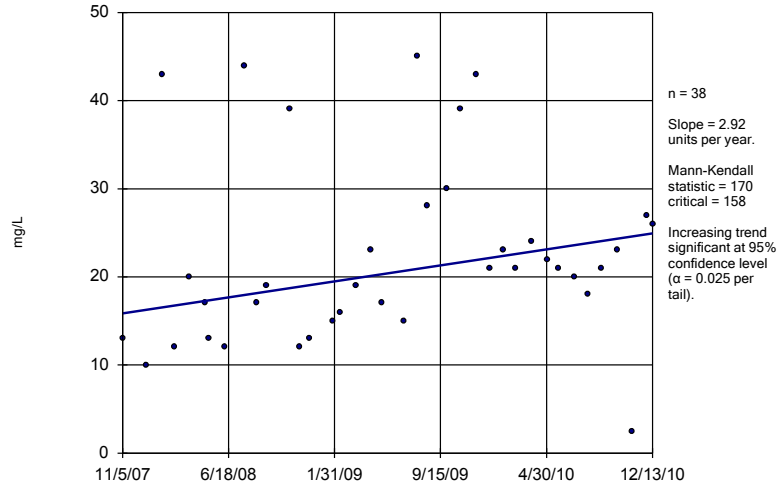
Constituent: Sulfate Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = 2.92 units per year.

Mann-Kendall statistic = 170 critical = 158

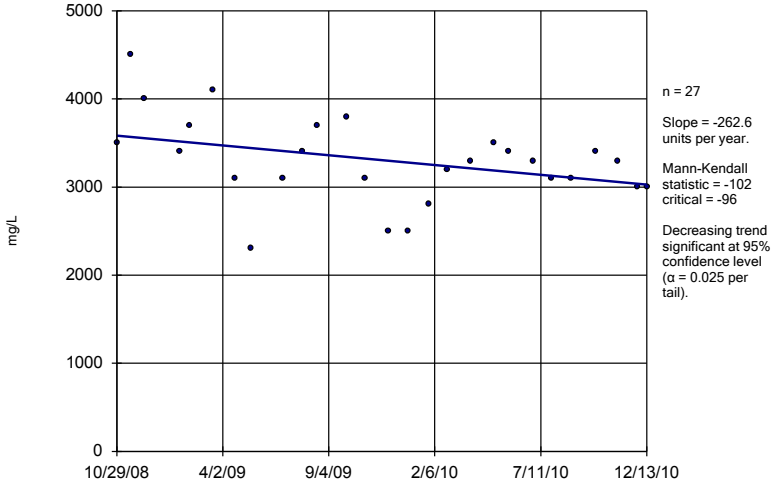
Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Sulfate Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

Sen's Slope Estimator

LPLF8



n = 27

Slope = -262.6 units per year.

Mann-Kendall statistic = -102 critical = -96

Decreasing trend significant at 95% confidence level (α = 0.025 per tail).

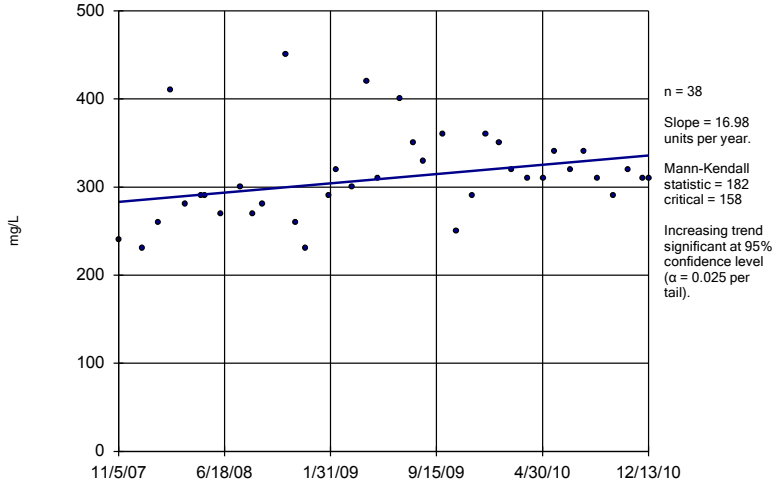
Constituent: Sulfate Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF4 (bg)



n = 38

Slope = 16.98 units per year.

Mann-Kendall statistic = 182 critical = 158

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

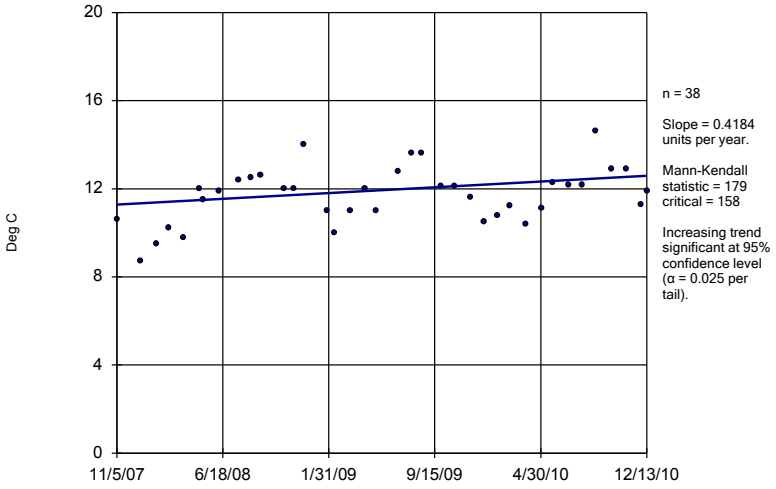
Constituent: TDS Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF2



n = 38

Slope = 0.4184 units per year.

Mann-Kendall statistic = 179 critical = 158

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

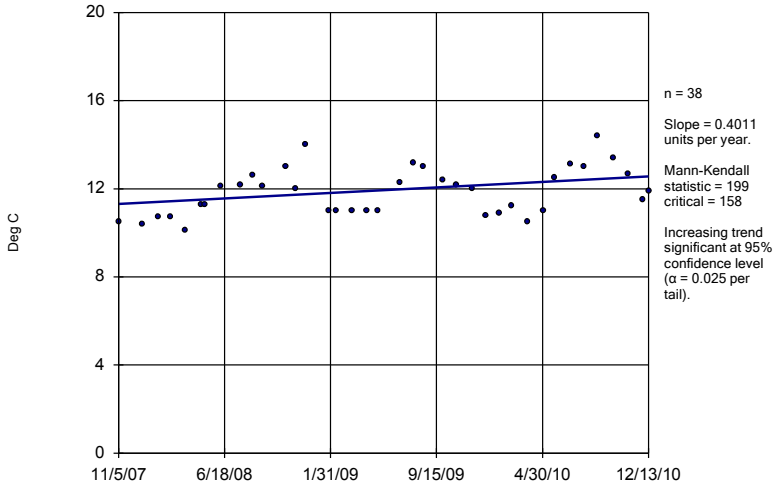
Constituent: Temperature Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_

v.9.1.20 For the statistical analyses of ground water by TransAlta Centralia Mining LLC only. EPA

Sen's Slope Estimator

LPLF3



n = 38

Slope = 0.4011 units per year.

Mann-Kendall statistic = 199 critical = 158

Increasing trend significant at 95% confidence level (α = 0.025 per tail).

Constituent: Temperature Analysis Run 2/10/2011 11:36 AM

Facility: TransAlta Centralia Mining LLC Client: TransAlta Centralia Mining LLC Data File: LPLF Data_Dec 2010_